Downtown Redmond Link Extension
SEPA Addendum

Appendix F
Biological Assessment

Hydrologic Unit Code (HUC) 17110012 (Lake Washington-Sammamish River)

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Prepared for

Central Puget Sound Regional Transit Authority
401 S. Jackson Street
Seattle, WA 98104

Prepared by

Parametrix
719 2nd Avenue, Suite 200
Seattle, WA 98104
T. 206.394.3700 F. 1.855.542.6353
www.parametrix.com

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D Best Management Practices and Minimization Measures from the 2010 East Link BA
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ACRONYMS AND ABBREVIATIONS

BA	biological assessment
Ballard Locks	Hiram M. Chittenden Locks
BMPs	best management practices
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
dBA	A-weighted decibels
°C	degrees Celsius
DPS	distinct population segment
Ecology	Washington State Department of Ecology
EFH	essential fish habitat
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FTA	Federal Transit Administration
HPA	Hydraulic Project Approval
Leq	equivalent sound level
LID	low-impact development
LWD	large woody debris
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OHWM	ordinary high water mark
PGIS	pollution-generating impervious surface
Services	NMFS and USFWS
SMP	Shoreline Master Program
Sound Transit	Central Puget Sound Regional Transit Authority
SPCC	spill prevention, control, and countermeasures
SR	State Route
TDA	threshold discharge area
TESC	temporary erosion and sediment control
USFWS	U.S. Fish and Wildlife Service

ACRONYMS AND ABBREVIATIONS (CONTINUED)

WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

EXECUTIVE SUMMARY

The Central Puget Sound Regional Transit Authority (Sound Transit) has prepared this biological assessment on behalf of the Federal Transit Administration to facilitate the reinitiation of consultation on the East Link Light Rail Project—specifically, for the project segment known as the Downtown Redmond Link Extension (which corresponds to Segment E of the East Link project)—under Section 7 of the Endangered Species Act (ESA). Analyses in this document address effects that differ from those analyzed in the biological assessment prepared in 2010 for the East Link project. The primary factors driving the need for reinitiation are the inclusion of in-water work within Bear Creek, as well as the placement of structures below the ordinary high water mark of Bear Creek and the Sammamish River. Other features of the project that were not previously analyzed are proposed habitat improvements in Bear Creek, clearing of riparian habitat along Bear Creek, and the installation of a pedestrian bridge over the stream. Discussions in this document also provide site-specific information about changes in the amount of impervious surface in the project action area.

The project site is largely in the city of Redmond, Washington; portions that pass through Marymoor Park fall within the jurisdiction of King County. The Downtown Redmond Link Extension will add 3.4 miles of light rail and two new light rail stations from the interim terminus of the Redmond Technology Center Station (formerly called the Overlake Transit Center Station) to downtown Redmond. With the exception of in-water work and the placement of structures below the ordinary high water mark of Bear Creek and the Sammamish River, construction methods and structures will generally be as described in the 2010 East Link BA. In addition, several improvements to Bear Creek in the project corridor are proposed. The existing treated wood bridge at the former BNSF railroad crossing will be removed from the stream, and portions of the fill prism upon which the railroad was built will be pulled back. Excavated fill will be removed from the floodplain of Bear Creek. The channel and floodplain of Bear Creek will be widened where the existing stream channel and floodplain are currently constricted by the bridge and the fill prism. Over the long term, the proposed habitat improvements in Bear Creek will benefit aquatic species by increasing the amount of available habitat, improving habitat complexity, maintaining riparian cover and water quality, and facilitating upstream migration.

The primary federal nexus for this project is federal aid funding provided by the Federal Transit Administration. This document also supports ESA Section 7 compliance for issuance by the U.S. Army Corps of Engineers of a permit under Section 404 of the federal Clean Water Act, and for permitting by the U.S. Coast Guard under the General Bridge Act.

Project activities with the potential for direct effects on ESA-listed species include ground-disturbing work and equipment use near and within Bear Creek and the Sammamish River. Potential effects of these activities include temporary loss or degradation of riparian or in-stream habitat (including water quality) and disturbance of fish during in-water work. The project will implement minimization measures to reduce effects on listed species and critical habitat. The risk of exposure to construction-related effects will be minimized by performing work within the active stream channel during the approved in-water work window. Table ES-1 identifies the listed species and critical habitats addressed in this biological assessment and summarizes the effect determinations.

The project may adversely affect freshwater essential fish habitat (EFH) for Pacific salmon in Bear Creek and the Sammamish River. However, it will not adversely affect EFH for groundfish or coastal pelagic species.

Table ES-1. ESA-Listed Species and Critical Habitat Addressed in this Biological Assessment

Species	Status	Species Effect Determination	Critical Habitat Status	Critical Habitat Effect Determination
Chinook salmon (*Oncorhynchus tshawytscha*) (Puget Sound ESU)	Threatened	Likely to Adversely Affect	Designated; none in action area	No Effect
Steelhead trout (*Oncorhynchus mykiss*) (Puget Sound DPS)	Threatened	Not Likely to Adversely Affect	Designated; none in action area	No Effect
Bull trout (*Salvelinus confluentus*)	Threatened	Not Likely to Adversely Affect	Designated; none in action area	No Effect
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	No Effect	Designated; none in action area	No Effect
Streaked horned lark (*Eremophila alpestris strigata*)	Threatened	No Effect	Designated; none in action area	No Effect
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	No Effect	Designated; none in action area	No Effect
North American wolverine (*Gulo gulo luscus*)	Proposed Threatened	No Effect	None designated or proposed	No Effect

ESU = Evolutionarily Significant Unit

DPS = Distinct Population Segment

1. INTRODUCTION

The Central Puget Sound Regional Transit Authority (Sound Transit) has prepared this biological assessment (BA) to facilitate the reinitiation of consultation between the Federal Transit Administration (FTA) and the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) on the East Link Light Rail Project—specifically for the project segment known as the Downtown Redmond Link Extension (which corresponds to Segment E of the East Link project)—under Section 7 of the Endangered Species Act (ESA) of 1973 (16 United States Code Sections 1531-1544). The primary factors driving the need for reinitiation are the inclusion of in-water work within Bear Creek, as well as the placement of structures below the ordinary high water mark (OHWM) of Bear Creek and the Sammamish River. Other features of the project that were not previously analyzed are the habitat improvements in Bear Creek, clearing of riparian habitat along Bear Creek, and the installation of a pedestrian bridge over the stream.

The primary federal nexus for this project is federal aid funding provided by FTA. This BA also supports ESA Section 7 compliance for the U.S. Army Corps of Engineers' (Corps) issuance of a permit under Section 404 of the federal Clean Water Act, and for permitting by the U.S. Coast Guard under the General Bridge Act. Analyses in this document also address potential effects on designated or proposed critical habitat for ESA-listed species. Effects on essential fish habitat (EFH), as defined by NMFS (2004), are also examined in this document (Attachment A).

Section 7 of the ESA requires each federal agency to ensure that any actions it undertakes or approves will not jeopardize the continued existence of ESA-listed endangered or threatened species or result in the destruction or adverse modification of their designated critical habitat. To meet this requirement, FTA initiated consultation with NMFS and USFWS (collectively referred to as the Services) concerning the potential effects of the East Link Preferred Alternative on ESA-listed species and critical habitat. Sound Transit prepared a BA for the East Link Light Rail Transit Project to serve as the basis for the consultation (Sound Transit 2010). Based on the analysis in that document, and on the implementation of proposed mitigation measures, FTA determined that construction and operation of the East Link project **may affect, but is not likely to adversely affect**, ESA-listed species and critical habitat. FTA received letters of concurrence from NMFS on December 7, 2010, and from USFWS on February 23, 2011.

The requirement to comply with the consultation provisions of ESA does not end with the completion of consultation, however. The implementing regulations for ESA (50 Code of Federal Regulations 402.16) provide for the reinitiation of consultation under any of the following circumstances:

(a) If the amount or extent of taking specified in an incidental take statement is exceeded;

(b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

(c) If the identified action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in a biological opinion; or

(d) If a new species is listed or critical habitat designated that may be affected by the identified action.

Based on the determination of effects, consultation on the 2010 East Link BA was conducted on an informal rather than formal basis; the Services thus did not prepare a biological opinion and no incidental take statement was issued. For this reason, criteria (a) and (c) above do not apply. Discussions in this BA address changes in the manner or extent of anticipated effects on ESA-listed species or critical habitat (criterion b), as well as new listings and critical habitat designations since the 2010 East Link BA was completed (criterion d).

The 2010 East Link BA analyzed potential effects on Chinook salmon, steelhead, and bull trout, all of which are listed as threatened. The listing status of these species has not changed since 2010, and no additional aquatic species have been listed or proposed for listing under the ESA in the action area. No portions of the project action area have been designated or proposed for designation as critical habitat for these or any other ESA-listed species. General information about the life histories of the species covered in this BA is presented in Attachment B. Discussions in Chapter 6 of this BA provide updated information about the status of those species, as well as the timing and nature of their habitat use in the action area. Chapter 6 of this BA also provides information about wildlife species identified by USFWS (2017) as potentially occurring in areas that might be affected by the project.

This BA addresses effects that differ from those analyzed for Segment E of the East Link project in the 2010 East Link BA. Analyses pertaining to Segment E in the 2010 BA addressed potential effects resulting from sedimentation, temporary and permanent losses of vegetation, new impervious area, and shading from elevated structures. When that document was prepared, Sound Transit had not received funding for Segment E; therefore, site-specific values for changes in impervious area were not calculated for that segment. Discussions in this document provide that information, as well as analyses of impacts associated with work below the OHWM of Bear Creek and the Sammamish River and within the Bear Creek riparian area. The beneficial effects of habitat improvements in Bear Creek are also analyzed.

2. PROJECT LOCATION AND DESCRIPTION

The project site is largely in the city of Redmond, Washington; portions that pass through Marymoor Park fall within the jurisdiction of King County (Figure 2-1). Project features are within Sections 11, 12, and 14 of Township 25 North, Range 5 East, Willamette Meridian. The project area's boundaries conform to the following approximate latitude/longitude coordinates: 47.672° N (north), 122.107° W (east), 47.645° N (south), 122.137° W (west). The project area drains to the Sammamish River in Water Resource Inventory Area (WRIA) 8, Lake Washington/Cedar/Sammamish. Most of the project area falls within sixth-level hydrologic unit 171100120304 (Bear Creek-Sammamish River). Portions surrounding the crossing of Bear Creek are within sixth-level hydrologic unit 171100120301 (Bear Creek).

The Downtown Redmond Link Extension will add 3.4 miles of light rail and two new light rail stations from the interim terminus of the Redmond Technology Center Station (formerly called the Overlake Transit Center Station) to downtown Redmond. The paragraphs below provide an overview of the portions of the project that are not substantively different from what was analyzed in the 2010 East Link BA. In most areas, construction methods and structures being proposed will be as described in that BA. Descriptions of project activities that were not analyzed in the 2010 East Link BA are presented in the following subsections.

The proposed alignment is similar to what was analyzed in the 2010 East Link BA, but is shifted up to 30 feet in some locations to minimize impacts on properties and resources, and to account for the Washington State Department of Transportation (WSDOT) planned improvements to State Route (SR) 520 between the NE 40th Street and NE 51st Street interchange complex and the eastbound off-ramp to West Lake Sammamish Parkway NE. The following description starts from the Redmond Technology Center Station and proceeds into downtown Redmond.

The project alignment runs parallel to the east side of SR 520 north from NE 40th Street. This section of the light rail route will be generally retained-cut and at the same elevation of SR 520, with a retaining wall on the east side of the tracks where the alignment cuts into the hillside. Sections under the existing overpasses at NE 51st Street and NE 60th Street will be retained-cut. As SR 520 curves to the east, the alignment will remain on the south side of the highway and transition to an elevated structure to cross over the West Lake Sammamish Parkway NE interchange and the Sammamish River on a new bridge. The bridge over the river will be approximately 31 feet wide and 136 feet long and will be at least 50 feet above the OHWM of the river. Support columns will be placed landward of the top of the bank, approximately 20 to 25 feet outside of the OHWM.

East of the Sammamish River crossing, the configuration will transition to a retained-fill section as it crosses Marymoor Park to the at-grade SE Redmond Station. The retained-fill section will provide a level surface for the light rail and will be close to at-grade. Station facilities will include 1,400 parking spaces. These spaces will initially be accommodated in an approximately 1,050-stall parking structure and a 350-stall surface parking lot. NE 70th Street will be rebuilt to accommodate the station facilities.

From the SE Redmond Station, the alignment will turn to the northwest and cross at-grade underneath SR 520 before rising to cross over Bear Creek. The SR 520 eastbound off-ramp and westbound on-ramp will be reconstructed over the guideway. SR 202 and a short section of NE 76th Street will be raised slightly to align with the reconstructed westbound on-ramp. The alignment will enter the former BNSF Railway corridor as it crosses under the SR 520/SR 202 interchange. The alignment will also accommodate an at-grade trail connection between the East Lake Sammamish Trail and Redmond Central Connector.

Source: USGS, City of Redmond, King County, Parametrix

Figure 2-1
Project Alignment
Downtown Redmond Link Extension

From Bear Creek to downtown Redmond, the light rail alignment and profile differ from what was analyzed in the 2010 East Link BA, but not to such a magnitude that construction or operation would affect listed species or critical habitat in a manner or to an extent not considered in that BA. With the proposed project refinements, the alignment will run along the south edge of the rail corridor's easement and will have an elevated profile from Bear Creek through downtown Redmond. The alignment in downtown Redmond will be shifted approximately 7 feet south of the previously analyzed project to accommodate the Redmond Central Connector Trail. An elevated Downtown Redmond Station will span 166th Avenue NE. Tail tracks will extend approximately 460 feet west of the station for train layover and turnback operations. The light rail line will terminate just east of 164th Avenue NE.

2.1 Bear Creek Channel Improvements

Several improvements to Bear Creek in the project corridor are proposed. The existing treated wood bridge at the former BNSF railroad crossing will be removed from the stream, and portions of the fill prism upon which the railroad was built will be pulled back. Excavated fill will be removed from the floodplain of Bear Creek. The channel and floodplain of Bear Creek will be widened where the existing stream channel and floodplain are currently constricted by the bridge and the fill prism. Additional habitat improvements include placing large woody debris (LWD) in the floodplain, enhancing stream substrates, and planting native trees and shrubs in riparian and floodplain areas. Adjacent areas within the floodplain will be excavated to create more floodplain storage and off-channel habitat, and to ensure no net rise of the flood elevation in the floodway. To minimize the potential for adverse effects on ESA-listed fish, LWD will not be installed within the actively flowing channel. Instead, LWD installation will take place below the OHWM but outside of the active channel, or within dewatered portions of the stream channel.

The channel improvement work will be designed to establish a compositionally and structurally complex ecosystem with attributes important for supporting fish and wildlife. The work will also reduce the floodplain stages upstream of the existing bridge. The floodplain will change in configuration with the removal of past floodplain encroachments. No unmitigated floodplain storage or floodway fill impacts are proposed.

Only preliminary design has been completed. The current design depicts the reconfigured channel through the site of the existing bridge as matching the width of the existing channel upstream and downstream—i.e., 35 to 40 feet instead of its current width of approximately 30 feet. Pullback of the railroad fill prism will increase the amount of stream channel area by approximately 1,000 square feet. Removal of the existing bridge will result in a 400-square-foot reduction in the amount of stream channel affected by overwater shading, although this reduction will be offset by the construction of the new guideway and pedestrian bridge in the same area.

Work below the OHWM of Bear Creek, including removal of the existing bridge piles and widening of the channel, will be conducted in the dry. It is anticipated that work areas within the active channel will be isolated from flowing water by using a sheet pile cofferdam to direct stream flow into one side of the active channel. The cofferdam will be installed using vibratory methods and will remain in place only as long as necessary. The cofferdam will be allowed to remain within the active channel of Bear Creek outside of the approved in-water work window only if authorized by the Washington Department of Fish and Wildlife (WDFW). Before the stream channel behind the cofferdam is dewatered, fish will be excluded from the area behind the cofferdam; handling of fish will be avoided to the maximum extent practicable. A qualified fish biologist will ensure that all fish exclusion activities comply with current WSDOT Fish Exclusion Protocols and Procedures. When bridge support timbers have been removed and the fill prism has been pulled back from one side of the channel, the cofferdam will be reconfigured to tie into the opposite bank, and the process will be repeated on the other side of the channel. Portions of the floodplain restored through fill removal will be graded to match existing contours upstream and downstream of the bridge.

Because this work will be conducted during the summer low-flow period, it is expected that stream flow will be readily contained within the channel, even when the channel is narrowed by the cofferdam. Two existing 84-inch overflow pipes under the railroad fill prism will be able to accommodate any unanticipated high flows that may occur while the cofferdam is in place. This expectation is based in part on as-built drawings showing that when a sewer line was installed under Bear Creek near the project area in 1987, a pair of 36-inch pipes was sufficient to divert stream flow during construction.

Sensitive species and habitats will be protected through implementation of the best management practices (BMPs) and conservation measures specified in the 2010 East Link BA, as well as those identified in Chapter 3 of this document. All ground-disturbing work within the channel of Bear Creek, as well as dewatering and reintroducing flow to the stream channel, will be completed during the approved in-water work window. It is anticipated that work can be completed during a single season. If unforeseen circumstances prevent this from happening, the channel will be stabilized, the cofferdam will be removed, and work will resume during the following year's in-water work window.

As the project design evolves during the process of permitting review, it may become apparent that removal of the existing railroad structures and enhancement of stream habitat would be achieved more efficiently by diverting the stream around the work site, using the existing 84-inch overflow pipes. Should this be the case, fish would be excluded from the work area and flow would be diverted and then reintroduced to the channel during the approved in-water work window, and in a manner designed to minimize the exposure of ESA-listed fish to increased levels of turbidity. A qualified fish biologist would ensure that all fish exclusion activities comply with current WSDOT Fish Exclusion Protocols and Procedures.

To meet the requirements of permits issued by federal, state, and local agencies, LWD will be placed in the floodplain and below the OHWM, and riparian areas will be planted with native species. It is anticipated that one objective of these compensatory mitigation efforts will be to ensure no net loss of ecological functions and values of Bear Creek and its associated riparian area. Over the long term, the habitat improvements in Bear Creek are expected to result in a net benefit to the ecological functions and values of the system.

2.2 Bear Creek Crossing

Analyses in the 2010 East Link BA were based on the expectation that clearing of riparian vegetation would not be required for the crossing at Bear Creek. As a result of constraints posed by the need for the guideway to pass underneath the nearby on-ramp to SR 520 before rising to cross Bear Creek, the design was revised to include permanent structures less than 15 feet above ground level in the riparian area around Bear Creek. Where the guideway crosses Bear Creek, the alignment will be at-grade up to a point approximately 10 to 35 feet from the eastern stream bank (as reconfigured by the channel improvements described above), climbing to 3 feet above ground level as it starts to cross the stream, and 5.5 feet above ground at the western stream bank (Attachment C). The total length of guideway over the OHWM is approximately 260 feet. Project construction will also require temporary clearing of vegetation from the riparian area, as will ground-disturbing work for widening of the Bear Creek channel, described above. Approximately 2.65 acres of riparian habitat along Bear Creek will be affected by temporary clearing.

The design of the guideway where it crosses Bear Creek will comply with the following standards and guidelines:

- The design will be consistent with applicable provisions of current WDFW water crossing guidelines.
- Design and construction will comply with the provisions specified in the Hydraulic Project Approval (HPA) issued by WDFW.

- The structure will be designed to account for the lateral stream channel migration expected to occur during the bridge's lifespan.
- The project will comply with the City of Redmond's critical areas code and Shoreline Master Program (SMP).
- The bottom of the structure will have at least 4.2 feet of clearance over the existing OHWM of Bear Creek, and at least 3 feet of clearance over the 100-year future floodplain elevation[1].

Portions of several guideway support structures will likely be installed below the OHWM of Bear Creek. The exact location of the structures relative to the OHWM of Bear Creek is not known because the future location of the OHWM (following stream channel widening) cannot be predicted. As described in Section 5.2 of this document, the width of the OHWM in the project area currently ranges from 30 to 400 feet. No structures will be placed within the active channel of Bear Creek; the nearest structure will be more than 10 feet from the top of the bank. The active channel will be spanned by a 100-foot bridge between the eastern abutment and the first set of support columns west of Bear Creek. Approximately 2,000 square feet of the active channel will be beneath the guideway. Approximately 5,800 square feet within the existing OHWM (including the active channel) will be beneath the guideway. As shown in Attachment C, approximately 50 square feet of the eastern bridge abutment falls within the area defined by the existing OHWM. West of the stream, one of the support columns for the western pier will be below the existing OHWM, as will the bases of the next two support columns to the west. The three columns west of the stream will occupy approximately 76 square feet within the area defined by the existing OHWM.

Construction will start with installation of erosion control BMPs and preparation of the staging areas. Staging areas and access roads will be located in compliance with the conservation measures in Chapter 3 and will be constructed as trestles on pin piles and/or by laying geotextile fabric on the existing ground surface and placing 1 to 2 feet of pit-run gravel on top. Either method will allow temporary access and work areas to be restored to pre-construction conditions without impacting existing soils. The existing bridge may also be used as a work trestle. Once the staging areas are established, approach work for the guideway will begin.

The eastern abutment will be built on a retaining wall that is approximately 225 feet long overall, and 8 feet tall at its western end (i.e., the end closer to Bear Creek). The western end of the retaining wall will be supported by steel piles driven to bearing depth with a crane-mounted impact pile driver. Construction methods for the elevated guideway will be similar to those described for the Sammamish River crossing in the 2010 East Link BA. Where drilled shafts are used to support elevated guideways, shafts may need to be dewatered before concrete is poured. Drilling spoils may also need to be dewatered. Water recovered during the dewatering process will be treated to meet the appropriate permit requirements before being discharged to receiving waters.

[1] Analyses in this document refer to the existing OHWM because the future location of the OHWM can be determined only by field investigation and therefore cannot be predicted. The estimated post-project elevation of the 100-year floodplain is based on hydraulic modeling that has been conducted on the preliminary design of the reconfigured stream channel.

2.3 Bear Creek Pedestrian Bridge

The modified project will include the construction of a new pedestrian bridge over Bear Creek. The bridge will be part of the East Lake Sammamish Trail Connector, which is being constructed along the former rail corridor. The 18-foot-wide, 140-foot-long prefabricated bridge will be installed approximately 20 feet north (upstream) of the light rail crossing. The total length of the pedestrian bridge and approach trail segments within the OHWM is approximately 210 feet. East of the bridge (outside of the OHWM), the approach trail segment will be built on fill. West of the bridge, the approach trail segment will be supported on pin piles to minimize impacts to wetlands and the floodplain. No substantial work for the bridge design has been completed. The design will, however, comply with the following standards and guidelines:

- Bridge design will be consistent with applicable provisions of current WDFW water crossing guidelines.
- Bridge design and construction will comply with the provisions specified in the HPA issued by WDFW.
- The bridge will be designed to account for the lateral stream channel migration expected to occur during the bridge's lifespan.
- The project will comply with the City of Redmond's critical areas code and SMP.
- The bottom of the bridge will have at least 4.2 feet of clearance over the OHWM of Bear Creek, and at least 3 feet of clearance over the 100-year floodplain elevation.
- The bridge span will be 140 feet to minimize the need to place structures within or near the OHWM of Bear Creek.

The contractor will construct the foundation system and then hoist the bridge on a crane and place it on the foundation. The crane will operate from a level area outside of the active channel. Other aspects of bridge construction will generally be similar to those described above for the guideway crossing of Bear Creek, although driving of pin piles may be accomplished with equipment other than a crane-mounted impact pile driver.

2.4 Stormwater Outfalls to the Sammamish River

The only work below the OHWM of the Sammamish River will be the installation of two new outfalls to convey stormwater runoff from the guideway. One outfall will be on the east side of the river and will have a pipe size of 18 to 36 inches in diameter. The outfall will be below the OHWM of the river. The other new outfall, with a pipe size of 18 to 24 inches in diameter, will be on the west side of the river. The location of the second outfall relative to the OHWM has not been determined. Rocks will be placed downgradient of both outfall discharge points to prevent erosion.

Where ground-disturbing work below the OHWM is necessary, work will be conducted during the approved in-water work window and appropriate measures will be implemented to prevent sediment from entering the water. Because outfall installation will take place under summer low-flow conditions (i.e., during the in-water work window) when the water level is well below the OHWM, it may be possible to accomplish work area isolation with silt fences or similar BMPs. If the distance between ground-disturbing work areas and the river surface is too short, cofferdams will be used to isolate work areas from the river. If cofferdams are deemed necessary, work area isolation will include the placement of sandbags or sheet piles to form a wall, followed by dewatering of the area. Before and during dewatering activities, any fish in the work area will be herded out from behind the cofferdam using WSDOT-approved methods. Based on the small size of the work areas, combined with the lack of structural complexity in

the river at these locations, it is expected that most if not all fish can be excluded from the work areas without the need for direct handling. If any fish remain in the work area after completion of the cofferdam, they will be removed using approved WSDOT fish handling and exclusion protocols or by appropriately adapted and approved methods (WSDOT 2016). Work within the OHWM of the river, including dewatering and reintroducing flow to the work areas, will be performed only during the approved in-water work window.

The new conveyance pipes will be installed by clearing an approximately 15-foot swath of vegetation upslope of the OHWM, excavating a trench for each pipe, and then refilling the trench. Disturbed areas will be replanted with appropriate native species.

2.5 Stormwater Management

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

Conceptual engineering has been completed for the major stormwater detention and treatment facilities necessary for the proposed project. Sound Transit used a conservative approach in developing drainage concepts. Sound Transit applied the MGSFlood hydrological simulation model, Version 4.43, to analyze project hydrology and to determine sizing of the facilities. Much of the project will drain to Lake Sammamish and the Sammamish River, which are exempt from flow control requirements. In project areas where the soils and water table are suitable for infiltration, runoff from the guideway will be infiltrated. Runoff from pollution-generating surfaces will be treated before it is infiltrated into the ground. Some portions of the track may be elevated above existing wetlands or may partially displace wetlands. In these areas, runoff from the guideway may be directed back into the remaining wetland area to maintain the volume of water draining to the wetlands.

2.5.1 Stormwater Flow Control and Treatment

The Downtown Redmond Link Extension will comply with the following design manuals:

- City of Redmond Stormwater Technical Notebook, 2017
- King County Surface Water Design Manual, 2016
- Washington State Department of Ecology (Ecology) Stormwater Management Manual for Western Washington, 2014
- WSDOT Highway Runoff Manual, 2014
- WSDOT Hydraulics Manual, 2017

Sound Transit's preliminary engineering for the Downtown Redmond Link Extension includes development of a conceptual layout for major stormwater facilities that are sized to comply with Sound Transit's 2016 Design Criteria Manual (Revision 4), which requires stormwater facilities for Sound Transit projects to conform to the requirements of local jurisdictions. Based on the guidance provided in Sound Transit's Design Criteria Manual, low-impact development (LID) is a preferred method of stormwater management and will be employed wherever possible. In addition, Ecology's 2014 Stormwater Management Manual for Western Washington requires LID approaches to stormwater management to

the extent feasible. Stormwater management facilities will be designed using sustainable LID approaches where possible, referencing the above manuals and the Low Impact Development Technical Guidance Manual for Puget Sound (Hinman 2012) as guidance. However, in areas where use of LID measures is not feasible due to physical site constraints, other techniques will be used.

To minimize the potential impacts of increased impervious surface, stormwater infiltration facilities will be constructed as part of the Downtown Redmond Link Extension where feasible. Near the SE Redmond Station, several stormwater facilities will be created to infiltrate runoff from the guideway. Some of the facilities may be open ponds, while others may be underground infiltration galleries or other suitable methods.

Runoff from pollution-generating impervious surfaces (PGIS) will typically require basic water quality treatment, with a goal of removing at least 80 percent of total suspended solids. Water quality treatment techniques may include bioretention, modular wetlands, biofiltration swales, media filter drains, and media filter vaults. Treatment to remove metals, oil, and grease will be provided at parking lots and roadway areas where required. Enhanced treatment will be provided for controlled limited access highways with annual average daily traffic counts of 15,000 or more, and for roads with an annual average daily traffic of 7,500 or greater. The specific stormwater management facilities used will depend on the conditions at the site. Typical facilities may include bioretention facilities, media filter drains, biofiltration swales, and modular wetlands.

Runoff from new and replaced PGIS will be treated and infiltrated or will receive on-site water quality treatment before being discharged into municipal storm sewer systems, except where the City of Redmond has regional facilities. The area of the project west of 170th Avenue NE is located in the Downtown Regional Facility Surcharge Area. Project runoff within this area will be infiltrated where feasible; where infiltration is infeasible, runoff will discharge into the existing stormwater system that outfalls to the Sammamish River.

Where practicable, non-PGIS runoff will be conveyed separately from untreated PGIS runoff because it does not require water quality treatment. Where non-PGIS and PGIS runoff are conveyed jointly, the stormwater management facility will be designed to detain the joint flow and to provide required treatment for the PGIS flow in accordance with Ecology standards.

Consistent with the requirements of WSDOT's Highway Runoff Manual, seven threshold discharge areas (TDAs) were delineated in the action area. These TDAs and their discharge locations are described in Table 2-1, proceeding from TDA 1 at the southern end of the action area (NE 40th Street) to TDA 7 in downtown Redmond. Currently, only preliminary stormwater design has been completed. Analyses in this BA incorporate conservative assumptions about stormwater design details. It is likely that at least some of the traditional stormwater treatment methods described below will be replaced with LID options with equal or greater treatment and detention benefit.

Table 2-1. Summary of Existing and Proposed Stormwater Management in the Action Area

TDA	Fate of Runoff	Existing Treatment	Proposed Changes
1	Currently drains to Lake Sammamish via Villa Marina Creek. Following completion of a project in 2018, runoff will discharge directly to Lake Sammamish without entering Villa Marina Creek.	Driveways within the Microsoft Building 50 site drain to an existing biofiltration swale.	Current project design decreases the amount of PGIS in this TDA. Runoff from the guideway will drain to the trunk line in NE 40th Street that will discharge to Lake Sammamish.
2	Drains in a storm line via NE 51st Street to a vegetated dispersion area approximately 300 feet from the Sammamish River.	Stormwater runoff infiltrates and is diluted to a substantial degree as it travels from the discharge point toward the river.	Runoff from the relocated road will continue to drain to existing facilities, including vegetated dispersion area.
3	*West of Sammamish River*: Runoff flows via a storm pipe in SR 520 to a WSDOT wet pond and then out to the Sammamish River: *East of Sammamish River*: Most water likely infiltrates; the remainder either flows directly to the river or to an existing collection system in Marymoor Park that discharges to the river.	*West of river*: WSDOT wet pond provides basic treatment for SR 520 runoff. *East of river*: No pertinent facilities.	*West of river*: Some precipitation that currently reaches PGIS will be intercepted by the guideway. Runoff from the guideway will be discharged directly to the river. *East of river*: Runoff from the guideway will be collected and discharged to a new outfall in the river. There is no change in PGIS in this area.
4	All stormwater in this TDA currently infiltrates.	None	Runoff from the guideway will be collected and conveyed to the Sammamish River in TDA 3.
5	Stormwater discharges to a wetland in Marymoor Park (which has no apparent outlet) or infiltrates into the ground.	Runoff in the SE Redmond area is infiltrated into the ground. Treatment is unknown.	Runoff from the parking facilities and the reconstructed roadways will be treated with bioretention or similar facilities and then infiltrated.
6	Some of the runoff around the SR 520/SR 202 interchange infiltrates into the ground; overflows drain to Bear Creek.	Runoff from the eastbound off-ramp and from SR 202 southeast of the ramp drain to a biofiltration swale and then to an infiltration pond at the eastbound SR 520 off-ramp to southbound SR 202. Runoff from the westbound on-ramp and SR 202 adjacent to the on-ramp drain into a presettling cell and then to a stormwater treatment wetland. Some incidental infiltration occurs in the wetland. Stormwater from NE 76th Street is treated in a medial filter drain adjacent to the roadway.	Runoff from the guideway will infiltrate (if feasible) or be detained before discharge to Bear Creek. Runoff from modified roadways will continue to drain to existing facilities. The existing infiltration pond will be relocated. PGIS will increase slightly due to widening of the off-ramp. The additional runoff will be treated and infiltrated.
7	Part of the Downtown Regional Facility Surcharge Area. Drains to the Sammamish River.		Precipitation that currently reaches PGIS will be intercepted by the guideway. Runoff from the guideway will be collected into the existing conveyance system that discharges to the Sammamish River. Runoff may be partially infiltrated if soil is suitable.

2.5.2 Impervious Area

New project-related impervious areas will include tracks and guideways, stations, park-and-ride lots, and roads. Ballasted (i.e., gravel) track sections were counted as impervious areas by definition in accordance with the Stormwater Management Manual for Western Washington (Volume 1, Appendix G). Relocated roads to accommodate the Downtown Redmond Link Extension were also counted as project-associated impervious area. The new and replaced pavement will require stormwater treatment and detention. For those cases where elevated track will overlay a relocated road, the underlying impervious area of the road was not counted in the impervious area numbers (to avoid double-counting). An existing impervious area of 29 acres was obtained from new surveyed base maps. The project will increase the amount of impervious surface in the action area by 4.9 acres (approximately 17 percent), mostly as a result of the new guideway covering existing vegetated right-of-way areas.

2.5.3 Pollution-Generating Impervious Surfaces

Project-related PGIS consists primarily of frontage roads and intersections near the project route that will need to be reconstructed to accommodate the light rail tracks. In southeast Redmond, a large part of project-related PGIS will come from relocating NE 70th Street to access the new parking facilities and the station. PGIS also includes bus holding areas, access roads, and parking areas at the park-and-ride lots constructed for the project.

Light rail guideways and stations have no motor vehicle traffic or other sources of pollution-generating activities and are therefore classified as non-PGIS. Small amounts of non-toxic lubricant may be used on sections of light rail track to prevent operational noise from wheel squeal. Given the non-toxic nature of this product and small quantities anticipated to be used, track lubricant activities are not considered pollution-generating. No stormwater treatment facilities are required in the non-PGIS areas.

In some areas, pollution-generating segments of existing roadways will be spanned by elevated portions of the light rail guideway. In these areas, precipitation that might otherwise have fallen on PGIS will fall instead on the non-pollution-generating surface of the elevated guideway. The result will, in effect, be a conversion from pollution-generating to non-pollution-generating impervious surface, reducing the overall amount of PGIS in all but one TDA (Table 2-2). Overall, project construction will result in a minimal change in the amount of PGIS in the action area because most of the proposed road segments and parking lots will be located in areas with similar existing uses.

Table 2-2. Anticipated Changes in Pollution-Generating Impervious Surface (acres)

TDA	Existing PGIS	Proposed PGIS	Net Change	Existing Treated	Proposed Treated
1	1.06	1.03	- 0.03	0.41	0.38
2	0.18	0.18	0	0.18	0.18
3	1.84	1.69	- 0.15	1.73	1.69
4	0	0	0	0	0
5	8.32	8.18	- 0.14	8.32	8.18
6	4.94	5.12	+ 0.18	4.94	5.12
7	0.39	0.00	- 0.39	0	0
Total	**16.73**	**16.20**	**- 0.53**	**15.58**	**15.55**

PGIS—pollution-generating impervious surface.

The apparent decrease in the amount of PGIS receiving treatment is the result of decreases in the total amount of PGIS in most TDAs.

3. BEST MANAGEMENT PRACTICES AND MINIMIZATION MEASURES

The 2010 East Link BA specified BMPs and conservation measures for the protection of water quality and sensitive areas, mitigation of impacts to wetlands and streams and their buffers, control of weeds, and protection of Bear Creek and the Sammamish River during over-water work. These measures, along with conservation measures for project design and operation, will be implemented during construction and operation of the Downtown Redmond Link Extension (Attachment D). Additional measures for the protection of aquatic habitats during work below the OHWM of Bear Creek and the Sammamish River are specified below.

- All work within the channel of Bear Creek or the Sammamish River, including dewatering and reintroducing flow to work areas, will be completed during the approved in-water work window and will fully comply with the HPAs issued for the project by WDFW and with the Section 401 Individual Water Quality Certification issued by Ecology. Work within or over the OHWM outside of the in-water work window will be allowed only as approved by WDFW.
- In-water work areas will be isolated with cofferdams and dewatered. The final selection of methods will be determined by the construction contractor and design team based on flow conditions during the in-water work window and practical limitations dictated by site conditions.
- The contractor will submit a complete detailed plan for review and approval by a State of Washington Registered Professional Engineer at least 60 days before work below the OHWM of Bear Creek or the Sammamish River begins. The plan will specify measures for minimizing adverse effects on aquatic resources, including debris catchment structures (for removal of the bridge in Bear Creek) and cofferdam installation.
- Channel dewatering will be conducted gradually to encourage volitional movement of fish out of the construction zone.
- Cofferdams will be configured to allow unimpeded upstream and downstream migration outside of the work zone.
- Before, during, and immediately after isolation and dewatering of in-water work areas, any fish that remain in the isolated area will be captured and released using methods that minimize the risk of fish injury, in accordance with current WSDOT standards and protocols for such activities (WSDOT 2016). A fish exclusion plan will be submitted for review and approval by NMFS before fish exclusion work begins.
- Any Chinook salmon encountered during work area isolation will be documented by submitting an In-Water Construction Monitoring Report or equivalent to NMFS within 30 days of work area isolation.
- Debris from demolition of the existing bridge will be contained and removed from the site for disposal at an approved and permitted facility. Demolition debris will not be allowed to enter Bear Creek.
- Existing piles will either be fully extracted or (for piles that are too severely deteriorated to be removed without breaking) cut at or below the substrate, as required by project permits.

- Vibratory removal or direct pulling is the preferred method for pile removal. Alternative methods will be implemented only if authorized by the Services and WDFW. If a treated wood pile breaks during extraction, the broken portion will be removed from the channel, and the remaining portion will be cut at or below the substrate, as required by project permits.
- Unless it can be demonstrated that the surrounding substrate will fill the hole within 1 day, the holes left when pulling piles will be filled with appropriate material (such as clean sand). Buried piles will be capped with the same streambed gravel that will be used to line the modified channel.
- All treated wood will be contained during and after removal to prevent associated sediments and any contaminated materials from re-entering the aquatic environment. All contaminated materials will be disposed of at an approved and permitted disposal facility. No reuse of treated wood will occur.
- Debris from bridge demolition will be staged in contained storage areas on land. Bridge demolition will include sectioning the structure to the extent possible to provide for safer disposal and to minimize debris falling into surface waters. Debris containment netting and blankets or sheeting will be installed under the bridge during demolition to catch and contain debris.
- Sediment-laden water or water contained within an isolation barrier will not be discharged directly into any waters of the state unless the water has been satisfactorily treated (e.g., by bioswale, filter, bio-bag, settlement pond, or pumping to vegetated upland locations). Contaminated water will be pumped to water tanks for storage and proper disposal.
- Water recovered during the process of dewatering drilled shafts or drilling spoils will be treated to meet the appropriate permit requirements before being discharged to receiving waters.
- Equipment use within the wetted perimeter of wetlands and streams will comply with the following provisions:
  - Equipment will be thoroughly cleaned of mud, petroleum products, or other deleterious material before entering the work site.
  - Turning and spinning within the streambed will be avoided.
  - The amount and duration of in-stream work with machinery will be limited to the minimum necessary to complete the work.
  - Environmentally acceptable hydraulic fluids that meet requirements for biodegradability, aquatic toxicity, and bioaccumulation will be used for in-water and over-water construction where practicable.
  - Project activities will not result in any visible sheen from petroleum products in the receiving waters.
- Equipment fueling and maintenance areas will not be placed within 200 feet of wetlands or streams unless site-specific review completed by the project biologist indicates that no impacts to the sensitive resource areas will occur due to topography or other factors. Exceptions to this requirement may be allowed for large cranes, pile drivers, and drill rigs that cannot be easily moved.
- Temporary material storage piles consisting of erosive materials will be placed outside the 100-year floodplain during the rainy season (October 1 through June 1), and will be covered, hydroseeded, or otherwise treated as necessary to comply with the NPDES permit.

- Disturbance to riparian vegetation from the operation of heavy equipment will be minimized as much as practicable by straddling it with heavy equipment or by pruning it without damaging the roots. Existing riparian vegetation outside of the work area will not be removed or disturbed.
- Temporary lights for night work will be directed away from waters with listed fish species to the greatest extent possible, with the intent to prevent light from shining on surface waters.
- Water quality will be monitored downstream of work areas within or near the OHWM, as required in the TESC plan.

4. ACTION AREA

The action area is defined as the area with the potential to be affected directly or indirectly by the project actions. Project components with the potential to affect the species addressed in this analysis include construction activities (which may contribute to increased turbidity and sedimentation in project area waterbodies and elevated noise levels in terrestrial and aquatic areas); increases in the amount of impervious surface area (which may affect the quality and quantity of stormwater discharges to project area waterbodies); and changes in the condition of riparian habitat. Similar to the action area defined for the 2010 East Link BA, the action area for this project includes all terrestrial habitats within an approximately 1-mile radius of the project footprint, all aquatic habitats extending from the upstream extent of the project footprint, downstream to points 200 feet from the project footprint (in each waterbody), and the surface-flowing extent of streams within 200 feet of ground-disturbing activities in contiguous vegetated areas (Figure 4-1). The following subsections describe the basis for these determinations.

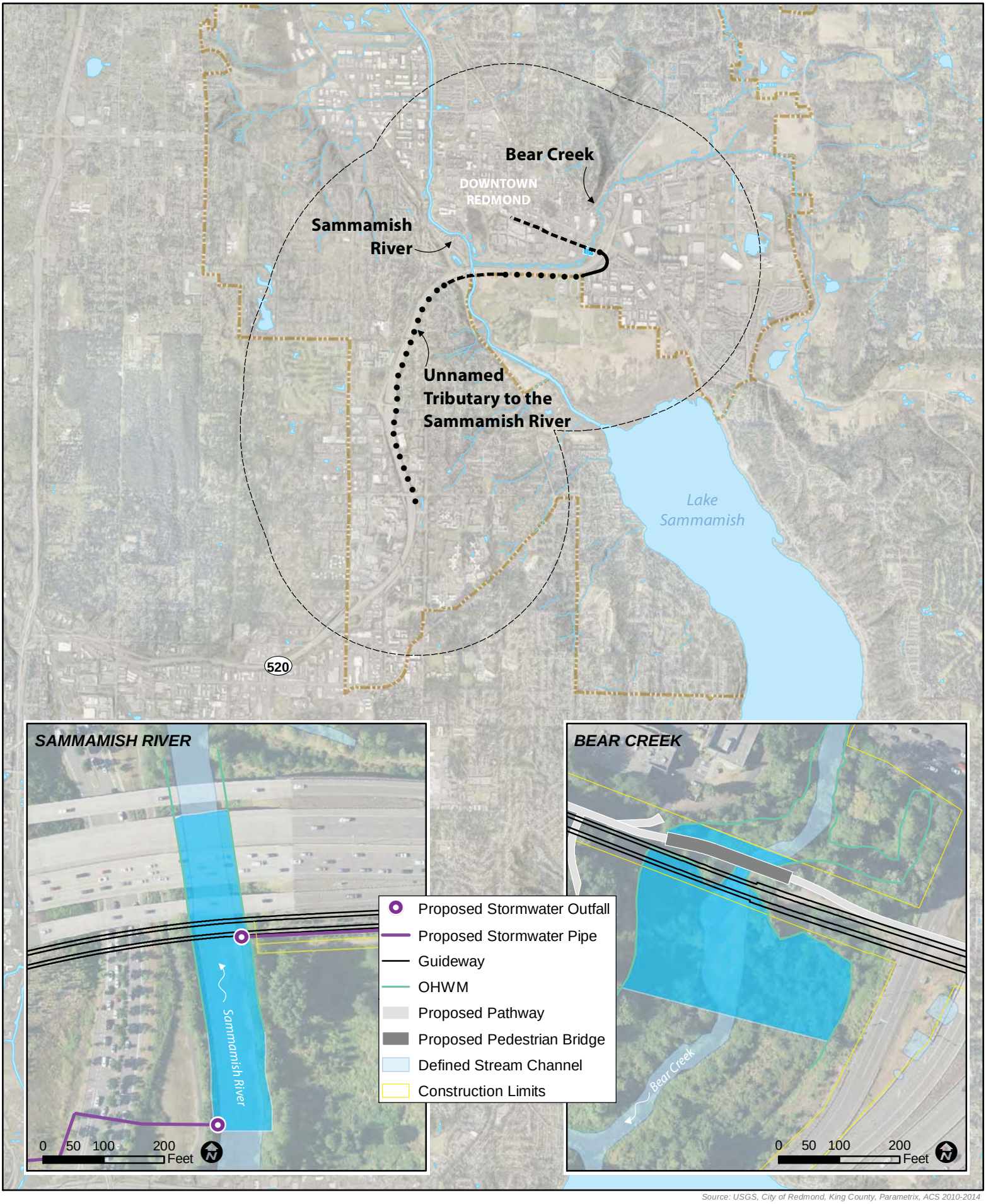
In this document, the term *project action area* (or action area) has a specific meaning, defined above. The project action area is different from the *project site* (which encompasses the limits of construction and which is also referred to as the *project footprint*) and from the *project area* (a more general term for the vicinity of the project site).

4.1 Terrestrial Considerations

Project components with the potential to affect the terrestrial environment include construction activities that generate noise levels that could potentially disturb sensitive wildlife species. Other sources of potential effects in terrestrial areas include vegetation removal and disturbance, habitat alteration, soil compaction, shading, and potential introduction of invasive species. All of these effects will be contained within the area potentially affected by noise from construction activities; therefore, the area potentially affected by construction noise was used as the basis for defining the terrestrial portion of the action area. Construction noise is expected to exceed noise generated from operation of the Downtown Redmond Link Extension; therefore, construction noise was used as a basis for defining the action area.

Baseline noise levels along the proposed project alignment are dominated by traffic noise from SR 520 and major arterial roadways. The baseline noise level along SR 520 was determined by the volume and speed of traffic. The average daily traffic volume on SR 520 ranges between 94,000 vehicles per day in the western portion of the project area and 40,000 vehicles per day near Redmond Way, which equates to approximately 4,000 to 9,400 vehicles per hour (WSDOT 2017). The posted speed limit on SR 520 in the project area is 60 miles per hour. Based on these values, the baseline equivalent noise level (L_{eq}) along SR 520 is approximately 78 to 81 decibels on the A-weighted scale (dBA) at 50 feet (WSDOT 2017).

The average daily traffic volume on Redmond Way ranges between 17,000 and 36,000 vehicles per day, or 1,700 to 3,600 vehicles per hour, with a posted speed limit of 30 miles per hour. Based on these numbers, the baseline equivalent noise level along Redmond Way is approximately 67 to 70 dBA at 50 feet (WSDOT 2017). Away from heavily traveled highways, background noise levels in the project area are likely similar to those characteristic of suburban and urban areas, ranging between 50 and 60 dBA (WSDOT 2017).



Source: USGS, City of Redmond, King County, Parametrix, ACS 2010-2014

Figure 4-1
Project Action Area
Downtown Redmond Link Extension

The extent of the terrestrial portion of the action area for the 2010 East Link BA was based on the assumption that impact pile driving would be used for installation of guideway support structures near the Sammamish River and Bear Creek. The maximum assumed noise level was 110 dBA, attenuating to background levels approximately 1 mile from the construction area (Sound Transit 2010). Because the Downtown Redmond Link Extension will be completed under a design-build contract, the specific plans for construction are not known at this time. For this reason, the terrestrial portion of the action area for this analysis is based on the same conservative assumption that short-term noise may reach 110 dBA during construction, with a resultant in-air action area of 1 mile (see Figure 4-1).

Notably, no ESA-listed species that are sensitive to airborne noise are known or expected to use terrestrial habitats within 5 miles of the project footprint.

4.2 Aquatic Considerations

The action area in the aquatic environment includes stream channels where construction activities will take place within or near the channel or directly overhead, along with reaches extending downstream from such locations. Project activities in or adjacent to waterbodies and wetlands, including earthwork and construction, have the potential to introduce and transport sediment into the aquatic environment at and downstream of the immediate construction or work area. In-water work, including work area isolation, has the potential to harass or harm fish. Project activities near waterbodies also have the potential to affect riparian habitat, resulting in indirect effects on fish species and habitat.

The risk of increased sediment input to project area waterbodies will be minimized by the use of BMPs and conservation measures described in Chapter 3, as well as those specified in the 2010 East Link BA (Attachment D). In addition, Sound Transit will comply with water quality mixing zone requirements established by Ecology to meet water quality standards. For streams with flows between 10 and 100 cubic feet per second (cfs) during construction, the water quality mixing zone is 200 feet downstream of project activities (Washington Administrative Code [WAC] 173-201A-200-1[e]).

Construction activities below the OHWM of waterbodies in the action area will comply with the terms and conditions set forth in the HPA and other permits (such as the Clean Water Act Section 404 permit) issued for the project, including provisions designed to avoid or minimize the potential for adverse effects on habitat in receiving waters. Such provisions may include restrictions on construction below the OHWM to minimize the risk of adverse effects on fish during highly sensitive life history stages (e.g., spawning, rearing). Permits for work in the Sammamish River and its tributaries commonly require in-water work to be conducted during the summer (primarily August). Flows in Bear Creek during July, August, and September typically range between 14 and 50 cfs (King County 2017b). During the same period, flows in the Sammamish River typically range between 20 and 100 cfs (King County 2017b).

Based on the above, the mixing zone for Bear Creek for this analysis is 200 feet downstream of the construction limits adjacent to the stream, and the mixing zone for the Sammamish River is 200 feet downstream of the proposed new stormwater outfalls. These points define the downstream extent of the aquatic portion of the action area as it relates to potential construction-related increases in turbidity. The action area within Bear Creek also includes the area where in-channel work is proposed, as well as portions of the stream between the proposed pedestrian bridge and the proposed guideway.

Changes in riparian habitat condition have the potential to affect habitat quality in surface-flowing streams up to 200 feet from the location of ground-disturbing activities. This distance is based on potential effects on riparian functions such as the provision of shade and the recruitment of LWD. Stream reaches that are separated from project activities by interruptions in surface flow (e.g., culverts) or vegetative cover (e.g., roadways and maintained clearings wider than 20 feet) are not likely to be affected.

The aquatic area affected by increased sound pressure levels due to in-water vibratory driving of piles and impact pile driving in areas near stream channels is not expected to extend beyond the area potentially affected by increased sedimentation and turbidity. This expectation is based in part on underwater sound monitoring data showing that vibratory installation of steel piles in a river resulted in sound pressure levels that did not exceed the background noise created by the current (Reyff 2006). In addition, based on monitoring of piles driven adjacent to or within the OHWM of a river, but in the dry, WSDOT (2017) has determined that impact pile driving in the dry is an effective means of minimizing the effects of sound in the water.

Based on these considerations, the aquatic portion of the action area includes (1) the mixing zones defined above, (2) the additional reaches of Bear Creek described above, and (3) the surface-flowing extent of both streams within 200 feet of ground-disturbing activities in contiguous vegetated areas. This defines the aquatic portion of the action area as it relates to fish exclusion, potential construction-related increases in turbidity, and potential effects on riparian habitat.

5. ENVIRONMENTAL BASELINE

The action area for the Downtown Redmond Link Extension is dominated by urban development where terrestrial and aquatic habitats have been subjected to moderate to high degrees of alteration. The degree of alteration varies from site to site, with the greatest alteration occurring where urban development is the greatest. Some of the smaller streams and headwater reaches have been placed in conveyance systems consisting of pipes and ditches, which interfere with natural flow patterns and processes such as groundwater recharge. Riparian areas along the streams may serve as connective corridors for terrestrial wildlife species. In general, however, patches of forest and other native habitat types in the project area are isolated from other areas of similar habitat and do not serve as connective corridors to other areas of habitat outside of the project area.

The project area drains to the Sammamish River in WRIA 8, Lake Washington/Cedar/Sammamish. The eastern portion of the project area drains to Bear Creek, a tributary to the Sammamish River. Remnants of a smaller tributary to the Sammamish River flow through pipes, ditches, and surface channels paralleling SR 520 south of the Sammamish River crossing (see Figure 4-1). Water entering Lake Washington drains to Puget Sound through the Lake Washington Ship Canal, an artificial waterway constructed in 1916.

The following subsections provide updated and additional information about streams in the action area. Discussions focus on aquatic habitats because no terrestrial species listed or proposed for listing under the ESA are known or expected to use habitats in the action area. Consistent with Sound Transit's stream habitat assessment guidelines (Sound Transit 2016), discussions provide information about the following key aquatic habitat elements:

- Riparian vegetation
- Physical in-stream habitat
- Biological connectivity
- Water quality and quantity
- Fish presence, fish habitat use, and stream typing

The proposed project alignment crosses three streams. Two of these (the Sammamish River and Bear Creek) are classified as shorelines of the state; the third is an unclassified tributary to the Sammamish River that flows primarily through pipes in the SR 520 right-of-way. The locations of the streams are shown in Figure 4-1. Table 5-1 summarizes regulatory information for the streams in the action area.

Table 5-1. Summary of Streams in the Action Area

Stream Name	Stream Index No. [a]	State Interim Water Type [b]	Local Jurisdiction	Local Jurisdiction Stream Classification	Local Jurisdiction Buffer Width (feet) [c]
Sammamish River	08.0057	Type 1	Redmond	Class I	150
Sammamish River	08.0057	Type 1	King County	Type S	115 [d]
Bear Creek	08.0105	Type 1	Redmond	Class I	150
Unnamed tributary to the Sammamish River (LLID 1221262476704)	N/A	Type 3	Redmond	Class III	100

[a] WRIA identification numbers according to Williams et al. (1975)

[b] WAC 222-16-031

[c] Redmond Zoning Code Table 21.64.020 (effective 4/16/2011); King County Code 21A.24.358 (updated May 12, 2017)

[d] The King County buffer width for the Sammamish River is based on (a) the location of the project area within the designated Urban Growth Area, and (b) the designation of the condition of the basin as "low," according to the map in Appendix A of the King County Critical Areas Ordinance.

5.1 Sammamish River

The presence and condition of aquatic habitats in the Sammamish River in the action area have not changed substantially from what was described in the 2010 East Link BA. Discussions in this subsection supplement and update the information presented in that document to frame the updated impact analysis.

Within the Redmond city limits, the Sammamish River and all lands extending 200 feet landward from the river's OHWM are subject to the regulatory requirements of the City's SMP. The SMP describes the environmental designation of the Sammamish River shoreline jurisdiction as follows:

> Designate the King County Sammamish River Park as Urban Conservancy and designate the balance of the adjacent property within the 200 foot shoreline jurisdiction as High Intensity/Multi-Use. This designation shall be coincidental with the King County park property, which is approximately 100 feet in width, as of January 1, 2008.

The shoreline zone within the boundaries of Marymoor Park falls within the shoreline management jurisdiction of King County. According to King County Code 21A.25.050, the King County shoreline jurisdiction consists of the Sammamish River and all lands extending 200 feet landward from the river's OHWM, the 100-year floodplain and contiguous floodplain areas 200 feet landward from the 100-year floodplain, and all wetlands associated with the Sammamish River.

As discussed in the 2010 East Link BA, the Sammamish River in the action area has been extensively modified and simplified from pre-settlement conditions. The Corps straightened the Sammamish River in the 1960s as a flood-control project, using sidecast material to construct uniform banks along the channel (U.S. Army Corps of Engineers and King County 2002). The following subsections describe key habitats and stream features that are directly related to ecological functions supporting stream ecosystems and which may be affected by the project, consistent with the stream habitat assessment guidelines established by Sound Transit (2016).

5.1.1 Riparian Vegetation

Riparian vegetation in the reach of the Sammamish River that includes the action area is severely degraded, consisting almost entirely of non-native shrubs and herbs—predominantly Himalayan blackberry and reed canarygrass (U.S. Army Corps of Engineers and King County 2002). Although the river banks in the action area are heavily armored, native and non-native shrubs (e.g., twinberry, willows, Himalayan blackberry) and young trees (primarily alder and bigleaf maple, as well as some cottonwood) have become established (Figure 5-1).

Figure 5-1. Riparian vegetation and the Sammamish River in the action area, looking north (downstream) from the left bank

The functional riparian buffer west of the river is approximately 30 feet wide, consisting of a single row of deciduous trees (primarily red alder and bigleaf maple) and various native and non-native shrubs, with relatively dense cover. Beyond that distance, the buffer zone consists of (1) the 12-foot-wide paved Sammamish River Trail; (2) a 30- to 50-foot-wide vegetated area with ornamental trees, native and non-native shrubs, and mowed grasses; and (3) the 70-foot-wide roadway of West Lake Sammamish Parkway NE.

Riparian vegetation on the east side of the river extends a greater distance from the river bank. Immediately south of the West Lake Sammamish Parkway on-ramp to SR 520, a 50-foot strip was cleared for the highway widening project in 2009 but was subsequently replanted. The innermost 50 feet of the riparian zone in that strip is densely covered with native and non-native shrubs, along with some recently planted conifers such as shore pines. East of that area, the previously cleared strip has been planted with young coniferous trees (western red cedar). South of the previously cleared strip, the innermost portion of the riparian buffer is densely vegetated with a 40- to 60-foot-wide band of deciduous trees (red alder, cottonwood, and Lombardy poplar) and shrubs. After being interrupted by a 10-foot-wide gap for an unpaved access route, the tree canopy extends east for approximately 60 more feet. Beyond that, the riparian buffer is dominated by low-growing non-native grasses and shrubs.

Downstream (north) of the project site, the river is spanned by SR 520; riparian vegetation is very sparse in the areas under the highway. The ground surface is covered with a mixture of wood chip mulch, bare soil, and exposed riprap. Invasive species, such as hedge bindweed and Himalayan blackberry, have become established in some areas under the overpass.

Within the riparian zone, the dominant tree species are red alder, Douglas-fir, Oregon ash, bigleaf maple, and black cottonwood. Some non-native deciduous trees such as Norway maple also occur in the riparian zone. Many of the trees in this area are wrapped with fencing for protection from beavers. Other trees have been damaged or felled by beaver activity. A complete inventory of trees and their condition is provided in the arborist's report for this project (Urban Forestry Services 2017). The dominant shrub species are Himalayan blackberry, Scouler's willow, Sitka willow, vine maple, red osier dogwood, and Pacific ninebark. Tree canopy cover exceeds 100 percent (complete canopy, multiple layers in some areas) throughout the corridor. In some areas, trees and/or shrubs extend over the stream channel. The river banks are densely rooted with good soil cohesion. Extensive areas of riprap have been placed along the river banks to limit erosion. Ground cover is dominated by shrubs and occupies approximately 60 percent of the riparian area. Herbaceous cover is generally sparse and dominated by non-native grasses. There are no large snags or downed logs in the action area. Small, short pieces of downed wood were observed on some site visits but appear to be mobile. The steep, hardened river banks limit the opportunity to rack up woody debris or develop persistent jams.

5.1.2 Physical In-stream Habitat

In general, habitat in the Sammamish River is highly degraded. Glides (one of the least desirable habitat types for salmonids) make up more than 98 percent of the river's length (Jeanes and Morello 2016). Dense aquatic vegetation, most notably Eurasian water milfoil and Brazilian elodea, is present in many areas. During a site visit in August 2017, the riverbed at and near the proposed crossing site was densely vegetated with filamentous algae, common elodea, Brazilian elodea, and Eurasian water milfoil. The action area is within a reach that includes some of the highest-quality habitat in the river, with 22 percent riffles, 3 percent pools, and 75 percent glide (U.S. Army Corps of Engineers and King County 2002). Within the action area itself, however, only glide habitat is present, with no riffles or pools (King County 2014). The stream channel is approximately 65 to 70 feet wide. Substrates are uniformly sand and silt except directly under the SR 520 bridge, where cobble and riprap are present on the banks and the river bed (Sound Transit 2010). LWD is essentially absent from the channel in the action area.

No off-channel habitat exists, and the river has very little capacity to form any such habitat due to its low gradient, deepened channel, and bank armoring. All former oxbows and sloughs have either been filled in or cut off from the river by modifications to the water level (U.S. Army Corps of Engineers and King County 2002). Channel sinuosity is low.

Key restoration opportunities in this reach include temperature reduction through modification of the Lake Sammamish outflow, riparian revegetation, and creation of cool-water refuge by utilizing groundwater sources in the reach (U.S. Army Corps of Engineers and King County 2002).

Table 5-2 summarizes the characteristics of physical in-stream habitat in the Sammamish River in the action area, using the metrics and measurements recommended by Sound Transit (2016).

Table 5-2. Characteristics of Physical In-stream Habitat in the Sammamish River in the Action Area

Parameter	Metric/Measurement	Characteristics of Sammamish River in Action Area
Channel Form and Profile	Macrohabitat—habitat type	Only glide habitat is present in the action area, with no riffles or pools.
	Macrohabitat—pool characteristics	Not applicable—no pools.
	Stream Reach Classification	Class I (Redmond), Type S (King County and Redmond), Type 1 (Washington State)
	Stream Slope	Extremely low: < 2 feet per 10,000 feet of channel length.
	Stream Patterns	River has been extensively modified and straightened. All former oxbows and sloughs have either been filled in or cut off from the river.
	Confinement	The stream channel is confined.
	Channel Dimension/Shape	Bankfull width is 65 to 70 feet; excavated.
Streambank Condition	Stability	Banks are hardened and/or heavily vegetated; no evidence of instability.
	Bank Hardening/Revetments	Areas near and under SR 520 are armored with cobble and riprap.
Substrate/ Sediment	Particle Frequency	Predominantly silt and sand.
	Percentage of Fine Sediments/ Embeddedness	Larger substrates are coated with fines but are not deeply embedded. A thick, soft layer of fine sediments is present along the stream banks.
Large Woody Debris	LWD Presence, Frequency, and Location	No LWD present. Some 2- to 4-inch-diameter, 3- to 4- foot-long logs were observed near the bank during site visits, but were mobile and not persistent.
	Debris Jams	Not applicable—no LWD.
	LWD Size	Not applicable—no LWD.
	Age and Type	Not applicable—no LWD.
Cover and Refuge	Pool Quality	No pools.
	Undercut Banks	No undercut banks, but very steep banks armored with riprap in some areas.
	Off-channel/Side-channel Habitat	Essentially absent; river has very little capacity to form any off-channel habitat due to low gradient, deepened channel, and bank armoring. Extensive evidence of beaver activity including many felled trees and shrubs, gnaw marks, and branch-dragging trails.
	In-stream Cover/Protection	Some riprap has fallen into the river providing some in-stream cover. Some overhanging vegetation is present. Aquatic macrophytes (primarily common elodea, Brazilian elodea, and Eurasian water milfoil) occur in patches and cover approximately 20% of the stream bed in the action area.

5.1.3 Biological Connectivity

No physical barriers to fish passage have been identified in the Sammamish River downstream of the action area.

5.1.4 Water Quality and Quantity

In 2011, the Sammamish River was on the 303(d) list of impaired waters, based on violations of state standards for temperature and oxygen. The Sammamish River in the action area is also on the current (approved July 22, 2016) 303(d) list of impaired waterbodies, based on violations of standards for dissolved oxygen, pH, and water temperature. Elevated water temperatures in the Sammamish River from July through September have been identified as a significant factor limiting production of Chinook salmon and other anadromous salmonid species during their spawning migration to Issaquah Creek, the Issaquah Creek Hatchery, Bear Creek, and other tributaries (WRIA 8 Steering Committee 2005). Daily maximum temperatures in the river near Lake Sammamish have exceeded 26.6 degrees Celsius (°C) and are frequently greater than 20°C during the summer months (Jeanes and Morello 2016). Water quality monitoring data from King County indicate an increasing trend in Sammamish River water temperatures between 1979 and 2007 (King County 2016b).

King County maintains a gauging station in the Sammamish River in Marymoor Park, approximately 0.8 mile upstream of the project area. Based on data collected from July 2001 through March 2017, the annual average discharge at that site is approximately 213 cfs (King County 2017b). Monthly average discharges during that period ranged from 19 cfs (August 2015) to 798 cfs (January 2006). Averaged over the full data period, monthly average discharges ranged from 34 cfs (in August) to 407 cfs (in January) (King County 2017b).

Several culverted discharges to the Sammamish River were observed during site surveys. On the west bank, a 24-inch culvert discharges to the river directly under SR 520 that was assumed to be stormwater from the highway. Another larger but partially obscured culvert discharges on the same bank, immediately downstream of the SR 520 bridge. The culvert appears to discharge water from stormwater ponds located immediately to the west, which are partially fed by piped but natural stream flow and road runoff. On the east bank, an 18-inch culvert occasionally discharges water from a floodplain mitigation site and depression excavated immediately east of the river. Another 18-inch culvert discharges water collected in a stormwater swale near SR 520.

5.1.5 Fish Habitat Use

The Sammamish River provides little rearing or spawning function for salmonids but serves as a migratory corridor for fish that spawn in its tributaries. Cutthroat trout spawn at the mouths of tributaries where gravel is present (Sound Transit 2010). From 1996 to 2016, volunteers from the King County Salmon Watcher Program documented Chinook, sockeye/kokanee, and coho salmon in the Sammamish River (King County 2016a). According to WDFW (2017a, 2017c), the Sammamish River in the action area provides spawning habitat for Chinook salmon. The potential for spawning in the main stem is limited, however, by high water temperatures, low water velocities, and the lack of suitable spawning substrates (U.S. Army Corps of Engineers and King County 2002). WDFW (2017a) also reports that steelhead, sockeye, and kokanee are present in the river, and that the reach in the action area provides rearing habitat for coho salmon. Most sockeye in the river are bound for Bear Creek and Chinook salmon are bound for the WDFW hatchery in Issaquah (Sound Transit 2010; Jeanes and Morello 2016). The primary limiting factor for salmon in the river reach that flows through the action area is elevated temperature; other than water temperature, habitat in this reach is of moderate quality (U.S. Army Corps of Engineers and King County 2002).

5.2 Bear Creek

Despite the effects of expanding urban development and an associated shift from forest to impervious surfaces and landscaped areas, Bear Creek continues to be a major producer of salmon in WRIA 8 (Lawson et al. 2012). The Bear Creek drainage is known to support Chinook salmon, coho salmon, sockeye salmon, kokanee salmon, steelhead, and cutthroat trout. In recognition of its role in upstream staging and downstream migration and rearing, and as a refuge for salmonids escaping the warmer waters of the Sammamish River, King County (1995) recognized the Lower Bear Creek sub-basin as a Locally Significant Resource Area.

The Bear Creek corridor in the action area is surrounded by developed parcels. To the west and northwest is the commercial core of downtown Redmond, consisting almost entirely of impervious surfaces. NE Redmond Way (SR 202) crosses Bear Creek approximately 250 feet north of the proposed alignment. SR 520 runs parallel to the stream south and east of the proposed crossing. Heavily developed commercial and retail complexes are on the opposite side of SR 520 from Bear Creek to the east and southeast. A corridor of relatively undeveloped land provides some riparian habitat along Bear Creek within the action area, and in adjoining reaches upstream and downstream.

A timber stringer bridge spans Bear Creek at the site of the former railroad crossing. The bridge is approximately 30 feet long and 14 feet wide and was constructed on treated wood piles with abutments of horizontal wood planks resting on stone and concrete riprap. Two sets of five piles apiece support the bridge at either abutment, and a third set of six piles supports the bridge in the center of the stream (Figure 5-2). An additional 16 piles, cut or broken off below the elevation of the OHWM, are also present in the streambed. A WDFW fish-monitoring barge is moored to this bridge. A gravel road, built on railroad bed fill, accesses the southeast side of the bridge from the westbound on-ramp to SR 520. An informal walking route has developed on the railroad fill northwest of the bridge.

The construction caused by the railroad fill prism exerts considerable influence on the hydrology of Bear Creek, as indicated by the boundaries of the floodplain and the OHWM in the project action area (see Figure 4-1 and Attachment C). The width of the area bounded by the OHWM in the action area varies widely, and it extends a considerable distance into the floodplain. The OHWM is more than 250 feet wide upstream of the bridge, narrowing to approximately 30 feet at the bridge, then widening to approximately 400 feet immediately downstream of the bridge. Within this area, the width of the active channel (i.e., top-of-bank width) ranges between approximately 30 and 40 feet. Stream gauging data show that the stream leaves its banks only between late October and June, meaning most of the area within the OHWM is dry throughout summer and late autumn (King County 2017b).

The Washington State Salmon Recovery Fund has sponsored millions of dollars of habitat restoration in the Bear Creek watershed, including in-stream work, riparian restoration, and the reconfiguration of the confluence of Evans Creek with Bear Creek. Reaches of Bear Creek within and near the action area have been the subject of extensive habitat restoration work and contain several mitigation sites. In the late 1990s, WSDOT and the City of Redmond collaborated on habitat enhancement efforts in Bear Creek immediately adjacent to the location where the proposed alignment crosses the stream (timber bridge site). These efforts included riparian plantings and wetland restoration.

More recently, a major restoration effort was implemented downstream of the action area, in part as mitigation for the SR 520, I-5 to Medina Bridge Replacement and HOV project. The restoration work, called the Lower Bear Creek Restoration Project, was designed to establish a compositionally and structurally complex ecosystem with attributes important for supporting fish and wildlife, with an emphasis on anadromous fish such as Chinook, coho, and sockeye salmon. The design included channel reconfiguration (to increase meandering), LWD placement, bank stabilization, stream gravel, native riparian plantings, and

wetland creation. Adjacent uplands were excavated to create more floodplain storage and habitat associated with the new channel. Riparian and floodplain areas were planted to enhance in-stream and riparian functions such as cover, shading, LWD recruitment, bank stabilization, terrestrial insect food production, and leaf litter organic debris in support of in-stream food sources. Approximately 3,000 pieces of LWD were added to the stream channel within the bankfull width (Lawson et al. 2012). The upstream end of the recently restored reach is approximately 1,500 feet downstream of the site where the Downtown Redmond Link Extension will cross Bear Creek.

Figure 5-2. Timber bridge over Bear Creek at the location of the former railroad crossing

The regulatory requirements of the City of Redmond's SMP apply to Bear Creek and all lands extending 200 feet landward from the OHWM of the stream, as well as portions of the 100-year floodplain and any associated wetlands that extend beyond the 200-foot buffer. The City of Redmond has designated a 150-foot-wide Urban Conservancy corridor adjacent to Bear Creek; the remaining 50 feet of the Shoreline Management Zone is designated as a High Intensity/Multi-use environment. According to SMP Policy SL-5, development should be encouraged in previously disturbed, under-utilized High Intensity/Multi-use shoreline environments, such as the BNSF corridor in the action area.

The only observed culvert discharging to Bear Creek in the action area conveys stormwater from detention ponds under the SR 520 bridge. It is approximately 30 inches in diameter.

5.2.1 Riparian Vegetation

The Bear Creek riparian zone in the vicinity of the proposed crossing is vegetated with a mixture of native and non-native species. Tree cover is extensive and dominated by native species, including red alder, Oregon ash, black cottonwood, and western red cedar, with scattered Douglas-fir at the highest elevations (Figure 5-3). Non-native deciduous trees also occur in the riparian area, along adjacent roads, trails, and other developments. A detailed tree assessment is included in the arborist's report (Urban Forestry Services 2017). Forested areas have understory vegetation composed of a mixture of native

shrubs (salmonberry, red osier dogwood, willows), invasive Himalayan and cutleaf blackberry, and a fairly sparse herbaceous stratum containing native piggy-back plant and slough sedge, as well as invasive creeping buttercup and reed canarygrass. Scrub-shrub areas are dominated by a mixture of shrubs described above. Emergent areas are dominated by dense stands of reed canarygrass. Beaver activity is apparent from numerous downed trees, cut shrubs, and dams. Habitat values of the riparian community are high, based on the complex vegetation and stream structure, presence of snags and LWD, and the extent of the restored corridor and its connectivity to habitats upstream and downstream.

A portion of the riparian zone in the project action area is occupied by the fill prism (berm) that was built for the BNSF railroad alignment. The surface of the berm is 10 to 15 feet wide and is largely unvegetated. The sides of the berm are dominated by invasive species such as Himalayan blackberry. East of Bear Creek, the berm broadens and has been cleared for access and parking; mature deciduous trees are present north of the berm, but the area south of the berm is dominated by low-growing non-native species (Figure 5-4). The nearest mature trees within the proposed light rail alignment are a stand of cottonwoods approximately 150 feet west of the stream.

Figure 5-3. Bear Creek riparian area, looking upstream from the former rail corridor crossing

photo courtesy Google Street View

Figure 5-4. View west toward Bear Creek riparian area, along former railroad berm east of Bear Creek

5.2.2 Physical In-stream Habitat

Habitat in the action area is a mixture of pools and runs. Substrates are predominantly gravel and cobble, with some silt and sand present. Overall spawning and rearing habitat quality in this reach is good. The stream channel was built in association with a major channel relocation and habitat enhancement project downstream of the proposed crossing. More than 100 logs with rootwads have been installed in the banks of the meandering channel. This area provides both overflow channel and wetland habitat. During a site visit in August 2017, a right-bank debris jam was observed approximately 100 feet upstream of the anticipated guideway crossing location. Some pieces of woody debris were also caught on the upstream end of the timber stringer bridge at the rail corridor crossing. The stream passes through a gap in the fill prism for the rail corridor. Under high flow conditions, this constriction in the width of the stream channel and associated floodplain likely contributes to backwater effects upstream.

Table 5-3 summarizes the characteristics of physical in-stream habitat in Bear Creek in the action area using the metrics and measurements recommended by Sound Transit (2016).

5.2.3 Biological Connectivity

No physical barriers to fish passage have been identified in Bear Creek or the Sammamish River downstream of the action area.

Table 5-3. Characteristics of Physical In-stream Habitat in Bear Creek in the Action Area

Parameter	Metric/Measurement	Characteristics of Bear Creek in Action Area
Channel Form and Profile	Macrohabitat—habitat type	Pools and runs.
	Macrohabitat—pool characteristics	Pools present, but scattered and generally shallow (less than 1 foot deep).
	Stream Reach Classification	Class I (Redmond), Type 1 (State of Washington)
	Stream Slope	Approximately 0.2%.
	Stream Patterns	Stream has been restored to include meandering channel, side channels, and backwaters.
	Confinement	In most of the action area, the stream channel is not confined. At the location of the bridge, however, the railroad fill prism keeps all but the highest flows within the stream channel.
	Channel Dimension/Shape	Bankfull width is 20 to 25 feet with a natural stream cross-section.
Streambank Condition	Stability	No evidence of instability. Minor areas of erosion and deposition are present.
	Bank Hardening/Revetments	Between SR 202 (Redmond Way) and the BNSF corridor crossing, both banks are armored with riprap.
Substrate/ Sediment	Particle Frequency	Predominantly gravel and cobble.
	Percentage of Fine Sediments/ Embeddedness	Some silt and sand are present, but embeddedness is minimal.
Large Woody Debris	LWD Presence, Frequency, and Location	LWD is present as isolated pieces and in jams and, outside of the mainstem channel, in beaver dams.
	Debris Jams	Small jams occur in side channels approximately 100 feet downstream.
	LWD Size	Some pieces larger than 12 inches in diameter and more than 10 feet long are present.
	Age and Type	Mostly new, small diameter deciduous.
Cover and Refuge	Pool Quality	Variable. Generally shallow, but some are deeper and with overhanging cover.
	Undercut Banks	Present in some areas, especially north bank, upstream and downstream of crossing.
	Off-channel/Side-channel Habitat	Extensive off-channel habitat as a result of restoration actions.
	In-stream Cover/Protection	Extensive overhanging vegetation. Other cover is provided by the bridge and the WDFW barge.

5.2.4 Water Quality and Quantity

In 2008, the U.S. Environmental Protection Agency approved total maximum daily loads for fecal coliform, temperature, and dissolved oxygen for the Bear Creek watershed. Ecology has been working with tribal, federal, state, and local stakeholders to implement projects consistent with the Water Quality Improvement Plan for the watershed. Water quality improvement efforts implemented through the plan have included riparian restoration projects and educational efforts such as encouraging people to reduce fertilizer use and pick up pet waste. Projects implemented by the City of Redmond have included installing bioretention cells, pervious pavement, a stormwater trunk line, a stormwater wetpond, decant bays, and an on-site stormwater management system designed to reduce the quantity of heavy industrial runoff. Bear Creek in the action area is on the current (approved July 22, 2016) 303(d) list of impaired waterbodies based on degradation of biological integrity.

King County maintains a gauging station in Bear Creek at Union Hill Road, approximately 0.5 mile upstream of the action area. Based on data collected from October 1987 through March 2017, the

annual average discharge at that site is approximately 78 cfs (King County 2017b). Monthly average discharges during that period ranged from 14 cfs (August 2006) to 357 cfs (January 1997). Averaged over the full data period, monthly average discharges ranged from 21 cfs (in August) to 144 cfs (in January) (King County 2017b).

5.2.5 Fish Habitat Use

Lawson et al. (2012) determined that the reach of Bear Creek immediately downstream of the action area is used by salmonids as a migration and rearing corridor, but not for spawning, and that Chinook, coho, and sockeye salmon spawn in upstream reaches of Bear Creek. The reach downstream of the action area and north of SR 520 is identified as a migration or rearing area of considerable importance for one or more species of juvenile salmon (Lawson et al. 2012). According to WDFW (2017a, 2017c), Bear Creek in the action area provides spawning habitat for Chinook and sockeye salmon, and rearing habitat for coho salmon. WDFW (2017a) also documents the presence of kokanee salmon and steelhead in the action area. From 1996 to 2016, volunteers from the King County Salmon Watcher Program documented Chinook, sockeye/kokanee, and coho salmon in Bear Creek, as well as chum salmon (which were characterized as strays) (King County 2016a).

WDFW operates a smolt trap in Bear Creek at the approximate location of the proposed light rail alignment crossing. Based on extrapolations from capture data, Kiyohara (2017) generated the following estimates for the abundance of juvenile salmonid migrants from Bear Creek in 2016:

- Sockeye salmon: 81,125 ± 20,814 (95 percent confidence interval)
- Chinook salmon: 45,946 ± 17,473
- Coho salmon: 11,545 ± 2,828

5.3 Unnamed Tributary to Sammamish River

In addition to the streams described above, the action area includes an unnamed tributary to the Sammamish River, identified by the Washington Department of Natural Resources (WDNR) as LLID 1221262476704. This watercourse runs parallel to SR 520 southwest of the Sammamish River crossing, discharging to the Sammamish River downstream of SR 520. Although Williams et al. (1975), WDFW (2017a, 2017b), and the City of Redmond (Map 64.3, Streams Classification, effective March 20, 2016) do not identify a stream in that area, the watercourse appears on maps developed by the WDNR Forest Practices Application Review System (based on the WDNR Fish Habitat Water Typing Model), King County (2017a), National Wetlands Inventory, and Washington Trout (2005). Historical aerial imagery (i.e., 1936 aerial photographs) and topographic contours (on a topographic map issued in 1897) suggest that a surface-flowing watercourse with multiple branches once flowed north from the location of NE 40th Street, and now has largely been piped through this reach. Field observations and mapping review suggest that the stream currently discharges from a pipe to a stormwater pond located north of SR 520, within the cloverleaf intersection with West Lake Sammamish Parkway NE. Flow is then piped to a confluence with the Sammamish River immediately downstream of the SR 520 bridge crossing.

During field reviews in May 2017, a stream was found flowing in an 8-foot-wide channel east of SR 520, immediately north of the NE 60th Street overpass, and presumed to be a branch or segment of LLID 1221262476704. The water flowed at surface into the WSDOT right-of-way from private property, flowing for approximately 20 feet through a forested area in the right-of-way before entering a culvert with an unknown discharge location. Washington Trout (2005) did not conduct field surveys of this watercourse and classified it as Type 9, untyped/unknown mapped stream. Reaches upstream of the

NE 60th Street overpass were also not surveyed by Washington Trout, but classified as Type 4 (perennially flowing, non-fish habitat) and Type 5 (seasonally flowing, non-fish habitat) (Washington Trout 2005). This watercourse is not mapped as a stream by WDFW; therefore, fish passage has not been evaluated. The likelihood of fish migrating between the river and the surface-flowing segment is extremely low, however, for several reasons. To enter the watercourse, fish would have to pass through the stormwater pond that empties to the river via a pipe. Upstream of the stormwater pond, the watercourse is contained within pipes for several thousand feet, flowing at surface for only the short segment described above. No other surface-flowing segments are readily apparent farther upstream.

Based on the lack of surface connections to waters that support ESA-listed fish, as well as the near absence of surface-flowing segments in the project action area, it is assumed that this watercourse is not used by ESA-listed fish species. In addition, the segment with the potential to be affected by project activities is several thousand feet upstream of any streams where fish are known or expected to be present. As such, this watercourse is not addressed further in this document.

6. SPECIES AND CRITICAL HABITAT STATUS AND OCCURRENCE

Lists of species that are listed or proposed for listing under the ESA in the project action area were obtained from the USFWS and NMFS websites in October 2017 (Attachment E). Table 6-1 lists these species and the status of any critical habitat designations in the project action area.

Table 6-1. ESA-Listed Species and Critical Habitat Addressed in this BA

Species	Status	Federal Jurisdiction	Critical Habitat Status
Chinook salmon (*Oncorhynchus tshawytscha*) (Puget Sound ESU)	Threatened	NMFS	Designated; none in action area
Steelhead trout (*Oncorhynchus mykiss*) (Puget Sound DPS)	Threatened	NMFS	Designated; none in action area
Bull trout (*Salvelinus confluentus*)	Threatened	USFWS	Designated; none in action area
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	USFWS	Designated; none in action area
Streaked horned lark (*Eremophila alpestris strigata*)	Threatened	USFWS	Designated; none in action area
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	USFWS	Designated; none in action area
North American wolverine (*Gulo gulo luscus*)	Proposed Threatened	USFWS	None designated or proposed

ESU = Evolutionarily Significant Unit

DPS = Distinct Population Segment

Four of the species identified in Table 6-1 are not expected to occur in the project action area for the following reasons:

- Marbled murrelets require old-growth forest for nesting and marine habitat for foraging. No breeding or foraging habitat is present in the action area and no observations have been documented within 10 miles (WDFW 2017a). The nearest location where critical habitat has been designated for the marbled murrelet is more than 25 miles from the action area.
- Yellow-billed cuckoos require large blocks (larger than 50 acres) of riparian forest habitat for breeding and foraging. No such habitat is present in or near the action area. Currently, the species no longer breeds in western Canada and the northwestern continental United States (Washington, Oregon, and Montana) (79 FR 59992, October 3, 2014). No observations of this species have been documented within 10 miles of the action area (WDFW 2017a). No critical habitat for the yellow-billed cuckoo has been proposed in Washington.
- Streaked horned larks are known to occur in Washington only in portions of southern Puget Sound, along the Washington coast, and at lower Columbia River islands (78 FR 61452, October 3, 2013). Breeding habitat for streaked horned larks in Washington consists of native prairie, grasslands, and sparsely vegetated areas at airports, sandy islands, and coastal spits. No suitable habitat is present in the action area, and the action area is not within the known range of the subspecies. The subspecies is largely absent from the Puget Trough during the non-breeding season; individuals

observed in this area outside of the breeding season have been seen using habitats similar to those used for breeding. The nearest location where critical habitat has been designated for the streaked horned lark is more than 100 miles from the action area.

- North American wolverines avoid people and developed areas, and prefer cold and remote mountainous areas with persistent spring snow cover. No such habitat is present in the lowland, urban setting of the action area. Critical habitat for the wolverine has not been proposed for designation.

Based on the above, the project has no potential to affect marbled murrelets, streaked horned larks, yellow-billed cuckoos, or North American wolverines; these species will not be addressed further in this analysis. Similarly, critical habitat will not be addressed further in this analysis because the action area does not include any areas that have been designated or proposed for designation as critical habitat. Information from the WDNR Natural Heritage database indicates that no threatened or endangered plants are known to occur within 5 miles of the project area (WDNR 2016). The following subsections provide updated information about the status of the other three species (Puget Sound Chinook salmon, Puget Sound steelhead, and bull trout), as well as the timing and nature of their habitat use in the action area.

6.1 Chinook Salmon

Chinook salmon in the Puget Sound evolutionarily significant unit (ESU) are listed as threatened under the ESA (63 FR 11482, March 24, 1999). The ESU includes naturally spawned Chinook salmon originating from rivers flowing into Puget Sound, along with Chinook salmon from 26 artificial propagation programs, including the Issaquah Creek program in the Lake Washington basin. Primary factors contributing to declines in Chinook salmon in the Puget Sound ESU include habitat blockages, genetic modification of wild fish through interbreeding with hatchery fish, urbanization, logging, hydropower development, harvests, and flood control and flood effects (NMFS 1998).

Fish that use stream habitats in the action area belong to the Sammamish population. The most recently calculated value for the 5-year geometric mean of raw wild spawners for the Sammamish population was 160 fish, making up less than 1 percent of the total number of wild spawners in the ESU (NFSC 2015). From 2000 to 2006, the estimated abundance of spawning females in Bear Creek ranged between 120 and 150; the estimates were below 100 females in all but 3 of the years between 2007 and 2016 (Kiyohara 2017).

The habitat restoration activities proposed for Bear Creek are similar to restoration activities specified in the Puget Sound Chinook recovery plan (Shared Strategy for Puget Sound 2007) and carried out recently in nearby reaches (see Section 5.2, above). Many of the newly constructed, low-energy habitat areas provide channel complexity and refugia for Chinook salmon and other species—habitat features that were nearly absent from much of lower Bear Creek in the 1990s (Kerwin 2001).

Adult Chinook salmon enter the Lake Washington system from July through September (Celedonia et al. 2011). Adults typically begin to appear in the Sammamish River in late August or early September, passing through the river on their way to suitable spawning habitat in tributaries (Jeanes and Morello 2016). Chinook salmon typically return to spawning grounds in Bear Creek during late September (Berge et al. 2006). Migration to spawning grounds is typically complete by November. Sammamish River Chinook salmon spawn primarily in Issaquah Creek, Bear Creek, and Cottage Lake Creek, and to a lesser degree in the larger tributaries to the Sammamish River (North, Swamp, and Little Bear Creeks) and to Lake Washington (Kelsey, Coal, May, Thornton, and McAleer Creeks) (WDFW 2017b). Even though WDFW (2017a, 2017c) identifies the Sammamish River in the action area as breeding habitat for Chinook salmon, the potential for spawning or rearing in the mainstem is limited by high water

temperatures, low water velocities, and the lack of suitable spawning substrates (U.S. Army Corps of Engineers and King County 2002). Similarly, although WDFW (2017a, 2017c) identifies Bear Creek in the action area as breeding habitat for Chinook salmon, monitoring data indicate that nearly all spawning takes place in the upper portions of the watershed, primarily in Cottage Lake Creek and the middle reaches of Bear Creek. During monitoring conducted from 2011 to 2015, the farthest downstream redds in Bear Creek were observed near NE Union Hill Road, approximately 2,000 feet upstream of the project area (pers. comm., J. Thompson, WDFW, November 9, 2017).

Spawning of Chinook salmon in the Lake Washington basin occurs from October to December, with peak spawning activity usually in the first few weeks of October (Burton et al. 2009). Fry emerge from redds between January and early April (Kiyohara and Zimmerman 2009). Most Chinook salmon in the Lake Washington basin rear in fresh water for 1 to 6 months before migrating to marine habitats. Chinook salmon from Sammamish River tributaries may emigrate as fry (primarily between February and April) or as smolts (primarily between late April and early July). Most juvenile Chinook salmon in the Lake Washington basin emigrate from the system via the Lake Washington Ship Canal by mid-summer, and almost all of the remaining juveniles have left by September. A small proportion of the population may remain in freshwater habitats for approximately 1 year.

NMFS (2009) determined that adult Chinook salmon are unlikely to be present in the lower reaches of Bear Creek until after September 10. Jeanes and Morello (2016) conducted surveys for Chinook salmon in the Sammamish River from August through October 2015. The survey area extended approximately 6 miles downstream from the outlet of Lake Sammamish and included the area where Bear Creek meets the river. Counts of live Chinook salmon peaked during mid-September and decreased steadily after the first week of October. Most observations of Chinook salmon during the survey period occurred in the uppermost reaches of the river, including the reach that flows through the action area (Jeanes and Morello 2016).

Fish monitoring data indicate that juvenile Chinook salmon remain in Bear Creek for only a few months after emergence, and that most if not all juveniles migrate out of the system by mid-July of their natal year. Since the late 1990s, WDFW has conducted annual surveys of juvenile salmon outmigration, operating a smolt trap in Bear Creek at the approximate location of the proposed light rail alignment crossing. Outmigration of juvenile Chinook salmon from Bear Creek demonstrates a bimodal pattern, with one peak corresponding to the migration of smaller fry between January and early May and a second peak corresponding to the migration of larger parr from early May to July (Kiyohara 2017). No juvenile Chinook have been captured after mid-July. Year 1+ juveniles have been detected only very rarely, indicating that nearly all juveniles migrate out of the system during their natal year. Year 1+ Chinook were observed during only 3 of 16 years of monitoring from 2002 to 2017, amounting to 10 fish out of nearly 100,000 captures (pers. comm., J. Anderson, WDFW, November 9, 2017). Further evidence of the single-season rearing pattern is provided by scale analysis of adult Chinook salmon returning to Bear Creek, which does not indicate that a 1+ life history type (i.e., juveniles remaining in freshwater habitats after their first summer) exists in Bear Creek (Foley, pers. comm. 2008, in Shannon 2009).

Additional evidence concerning the presence or absence of a 1+ life history type in Bear Creek may be available in monitoring reports submitted to NMFS during construction of the Lower Bear Creek Restoration Project. The biological opinion for that project included a requirement for documenting all Chinook salmon encountered during work area isolation. If NMFS has records of any such documentation, the dates of encounters may shed some light on the timing of Chinook salmon presence in the action area. Lack of such reports may provide further evidence that Chinook salmon are not present in the action area during the anticipated in-water work window.

In 2016 (the most recent year for which data are available), the Bear Creek smolt trap was in operation from January 24 through July 3. During that period, outmigrating juvenile Chinook salmon were captured during all but the final week of operation (Kiyohara 2017). Approximately 99 percent of the captures occurred between late February and early June (Kiyohara 2017). Juvenile Chinook salmon captured in Bear Creek were detected moving through the Hiram M. Chittenden Locks (Ballard Locks) in the Lake Washington Ship Canal between May 7 and June 29, 2016 (Kiyohara 2017).

Evidence for the timing of juvenile Chinook salmon presence in the Sammamish River is based on observations from Bear Creek and Lake Washington. As described above, most if not all juvenile Chinook migrate out of Bear Creek by mid-July. These fish are unlikely to linger in the Sammamish River; instead, they are likely to respond to high water temperatures and the low quality of rearing habitat in the river by continuing downstream to Lake Washington. Juvenile Chinook salmon are typically found in Lake Washington from mid-January through late June (Celedonia et al. 2008). Based on these observations, juvenile Chinook salmon are unlikely to be present in the Sammamish River after early to mid-July.

Habitat conditions for Chinook salmon in the action area are variable. Broadly, for all life stages, Bear Creek provides higher-quality habitat than the Sammamish River. Migrating adult Chinook salmon seek cover in deep pools, log jams, and undercut banks, until ready to spawn. They require a steady supply of clean, cool, well-oxygenated water, and clean gravel for successful spawning. Factors influencing the survival of all juvenile salmonids include the availability of suitable habitat, prey, and refuge from predators and floods. The structural complexity of habitat, in the form of pools and riffles, with interspersed downed woody debris of various size classes, is additionally important for the in-stream survival of both adult and juvenile salmonids. Such features are largely absent from the Sammamish River in the action area. Fresh et al. (1999) found that Chinook salmon spent an average of 9 days in the Sammamish River, indicating a low probability that any individual Chinook salmon would remain in the action area for an extended period. The lower reaches of Bear Creek were similarly lacking in high-quality habitat until recently, when the Lower Bear Creek Restoration Project increased the degree of channel meandering, installed large amounts of LWD, and created off-channel rearing habitat (see Section 5.2).

Based on the above, adult Chinook salmon may be present in the action area from mid-September through December, and juvenile Chinook salmon may be present from January through mid-July.

6.2 Steelhead

The Puget Sound steelhead distinct population segment (DPS) is listed as a threatened species (72 FR 26722, May 11, 2007). The DPS includes all naturally spawned anadromous *Oncorhynchus mykiss* originating below natural and manmade impassable barriers from rivers flowing into Puget Sound (79 FR 20802, April 14, 2014). The DPS also includes steelhead from six artificial propagation programs, none of which operate in the Lake Washington system.

Fish that use stream habitats in the Lake Washington system belong to the North Lake Washington and Lake Sammamish population. The number of naturally spawned steelhead in this population is very low. The most recent 5-year estimate of spawning abundance for the North Lake Washington and Lake Sammamish population was 12 fish (Ford 2011). Spawning abundance for this population could not be estimated for the subsequent status review update (NFSC 2015). It is not clear to what degree steelhead historically used tributaries in the Lake Washington basin (WDFW 2017b). Given the low steelhead counts at the Ballard Locks, the species is unlikely to be present in Sammamish River tributaries in appreciable numbers. No spawning is known to occur in the Sammamish River (U.S. Army Corps of Engineers and King County 2002; WDFW 2017c). Analyses conducted for the Lower Bear Creek

Restoration Project found that steelhead no longer occupy Bear Creek and that suitable habitat to sustain a steelhead population in Bear Creek does not exist (Shannon 2009).

Adult steelhead typically enter rivers and streams in the Lake Washington system from November through May and spawn from February through June (Myers et al. 2015). Most Puget Sound steelhead mature within 18 months after hatching and migrate to sea at age 2, with smaller numbers of fish emigrating to the ocean between 1 and 3 years of age. Seaward migration by juveniles occurs principally from April to June, with fish typically spending 1 to 3 years in the ocean before returning to fresh water (Busby et al. 1996).

WDFW (2017a, 2017c) identifies Bear Creek and the Sammamish River in the action area as migratory habitat for steelhead. There are no recent records of steelhead spawning in the Sammamish River or its tributaries, however. Since 1999, WDFW has monitored the emigration of juvenile salmonids from Bear Creek using traps located in the project action area. The period when the traps are in place encompasses the period of peak juvenile steelhead outmigration (April to June). In 14 years of monitoring since 2002, a total of 6 juvenile steelhead have been captured in Bear Creek (WDFW 2017d; Kiyohara 2017). The most recent captures were in 2016, when 2 juvenile steelhead were captured after a period of 7 years (2009 to 2015) with no captures at all (Kiyohara 2017).

In the biological opinion for the Lower Bear Creek Restoration Project, NMFS (2009) concluded that the potential for project-related effects on Puget Sound steelhead was discountable. This conclusion was based on the very low abundance and infrequent presence of steelhead in Bear Creek, as well as the low quality of habitat within the action area.

6.3 Bull Trout

The bull trout is listed as a threatened species (64 FR 58910, November 1, 1999) and is a candidate for listing at the state level. All bull trout in the coterminous United States are included in the listing. Bull trout have been observed entering Lake Washington in small numbers, but the Sammamish River and tributaries are not known or expected to support bull trout spawning or rearing. The only spawning population of bull trout documented in the Lake Washington system is in the upper Cedar River above Chester Morse Lake, which is upstream of a natural barrier to upstream migration (Shared Strategy for Puget Sound 2007). No spawning activity or juvenile rearing has been observed anywhere else in the basin. No bull trout have been documented in any of the tributaries to Lake Washington, including the Sammamish River (WDFW 2017c).

Bull trout have been observed entering Lake Washington through the fish ladder viewing area at the Ballard Locks, where every year, one or two fish are seen traveling into the lake. Many researchers believe that these fish are seasonal transient strays (i.e., not residents) rather than fish produced within the system. Surveys have not produced conclusive evidence for the presence or absence of bull trout in the Lake Washington system, outside of the population in the Cedar River drainage (King County Department of Natural Resources 2000). For regulatory purposes, USFWS assumes that natural production is possible in the system.

USFWS (2015) has identified Lake Washington and its tributaries (including the Sammamish River) as foraging, migration, and overwintering habitat for bull trout. A few stray individuals have been observed at scattered locations in the Lake Washington basin, but no evidence of reproduction has been observed (U.S. Army Corps of Engineers and King County 2002). Neither Bear Creek nor the Sammamish River is known or expected to support bull trout spawning or rearing; bull trout do not reproduce in any of the low-elevation tributaries in the Lake Washington system. WDFW (1999) determined that successful spawning by bull trout occurs only upstream of the winter snow line (i.e., the elevation at which snow is

present on the ground for much of the winter); no portions of the action area are upstream of this line. Water temperatures in the Sammamish River exceed the thermal tolerance exhibited by bull trout, and probably preclude their presence in the river during most months (Goetz 1989). Any fish attempting to gain access to the action area would have to pass through several miles of stream habitat with elevated temperatures in the Sammamish River. In light of these impediments, the potential for bull trout to use habitats in the action area for spawning, rearing, foraging, migration, or overwintering is negligible. If any bull trout were to enter the action area, it would likely be during winter and early spring, when adults or subadults may venture into freshwater habitats outside of their natal systems.

7. EFFECTS ANALYSIS AND EFFECT DETERMINATIONS

Analyses in the 2010 East Link BA evaluated impacts related to construction-related increases in turbidity, as well as temporary and long-term loss of wetland and riparian vegetation near the Sammamish River. The East Link BA also analyzed potential indirect effects resulting from changes in vehicular traffic and patterns of urban development, as well as the effects of actions interrelated and interdependent with the East Link project. The manner and extent of those impacts on ESA-listed fish in Bear Creek and the Sammamish River have not changed. Potential effects that were not addressed in the 2010 East Link BA include those associated with performing in-water work in Bear Creek, placing structures below the OHWMs of Bear Creek and the Sammamish River, clearing riparian habitat along Bear Creek, and installing a pedestrian bridge over Bear Creek. The 2010 East Link BA also did not address the beneficial effects of habitat improvements in Bear Creek. The potential effects of those activities on ESA-listed species are analyzed in the following subsections.

Effects analyses address potential effects on individuals, habitat, and the foraging base for each species. The effects determinations are based on life history analysis, habitat requirements, literature review, agency consultation, and field reconnaissance studies conducted by biologists.

No permanent impacts to the channel of the unnamed tributary (LLID 1221262476704) are anticipated because the channel will be spanned by a bridge, and no stormwater features will discharge to this stream. Moreover, as discussed in Section 5.3 of this BA, this watercourse is not known or expected to provide any habitat for ESA-listed species, and the segment with the potential to be affected by project construction or operation is several thousand feet upstream of any waterbodies where ESA-listed fish are known or expected to be present. Work near that watercourse will thus have no effect on ESA-listed species.

7.1 Short-term (Construction-related) Effects

Construction effects are considered short-term, meaning the ecological functions of the affected area are expected to return to pre-impact performance approximately one to two growing seasons after the completion of construction activities. Project activities with the potential for direct effects on ESA-listed species include ground-disturbing work and equipment use near and below the OHWM of Bear Creek and the Sammamish River. Potential effects of these activities include temporary loss or degradation of riparian or in-stream habitat (including water quality) and disturbance of fish during in-water work.

For all three species addressed in this analysis, the risk of exposure to construction-related effects will be minimal. Given the very low abundance and infrequent presence of steelhead and bull trout in Bear Creek or the Sammamish River, the potential for either species to be present in the action area during project construction is discountable. The potential for bull trout to be present while in-water work is underway is even lower because any bull trout that venture into the Sammamish River system would be expected to do so only during winter, outside of the anticipated in-water work window.

Work within the channel of Bear Creek or the Sammamish River, including installing cofferdams or diversions, dewatering, and reintroducing flow to work areas, will be completed during the approved in-water work window. Work within or over the OHWM during the in-water work window will be allowed only as approved by WDFW. If a cofferdam is used to exclude flow from a portion of the Bear Creek channel, or if the stream is diverted, the cofferdam or diversion will be allowed to remain in place outside of the approved in-water work window only if authorized by WDFW. The typical in-water work window for the Sammamish River and tributaries is August 1 through August 31. Adult Chinook salmon are unlikely to be present in the action area until mid-September, and outmigrating juvenile Chinook salmon are expected to leave the action area by mid-July. Fish monitoring data indicate that juvenile Chinook salmon remain in Bear Creek for only a few months after emergence, and that most if not all juveniles migrate out

of the system by mid-July of their natal year. Based on high water temperatures and the low quality of rearing habitat in the Sammamish River, juvenile Chinook salmon are also not expected to be present in the river after mid-July.

The following subsections address the potential effects of exposure to the impact mechanisms identified above.

7.1.1 Construction-related Sedimentation, Turbidity, and Pollutants

Project activities in or adjacent to waterbodies have the potential to introduce sediment from disturbed soils and pollutants from spills of fuel, hydraulic fluid, or other substances. All work in or near waterbodies in the action area will comply with the terms of federal, state, and local permits, minimizing the potential for sediment or pollutants to be carried from work sites to waterbodies by stormwater. In addition, all work will be conducted in compliance with the TESC plan and SPCC plan for the project, and BMPs will be implemented to prevent construction-related sediment or pollutants from entering streams. The treated wood timbers supporting the existing bridge over Bear Creek will be removed from dewatered portions of the stream channel, essentially eliminating the potential for contaminants from those timbers to enter the stream. Based on these factors, the potential for construction activities to result in the introduction of sediment or pollutants into waters that support ESA-listed fish is extremely low.

Any work below the OHWM of Bear Creek or the Sammamish River will be conducted in accordance with the terms of HPAs and other applicable permits obtained for this project. Compliance with the terms and conditions of these permits, as well as implementation of the conservation measures specified in the 2010 East Link BA and Chapter 3 of this document, will minimize the potential for ground-disturbing work near and within these streams to adversely affect ESA-listed fish.

The reintroduction of water to the channel of Bear Creek will temporarily increase turbidity in downstream reaches of the stream. This will occur during the approved in-water work window, minimizing the potential for exposure. If any ESA-listed fish are present in the stream while work is underway, most would likely move out of the affected stream segment to avoid the activity and turbidity associated with the project work. The duration of the elevated turbidity levels is difficult to predict, but it is expected that turbidity will remain above background levels for a matter of hours following the reintroduction of water to the stream channel. Based on analyses completed for similar work associated with the Lower Bear Creek Restoration Project, it is unlikely that the effects of elevated turbidity levels would be lethal to adult or juvenile salmonids (NMFS 2009).

No in-water work will be needed for guideway construction at the Sammamish River crossing. Disturbance of substrates below the OHWM of the river for installation of the new stormwater outfalls could, however, result in elevated levels of turbidity. The potential for adverse effects on ESA-listed species will be minimized or avoided altogether by conducting the work during the approved in-water work window, when Chinook salmon, steelhead, and bull trout are not known or expected to be present in the action area. Where ground-disturbing work below the OHWM is necessary, appropriate measures will be implemented to prevent sediment from entering the water. Because outfall installation will take place under summer low-flow conditions (i.e., during the in-water work window) when the water level is well below the OHWM, it may be possible to accomplish work area isolation with silt fences or similar BMPs. If the distance between ground-disturbing work areas and the river surface is too short, cofferdams will be used to isolate work areas from the river.

Any guideway support columns installed below the OHWM of Bear Creek will be placed at least 10 feet away from the defined stream channel and installed during the summer months when stream flows are contained within the active channel. Appropriate measures, most likely silt fences or similar BMPs, will be installed to

prevent sediment from entering the water. If additional measures to isolate the work areas from the stream channel are deemed necessary, sheet piles or similar structures will be installed around the support column construction areas. As such, installation of the guideway support columns is not expected to result in adverse effects on aquatic resources, such as elevated levels of turbidity or contaminants.

Where drilled shafts are used to support elevated guideways, shafts may need to be dewatered before concrete is poured. Drilling spoils may also need to be dewatered. Water recovered during the dewatering process will be treated to meet the appropriate permit requirements before being discharged to receiving waters.

7.1.2 Fish Exclusion

If any ESA-listed fish are present in portions of Bear Creek or the Sammamish River that are dewatered, they will experience harassment and possibly harm during the work area isolation process. As discussed above, the potential for ESA-listed species to be exposed to these effects is extremely low because work within the stream channels is anticipated to take place during the in-water work window, when none of these species is known or expected to be present in the action area. This potential is further reduced by the expectation that many fish will respond to in-water noise associated with vibratory driving of sheet pile cofferdams by leaving the area. It is possible, however, that ESA-listed species (particularly Chinook salmon) may enter Bear Creek while project work is underway, or that it may become necessary to conduct work within the channel outside of the anticipated work window. Should Chinook salmon, steelhead, or bull trout be present in areas subjected to project activities, the risk of adverse effects will be minimized through the implementation of current WSDOT Fish Exclusion Protocols and Procedures. A fish exclusion plan will be submitted for review and approval by NMFS before fish exclusion work begins.

Work area isolation practices are expected to start with stream seining to herd fish out of the work site. Fish that remain in the seined areas will be removed via dip netting—a typical procedure. As a last resort, electrofishing may be used to immobilize, locate, and remove the few fish that may remain in the isolation area following other removal techniques. The areas where electrofishing is most likely to be needed are the portions of Bear Creek where juvenile fish may take cover in large rocks, woody debris, overhanging banks, and other structural elements. None of these techniques is certain to be completely successful; therefore, some fish may be stranded during dewatering, in addition to any stress they incur during removal techniques.

Potential adverse effects on adult salmonids from work area isolation would be limited to temporary displacement. Because of their size, adults are typically successfully seined out of the construction area. Juveniles are more likely to find cover within isolation areas, where they would be susceptible to the effects of electrofishing or stranding, in addition to those of temporary displacement, seining, and handling.

7.1.3 Channel Constriction or Flow Diversion

The presence of a cofferdam or diversion in Bear Creek may create localized increases in stream velocities during construction, potentially impeding the upstream migration of adult Chinook salmon en route to spawning habitat farther upstream. If the cofferdam or diversion remains in place only during the approved in-water work window (when adult Chinook salmon are not known or expected to be present in the action area), the potential for adverse effects will be discountable. If it becomes necessary to leave the structure in place beyond the in-water work window, or if any adults arrive before the structure is removed, then the upstream migration of adult Chinook salmon could be delayed. Any such delays would be brief and would not be expected to result in a substantial risk of decreased reproductive success.

7.1.4 Temporary Loss of Riparian and Wetland Vegetation

The 2010 East Link BA analyzed the effects of placing footings for the elevated guideway near the bank of the Sammamish River but outside the OHWM, as well as replacing tall trees with lower-growing native vegetation (Sound Transit 2010). That analysis remains valid.

In contrast to the analysis in the 2010 East Link BA (which assumed no riparian habitat would be disturbed near Bear Creek), project construction at the Bear Creek crossing will temporarily disturb 2.65 acres of riparian vegetation along Bear Creek. Much of the existing riparian and wetland vegetation to be temporarily cleared for construction consists of invasive species, especially Himalayan blackberry and reed canarygrass. These areas will be cleared of invasive species and replanted with native vegetation after construction, resulting in long-term improvements in riparian and wetland habitat functions.

Temporary clearing of trees and shrubs may result in reduced shading, potentially leading to elevated stream temperatures until vegetation becomes reestablished in disturbed areas. Riparian vegetation removal can also reduce insect recruitment to the waterbodies below and limit recruitment of LWD. Following construction, all temporarily disturbed areas will be restored with appropriate native vegetation, consistent with the conceptual mitigation approach (Sound Transit 2011) and local permit requirements.

7.2 Long-term Effects

Long-term effects of the Downtown Redmond Link Extension include those expected to persist through the design life of the light rail project. Such effects include the presence of structures below the OHWM of fish-bearing streams, shading from over-water structures, permanent loss of vegetation, and the addition of new impervious area. Improvements to the Bear Creek channel and removal of hydraulic constraints at the existing railway crossing site will have long-term beneficial effects for ESA-listed fish.

7.2.1 Presence of Structures below the OHWM

The presence of two new stormwater outfalls in the Sammamish River is unlikely to affect ESA-listed fish to an appreciable degree. Riverine habitat in the action area provides little rearing or spawning function for salmonids; instead, the river serves as a migratory corridor for fish that spawn in tributaries. Substrates near the stream banks include large riprap and a thick, soft layer of fine sediments. The presence of outfall pipes and outfall protection (i.e., rock pads) at the discharge points is unlikely to present a substantial barrier to the movement of fish through the area.

The presence of support columns below the OHWM of Bear Creek will reduce the amount of habitat available to aquatic species under high-flow conditions and potentially modify channel morphology and flow dynamics. Based on the location of these structures—more than 10 feet from the defined channel—combined with the fact that the stream remains within the defined channel under most flow conditions, the potential for adverse effects will be minimal. In addition, by increasing the amount of aquatic habitat in the stream channel (through channel widening), the project will result in a net increase in the amount of aquatic habitat in the action area. The placement of any structures below the OHWM of any streams in the action area will be done in accordance with the terms of the HPAs and other applicable permits obtained for the project.

A quantitative floodplain analysis will be conducted to support project permitting. Where the light rail alignment passes through the Sammamish River floodplain in the Marymoor Park area and the adjacent WSDOT right-of-way, the project will prevent impacts to regulated floodplain elevations by providing required compensatory storage for fill or via other mitigation measures. In the vicinity of Bear Creek, the

project will conduct a flood study and gain approval from the City of Redmond for any proposed improvements to the stream channel and floodplain. The improvements to the stream channel and floodplain implemented by the project (including removal of the flow constraints associated with the former railroad crossing) are expected to result in either no net impact or a benefit to the stream channel and floodway conveyance (Sound Transit 2017).

7.2.2 Overwater Shading and Artificial Lighting

The project will construct two new bridges spanning Bear Creek and will remove an existing bridge. The light rail alignment will be on an elevated guideway that is at least 4.2 feet above the OHWM of the stream. The bottom of the pedestrian bridge for the East Lake Sammamish Trail Connector crossing will be a similar height above the OHWM.

The presence of these two new structures will not constitute a qualitative difference from existing conditions because a bridge is currently present at the same location. The bottom of the existing bridge is approximately 5 feet above the OHWM.

Shade from the existing bridge may provide hiding cover for potential predators such as northern pikeminnow and largemouth bass. In addition, outmigrating juvenile salmonids may respond to the shadow cast by the bridge by pausing at the upstream end of the darkened area, potentially increasing their vulnerability to predation (Kemp and Williams 2008). By removing the existing bridge and replacing it with two new structures, the project will increase the amount of stream habitat that is affected by overwater shading. The existing 14-foot-wide bridge will be replaced by the 31-foot-wide guideway and the 18-foot-wide pedestrian bridge. As a result, the area of stream channel affected by overwater shading will increase from 400 square feet to approximately 3,350 square feet. It is unclear whether this increase will result in a substantial increase in the energetic costs and predation risks that accompany delays in downstream migration.

Neither construction nor operation of the Downtown Redmond Link Extension is expected to result in any increases in nighttime illumination of fish-bearing waters (which could increase the risk of predation on juvenile salmonids). If any construction activity occurs at night, temporary lights will be directed away from fish-bearing waters to prevent interference with fish behavior patterns. During operation, the tracks will have no overhead lighting and the train headlights will be directed parallel to the tracks. Lighting at light rail stations is not expected to result in any adverse effects because no stations are proposed within 200 feet of surface-flowing streams that are known or expected to support ESA-listed fish.

7.2.3 Stormwater Management

Stormwater infiltration facilities will be constructed where feasible, and the project will comply with the guidance documents identified in Section 2.5 of this BA. Stormwater from all project-related impervious surfaces will receive appropriate flow control where required (note that the Sammamish River is a flow-exempt waterbody, meaning detention is not required). Where runoff is treated in infiltration facilities, it will not affect flows in nearby streams or other waterbodies. With the implementation of these measures, runoff from project facilities during peak flow conditions will not be expected to have a detrimental effect on any of the streams in the action area, and base flows will be expected to remain similar to current conditions.

Stormwater runoff from the guideways will be discharged to uplands, existing drainage systems, stormwater facilities, wetlands, or to the Sammamish River. To minimize site-specific impacts, multiple outfalls will be used, and protection will be installed at each outfall. Runoff from guideways will also discharge to new outfalls in the Sammamish River. The addition of these new stormwater outfalls will

not affect water quality in the river because all runoff will be from non-pollution-generating surfaces. No changes in flow regime, including peak flows and base flows of the Sammamish River, are anticipated because the volume of runoff from the small amount of added impervious surface will be miniscule compared to the magnitude of stream flows in the river.

Through the use of existing and proposed stormwater treatment facilities, combined with reductions in the amount of PGIS in the action area, the project is expected to improve water quality in receiving waters. Where runoff is treated in infiltration facilities, it will not affect water quality in nearby streams or other waterbodies.

The 2010 East Link BA included a general discussion of stormwater management, based on the preliminary design for the East Link project as a whole. Since then, more detailed design has been completed for the Downtown Redmond Link Extension. Also, the WSDOT Highway Runoff and Dilution Loading (HI-RUN) model was used to generate estimates of project-related changes in loadings of dissolved copper and dissolved zinc at the points where stormwater runoff discharges to receiving waters. The results of this analysis are summarized below; model output is included as Attachment F.

Because most of the stormwater runoff from PGIS in the action area comes from sources other than the Downtown Redmond Link Extension, a "pipe-within-a-pipe" approach was used for the HI-RUN model. This approach assumes that stormwater from the new PGIS resulting from the Downtown Redmond Link Extension will not combine with water from other sources before reaching the discharge point. In other words, the pipe-within-a-pipe approach recognizes the need to consider the project's contribution to water quality independently of the much greater contribution of pollutants from other sources such as SR 520.

The model results show that pollutant loading in the action area as a whole (i.e., all seven TDAs combined) will decrease compared to current conditions. This conclusion is based on the P(exceed) values generated by the model. P(exceed) values less than 0.50 represent conditions under which runoff quality is expected to improve (WSDOT 2011). The P(exceed) value for dissolved copper in the action area is 0.383 and the value for dissolved zinc is 0.385. These results are consistent with expectations based on the combined effects of treating all new PGIS and removing some areas of existing PGIS in the action area.

When the model is run for individual TDAs, the results vary but are generally consistent with the model results for all TDAs combined. Results for individual TDAs are as follows:

- **TDA 1**: P(exceed) = 0.488 for both dissolved copper and dissolved zinc, reflecting a small reduction in the total amount of PGIS in the TDA, but no change in the amount of untreated PGIS. Runoff from this TDA discharges directly to Lake Sammamish, where it will be diluted almost immediately to concentrations indistinguishable from background levels.
- **TDA 2**: P(exceed) = 0.498 for dissolved copper and 0.499 for dissolved zinc. Although these values exceed the analysis threshold value of 0.45, the potential for project-related changes in pollutant loading in the receiving water (Sammamish River) is negligible because the TDA discharges to a vegetated dispersion area approximately 300 feet from the water's edge. Stormwater runoff will infiltrate and be diluted to a substantial degree as it travels from the discharge point toward the river. Any pollutants that reach the river will be diluted to negligible levels almost immediately.
- **TDA 3**: P(exceed) = 0.439 for dissolved copper and 0.419 for dissolved zinc, reflecting an overall reduction in the amount of PGIS in the TDA, as well as the elimination of untreated PGIS. Any pollutants that reach the river will be diluted to negligible levels almost immediately.

- **TDA 4**: All runoff from PGIS will infiltrate; the model was not run for this TDA.
- **TDA 5**: P(exceed) = 0 for dissolved copper and 0 for dissolved zinc because runoff from all PGIS will be treated in infiltration facilities.
- **TDA 6**: P(exceed) = 0.454 for dissolved copper and 0.458 for dissolved zinc. There is no untreated PGIS in this TDA under existing conditions, nor will there be any following project construction; the amount of PGIS runoff receiving basic treatment will decrease by approximately 0.45 acre (11 percent), and the amount of PGIS runoff being treated in infiltration facilities will increase by approximately 0.63 acre (73 percent).
- **TDA 7**: P(exceed) = 0 for dissolved copper and 0 for dissolved zinc because 0.39 acre of existing PGIS will be removed, and no new PGIS will be created.

7.2.4 Permanent Impacts to Riparian and Wetland Areas

Permanent project-related impacts on riparian habitat will occur where the light rail alignment and the proposed pedestrian bridge are within 200 feet of Bear Creek[2]. Wetlands along Bear Creek will also be affected. Existing vegetation will be replaced by at-grade guideways and support structures for elevated guideways, and by the pedestrian bridge and associated approach trail segments. Trees and other tall vegetation underneath and within 15 feet of elevated guideways will be permanently cleared for safety; trees near the pedestrian bridge and approach trail segments will likely need to be cleared as well. In addition, construction of the elevated guideway above vegetation will reduce the amount of water the vegetation receives from precipitation. Finally, guideways with low clearance (generally, less than 15 feet) may limit sunlight. In some areas, vegetation cleared from beneath elevated guideways may not grow back. The presence of elevated guideways and trail features will preclude the development of mature forest habitat in such areas, reducing the potential for the recruitment of LWD to streams. Planting native trees and shrubs in riparian areas near the project area will compensate for these losses over the long term.

The light rail alignment will be at-grade up to a point approximately 10 to 35 feet from the eastern bank of Bear Creek and will be less than 15 feet above ground level for its entire length within 200 feet of the stream. Existing trees in the riparian area below and within 15 feet of the guideway will be cleared and replaced with lower-growing native plants. Also, some trees in areas beyond the 15-foot clear zone may need to be removed to protect light rail safety and reliability. Removal of such hazard trees may continue as a maintenance activity throughout the operational life of project facilities. The 31-foot-wide guideway, combined with the clear zones, will affect approximately 12,200 square feet (0.28 acre) within 200 feet on each side of Bear Creek, for a total of 24,400 square feet (0.56 acre). The pedestrian bridge is expected to be located along the outer edge of the clear zone north of the light rail alignment. Portions of the approach trail segment will fall within the clear zone and thus will not affect areas that would not have been affected anyway by guideway construction. The pedestrian bridge and approach trail segment will likely affect approximately 8,000 additional square feet (0.18 acre) of vegetation in the Bear Creek riparian zone. Both the light rail guideway and the pedestrian bridge will cross Bear Creek perpendicular to the axis of stream flow, minimizing the extent of impacts along the stream bank.

[2] The design of the light rail alignment near the Sammamish River crossing has not changed substantially from what was analyzed in the 2010 East Link BA. As discussed in that analysis, based on the height of the elevated guideway in that area, the presence of project features is not likely to result in measurable reductions in wetland or riparian vegetation near the Sammamish River (Sound Transit 2010).

East of Bear Creek, existing land cover where the proposed light rail alignment passes through the riparian area is dominated by the compacted surface of the railroad berm, low-growing non-native vegetation, and cleared areas used for access and parking. Aerial imagery shows that riparian land cover in the proposed alignment route east of Bear Creek consisted solely of bare ground and mown grasses as recently as 2005, indicating that no mature trees will be removed for project construction in that area. Construction of the pedestrian bridge and approach trail segment on that side of the stream will likely require the removal of several mature cottonwood trees.

West of Bear Creek, young trees and native shrubs are present in the proposed alignment, extending the breadth of the riparian area from the stream bank. The nearest mature trees (i.e., larger than 20 inches in diameter at breast height) within the proposed light rail alignment are a stand of cottonwoods approximately 150 feet west of the stream. The riparian area north of the railroad berm, where the pedestrian bridge and approach trail segment will be built, is dominated by Himalayan blackberry and other shrubs.

Beyond the limits of the old railroad berm, almost all of the area where the proposed light rail alignment passes through the Bear Creek riparian area has been identified as wetlands. Permanent impacts to these wetlands and their regulatory buffers will be mitigated as required by federal and local agencies with permitting authority (e.g., the Corps and the City of Redmond), as will impacts to the regulatory buffer of Bear Creek.

Based on (1) the predominance of young and non-native vegetation in the affected areas, (2) the narrow width of the affected areas along the axis of stream flow, (3) the abundance of riparian habitat with native vegetation in areas immediately upstream and downstream of the affected areas, and (4) anticipated compensatory mitigation, project-related impacts to riparian and wetland areas will not likely result in a noticeable reduction in the function of riparian habitats along Bear Creek. As such, impacts to wetlands and riparian areas are not expected to result in significant effects on ESA-listed fish.

7.2.5 Habitat Improvements

Over the long term, the proposed habitat improvements in Bear Creek will benefit aquatic species, including ESA-listed species, in multiple ways. As described in Section 2.1 of this document, the channel improvement work will be designed to establish a compositionally and structurally complex ecosystem with attributes important for supporting fish and wildlife. Pullback of the railroad fill prism will increase the amount of stream channel area by approximately 1,000 square feet, increasing the amount of in-stream habitat available to Chinook salmon and other species. Excavation of floodplain areas near the creek will increase the availability of off-channel habitat. Stream substrate enhancement and LWD installation will improve habitat complexity. Planting trees and shrubs in riparian and floodplain areas will provide long-term benefits such as water temperature maintenance, bank stabilization, input of organic matter, and provision of woody debris. The removal of the existing treated-wood bridge will reduce the input of contaminants to the stream. In addition, widening the channel will remove a hydraulic constraint that may impede the upstream migration of anadromous salmonids during high flows.

7.3 Indirect Effects

The 2010 East Link BA analysis still applies.

7.4 Interrelated/Interdependent Actions

The 2010 East Link BA analysis still applies.

7.5 Cumulative Effects

Consistent with the requirements specified in 50 CFR 402.02, the analysis of cumulative effects is based on future actions that are (1) reasonably certain to occur in the action area, and (2) not expected to include a federal nexus that would trigger ESA Section 7 compliance requirements. In the action area, the only reasonably foreseeable future actions that have no federal nexus and that could adversely affect ESA-listed species consist of urban development projects on private lands. If such projects result in the conversion of relatively undisturbed areas to housing, landscaping, and impervious surfaces, they could contribute to increased pollutant loading in waters that support ESA-listed fish. No projects with that potential have been identified in the action area. Most lands in the action area are already heavily developed; those that are not developed (e.g., Marymoor Park) are zoned for uses that preclude such development. Any future projects, therefore, would consist of redevelopment of existing developed parcels rather than conversion of relatively undisturbed areas. In addition, by improving habitat conditions in Bear Creek and by reducing the number of vehicles on SR 520 and other roadways, the project is expected to generate long-term benefits for ESA-listed fish species in the action area. As such, there is no potential for the project to contribute to adverse cumulative effects on ESA-listed species.

7.6 Effect Determinations

7.6.1 Effect Determinations Previously Consulted Upon

The 2010 East Link BA found that construction and operation of East Link Segment E **may affect** Puget Sound Chinook salmon, Puget Sound steelhead, and bull trout for the following reasons:

- These species may be present in Bear Creek and the Sammamish River.
- Turbidity generated by construction activities could be released into surface waters.
- Removal of riparian vegetation from construction activities and shading could temporarily disrupt riparian functions in a small geographic area.

The 2010 East Link BA found, however, that construction and operation of East Link Segment E was **not likely to adversely affect** Puget Sound Chinook salmon and Puget Sound steelhead for the following reasons:

- BMPs will be employed to prevent sediment, turbidity, and dewatering water from entering any waterbody.
- Native riparian vegetation will be replanted immediately after construction. Monitoring and adaptive management will ensure survival of revegetated areas.
- Permanent wetland and riparian impacts will be mitigated in accordance with regulatory requirements.

The 2010 East Link BA also found that construction and operation of East Link Segment E was **not likely to adversely affect** bull trout for the following reasons:

- Waterbodies in the action area do not provide suitable spawning habitat, and no spawning activity has been observed in stream systems in the action area. No spawning populations are known to exist in the Lake Washington watershed outside of the Cedar River above Chester Morse Lake.

- Although the Sammamish River may be accessible to bull trout, no observations of bull trout in the river have been documented; moreover, it is unlikely bull trout would use the river due to high water temperatures.

For those elements of the project, the original rationales are still valid. No observations of bull trout in Bear Creek or the Sammamish River have been reported since 2010 (after the original BA was completed), and Sound Transit remains committed to implementing BMPs, replanting and monitoring native riparian vegetation, and mitigating permanent impacts to wetland and riparian areas.

7.6.2 Updated Effect Determinations

The following subsections present updated effect determinations and rationales, based on the analysis of project impacts that differ in manner and/or extent from those previously considered. Table 7-1 summarizes the effect determinations for each species considered in this analysis.

Table 7-1. Effect Determinations for ESA-Listed Species and Critical Habitat

Species	Status	Federal Jurisdiction	Effect Determination	Critical Habitat Effect Determination
Chinook salmon, Puget Sound ESU	Threatened	NMFS	Likely to Adversely Affect	No Effect
Steelhead, Puget Sound DPS	Threatened	NMFS	Not Likely to Adversely Affect	No Effect
Bull trout	Threatened	USFWS	Not Likely to Adversely Affect	No Effect

ESU = Evolutionarily Significant Unit
DPS = Distinct Population Segment

Puget Sound Chinook Salmon

The project **may affect** Puget Sound Chinook salmon for the following reasons:

- In-water work will occur in Bear Creek, which supports a spawning population of Chinook salmon, and in the Sammamish River, which provides migratory habitat.
- Sediment or pollutants generated by construction activities could be released into surface waters.
- Increases in the amount of impervious surface in the action area could result in increased velocities and durations of peak flows in receiving waters.
- Removal of riparian vegetation due to project construction could disrupt riparian functions in stream reaches used by Chinook salmon.
- The presence of two new stormwater outfalls below the OHWM of the Sammamish River may modify habitat conditions or fish use in the river.

The project is **likely to adversely affect** Puget Sound Chinook salmon for the following reasons:

- If any juveniles are present in the action area during the in-water work window, or if it becomes necessary to conduct work within the channel of Bear Creek outside of the anticipated work window, fish will be exposed to disturbance from the installation of sheet pile cofferdams,

harassment and possible harm from fish exclusion activities, and increased turbidity when water is reintroduced to the stream channel.

Most project-related impacts are not expected to adversely affect Puget Sound Chinook salmon for the following reasons:

- Work within the channels of Bear Creek and the Sammamish River is expected to be performed during the period when Chinook salmon are least likely to be present in the action area—after juvenile outmigration is typically complete and before adults typically start to enter freshwater spawning habitats.
- All work below the OHWM of any waterbodies will be conducted in accordance with the HPA issued by WDFW, the Clean Water Act Section 404 permit issued by the Corps, and the Section 401 Water Quality Certification issued by Ecology. Such permits typically include provisions designed to avoid or minimize the risk of adverse effects on fish, such as measures to avoid or minimize the potential for construction activities to deliver sediment or pollutants to streams.
- Work near streams will comply with permits obtained under local critical areas ordinances, which will likely include provisions for the protection of water quality and riparian habitat, further reducing the potential for adverse effects on fish and fish habitat.
- BMPs will be employed to prevent sediment and pollutants from entering any waterbody.
- Any guideway support columns installed below the OHWM of Bear Creek will be placed at least 10 feet away from the defined stream channel and installed during the summer months when stream flows are contained within the active channel.
- Stormwater runoff from all new PGIS in the action area will be infiltrated or will receive water quality treatment, minimizing the risk of degradation of water discharged to action area streams.
- To minimize the potential impacts of increased impervious surface, stormwater detention facilities will be constructed as part of the project; the volume detained will be sufficient to offset any increase in impervious surface area.
- The presence of new outfall pipes and outfall protection in the Sammamish River, and the presence of guideway support columns below the OHWM of Bear Creek, is unlikely to present a noticeable barrier to the movement of fish through the area.
- New stormwater outfalls in the Sammamish River will not appreciably affect water quality, peak flows, or base flows.
- Native riparian vegetation will be replanted immediately after construction. Monitoring and adaptive management will ensure survival of plants in revegetated areas.
- Impacts to wetlands and riparian areas will be mitigated in accordance with regulatory requirements.
- Habitat improvements in Bear Creek will increase the amount of in-stream and off-channel habitat, improve habitat complexity, improve water quality, and facilitate upstream migration.

Steelhead

The project **may affect** Puget Sound steelhead for the following reasons:

- In-water work will occur in Bear Creek, where juvenile steelhead have been captured in small numbers, and in the Sammamish River, where steelhead could also be present.
- Removal of riparian vegetation due to project construction could disrupt riparian functions in stream reaches where steelhead may be present.
- Sediment or pollutants generated by construction activities could be released into surface waters.
- Increases in the amount of impervious surface in the action area could result in increased velocities and durations of peak flows in receiving waters.
- The presence of two new stormwater outfalls below the OHWM of the Sammamish River may modify habitat conditions or fish use in the river.

The project is **not likely to adversely affect** Puget Sound steelhead for the following reasons:

- Given the very low abundance and infrequent presence of steelhead in Bear Creek or the Sammamish River, the potential for this species to be present in the action area during project construction is discountable.
- Neither Bear Creek nor the Sammamish River is known or expected to provide spawning or rearing habitat for Puget Sound steelhead.
- Work within the channels of Bear Creek and the Sammamish River is expected to be performed during the period when steelhead are least likely to be present in the action area—after juvenile outmigration is typically complete and before adults typically start to enter freshwater spawning habitats.
- All work below the OHWM of any waterbodies will be conducted in accordance with the HPA issued by WDFW, the Clean Water Act Section 404 permit issued by the Corps, and the Section 401 Water Quality Certification issued by Ecology. Such permits typically include provisions designed to avoid or minimize the risk of adverse effects on fish, such as measures to avoid or minimize the potential for construction activities to deliver sediment or pollutants to streams.
- Work near streams will comply with permits obtained under local critical areas ordinances, which will likely include provisions for the protection of water quality and riparian habitat, further reducing the potential for adverse effects on fish and fish habitat.
- Any guideway support columns installed below the OHWM of Bear Creek will be placed at least 10 feet away from the defined stream channel and installed during the summer months when stream flows are contained within the active channel.
- BMPs will be employed to prevent sediment and pollutants from entering any waterbody.
- Stormwater runoff from all new PGIS in the action area will be infiltrated or will receive water quality treatment, minimizing the risk of degradation of water discharged to action area streams.
- To minimize the potential impacts of increased impervious surface, stormwater detention facilities will be constructed as part of the project; the volume detained will be sufficient to offset any increase in impervious surface area.

- The presence of new outfall pipes and outfall protection in the Sammamish River, and the presence of guideway support columns below the OHWM of Bear Creek, is unlikely to present a noticeable barrier to the movement of fish through the area.
- New stormwater outfalls in the Sammamish River will not appreciably affect water quality, peak flows, or base flows.
- Native riparian vegetation will be replanted immediately after construction. Monitoring and adaptive management will ensure survival of plants in revegetated areas.
- Impacts to wetlands and riparian areas will be mitigated in accordance with regulatory requirements.
- Habitat improvements in Bear Creek will increase the amount of in-stream and off-channel habitat, improve habitat complexity, improve water quality, and facilitate upstream migration.

Bull Trout

The project **may affect** bull trout for the following reasons:

- Bull trout have been observed in the Lake Washington basin occasionally and in small numbers.
- Removal of riparian vegetation due to project construction could disrupt riparian functions in stream reaches where adult or subadult bull trout could be present.
- Sediment or pollutants generated by construction activities could be released into surface waters.
- Increases in the amount of impervious surface in the action area could result in increased velocities and durations of peak flows in receiving waters.
- The presence of two new stormwater outfalls below the OHWM of the Sammamish River may modify habitat conditions or fish use in the river.

The project is **not likely to adversely affect** bull trout for the following reasons:

- Neither Bear Creek nor the Sammamish River is known or expected to support spawning or rearing by this species.
- Work within the channels of Bear Creek and the Sammamish River will take place during the approved in-water work window, which coincides with the period when temperatures in the Sammamish River commonly exceed 20°C. Any bull trout that may venture into the action area would likely do so only during the winter months (i.e., outside of the in-water work window), when temperatures are low enough to allow fish to survive in the river.
- Given the very low abundance and infrequent presence of bull trout in Bear Creek or the Sammamish River, combined with the timing of any possible presence, the potential for this species to be present in the action area during project construction is discountable.
- All work below the OHWM of any waterbodies will be conducted in accordance with the HPA issued by WDFW, the Clean Water Act Section 404 permit issued by the Corps, and the Section 401 Water Quality Certification issued by Ecology. Such permits typically include provisions designed to avoid or minimize the risk of adverse effects on fish, such as measures to avoid or minimize the potential for construction activities to deliver sediment or pollutants to streams.

- Work near streams will comply with permits obtained under local critical areas ordinances, which will likely include provisions for the protection of water quality and riparian habitat, further reducing the potential for adverse effects on fish and fish habitat.
- Any guideway support columns installed below the OHWM of Bear Creek will be placed at least 10 feet away from the defined stream channel and installed during the summer months when stream flows are contained within the active channel.
- BMPs will be employed to prevent sediment and pollutants from entering any waterbody.
- Stormwater runoff from all new PGIS in the action area will be infiltrated or will receive water quality treatment, minimizing the risk of degradation of water discharged to action area streams.
- To minimize the potential impacts of increased impervious surface, stormwater detention facilities will be constructed as part of the project; the volume detained will be sufficient to offset any increase in impervious surface area.
- The presence of new outfall pipes and outfall protection in the Sammamish River, and the presence of guideway support columns below the OHWM of Bear Creek, is unlikely to present a noticeable barrier to the movement of fish through the area.
- New stormwater outfalls in the Sammamish River will not appreciably affect water quality, peak flows, or base flows.
- Native riparian vegetation will be replanted immediately after construction. Monitoring and adaptive management will ensure survival of plants in revegetated areas.
- Impacts to wetlands and riparian areas will be mitigated in accordance with regulatory requirements.
- Habitat improvements in Bear Creek will increase the amount of in-stream and off-channel habitat, improve habitat complexity, improve water quality, and facilitate upstream migration.

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Attachment A

Essential Fish Habitat Consultation

ESSENTIAL FISH HABITAT CONSULTATION

The Magnuson-Stevens Fishery Conservation and Management Act requires consultation for all federal agency actions that may adversely affect essential fish habitat (EFH) that has been designated for federally managed commercially harvestable fish species. EFH consultation with NMFS is required by federal agencies undertaking, permitting, or funding activities that may adversely affect EFH, regardless of its location. Under Section 305(b)(4) of the Magnuson-Stevens Act, NMFS is required to provide EFH conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH. Wherever possible, NMFS uses existing interagency coordination processes to fulfill EFH consultations with federal agencies. For the proposed action, this goal is being met by incorporating EFH consultation to the ESA Section 7 consultation, as represented by this BA.

The Pacific Fishery Management Council has designated EFH for the Pacific Coast groundfish fishery, the coastal pelagic species fishery, and the Pacific Coast salmon fishery. The streams in the project action area contain EFH for Pacific salmon. Designated EFH for groundfish and coastal pelagic species is limited to marine habitats. No marine habitats are present in the action area or areas directly or indirectly affected by the project; therefore, the project will have no adverse effects on EFH for groundfish or coastal pelagic species. EFH for groundfish or coastal pelagic species is not discussed further in this assessment.

The EFH designation for the Pacific salmon fishery includes all streams, lakes, ponds, wetlands, and other waterbodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above impassable barriers. The Pacific salmon management unit includes Chinook, coho, and pink salmon.

The action area includes areas designated as EFH for various life-history stages of Chinook salmon and coho salmon; both species have been documented in Bear Creek and the Sammamish River. Self-sustaining populations of pink salmon are not found in WRIA 8; the occasional adult fish observed in the basin are thought to be strays from other basins (Kerwin 2001). For this reason, this analysis addresses potential effects on Chinook or coho salmon only.

Description of Project Activities

The project activities covered by this BA are described in Chapter 2, Project Location and Description. Potential effects of the project on salmonids are discussed in detail in Chapter 7, Effects Analysis and Effects Determinations. The analysis of effects on Chinook salmon and their habitat in Chapter 7 of this BA concluded that the proposed project **may adversely affect** Chinook salmon. Based on project timing and anticipated impacts, coho salmon have a similar potential to be present in areas where project-related impacts will occur. As such, the effects on EFH for coho salmon are expected to be similar to those for Chinook salmon.

Conservation Measures and Best Management Practices

Conservation measures and best management practices (BMPs) are included for project activities and are described in Chapter 3 of this BA.

Conclusions

In accordance with the EFH requirements of the Magnuson-Stevens Fishery Conservation and Management Act, it has been determined that the project will have the following effect on EFH for the guilds identified below:

Pacific Salmon	☐ No Adverse Effect	☒ Adverse Effect
Groundfish	☒ No Adverse Effect	☐ Adverse Effect
Coastal Pelagic Species	☒ No Adverse Effect	☐ Adverse Effect

The project will have **no adverse effects** on EFH for groundfish or coastal pelagic species because they do not occur in the areas directly or indirectly affected by the project.

The project will have **adverse effects** on EFH for Pacific salmon (including Chinook, coho, and pink salmon) for the following reasons:

- In-channel construction activities are likely to create locally elevated levels of turbidity during construction, degrading water quality conditions and substrate habitat.
- Any fish present in the action area during the in-water work window may be exposed to disturbance from the installation of sheet pile cofferdams, harassment and possible harm from fish exclusion activities, and increased turbidity when water is reintroduced to the stream channel.
- Temporary in-channel features may create localized increases in stream velocities during construction, potentially affecting migratory habitat.

Attachment B

Biology of Species Addressed in this Analysis

BIOLOGY OF SPECIES ADDRESSED IN THIS ANALYSIS

This appendix details the life history of the species covered in this Downtown Redmond Link Extension Biological Assessment (BA).

Puget Sound Chinook Salmon (*Oncorhynchus tshawytscha*)

The Puget Sound Chinook salmon evolutionarily significant unit (ESU) encompasses all runs of Chinook salmon from the Elwha River in the Strait of Juan de Fuca eastward, including rivers and streams flowing into Hood Canal, Puget Sound, and the Strait of Georgia in Washington. Of an estimated 31 original populations, there are 22 extant geographically distinct populations representing the primary historical spawning areas of Chinook salmon in the ESU (Good et al. 2005). Of the nine extinct populations, eight were spring Chinook salmon. The extinct spring Chinook salmon populations represented a significant portion of the historical life history diversity and spatial structure of the ESU. Their loss has increased the ESU's risk of extinction.

Long-term trends in abundance and median population growth rates for naturally spawning populations of Puget Sound Chinook salmon indicate that approximately half of the populations are declining and the other half are increasing in abundance. Eight of the 22 populations are declining over the short term, and 11 or 12 populations are experiencing long-term declines (Good et al. 2005). Factors contributing to the downward trends are widespread blockages of streams, degraded freshwater and marine habitat, poor forest practices in upper river tributaries, and urbanization and agriculture in lower tributaries and main stem rivers.

Chinook salmon spawning areas are generally characterized by stream gradients of less than 2 percent, velocities between 1.0 and 3.6 feet per second, depths greater than 0.8 feet, and gravel and cobble substrates as large as 4 inches. Chinook salmon favor the head of riffles and side channels for their redd locations (Healey 1991). The eggs are deposited in gravel that has well-oxygenated water percolating through it (Healey 1991). The eggs overwinter and hatch in the gravel to become juveniles with a yolk-sac. Juveniles emerge from the gravel (usually in late winter), begin to forage on their own, and move downstream into estuaries, where they continue to forage before moving into the North Pacific Ocean and reside for 1 to 5 or more years (Healey 1991).

Stream-type Chinook salmon (spring-run Puget Sound Chinook salmon) migrate into nearshore waters and return to natal streams in spring to early summer. They usually spawn greater distances from salt water than the ocean-type stocks. Ocean-type Chinook salmon (commonly called the fall-run) move to their natal streams in late summer and early fall. These individuals usually spawn lower in rivers than the stream-type stocks. Spring-run Puget Sound Chinook salmon spawn in late August through early October, while fall-run Puget Sound Chinook salmon spawn in late September through October (Healey 1991).

Spring-run Chinook salmon return to rivers when they are reproductively immature and typically hold in deep pools with flowing water for summer holding prior to spawning. Suitable holding pools have depths greater than 5 feet; contain cover from undercut banks, overhanging vegetation, boulders, or woody debris (Lindsay et al. 1986); and have water velocities ranging from 0.5 to 1.2 feet per second (Marcotte 1984). In the summer, Chinook salmon juveniles prefer areas with water velocities less than 0.7 feet per second, depths between 0.7 and 2.6 feet, and cover (Hillman et al. 1987).

Adult Chinook salmon enter the Lake Washington system from Puget Sound through the Ballard Locks in July through September (Celedonia et al. 2011). Adult Chinook salmon begin entering the spawning streams in September and continue until November. Spawning occurs from October to December, with peak spawning activity usually in the first few weeks of October (Burton et al. 2009). Fry emerge from

redds between January and early April (Kiyohara and Zimmerman 2009). Juvenile Chinook salmon in the Lake Washington system appear to have two rearing strategies: some rear in their natal streams and emigrate to the lake as pre-smolts in May, June, or July; others emigrate as fry between January and mid-May and rear in the south or north end of Lake Washington or in Lake Sammamish for several months (Celedonia et al. 2011). All Lake Washington Chinook migrate to marine habitats during their first year.

The largest run of naturally produced Chinook salmon in the Lake Washington basin occurs in the Cedar River. Large numbers of adult fish also spawn in Bear Creek. Small numbers of Chinook salmon spawn in several tributaries to Lake Washington and Lake Sammamish. Most hatchery production occurs at the Washington Department of Fish and Wildlife's Issaquah Creek Hatchery.

The size of historical runs of the ESU were estimated at 670,000. During a recent 5-year period, the geometric mean of natural spawners in populations of Puget Sound Chinook salmon ranged from 222 to just over 9,489 fish. The historical estimates of spawner capacity are several orders of magnitude higher than spawner abundances currently observed throughout the ESU (Good et al. 2005). The NMFS Biological Review Team identified the following risks: (1) the concentration of the majority of natural production in just two basins; (2) high levels of hatchery production in many areas of the ESU; and (3) widespread loss of estuary and lower floodplain habitat diversity. Populations in this ESU have not experienced the sharp increases in the late 1990s seen in many other ESUs, though more populations have increased than decreased since the last Biological Review Team assessment (Good et al. 2005).

Habitat requirements for Chinook salmon are listed by NMFS in terms of primary constituent elements (PCEs), which include sites that are essential to supporting one or more life stages of the ESU and which contain physical or biological features essential to the conservation of the ESU.

Specific sites and features designated for Puget Sound Chinook salmon include the following:

1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning incubation and larval development
2) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks
3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival
4) Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between freshwater and saltwater, natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels, and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation
5) Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation, and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels

6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes supporting growth and maturation

Puget Sound Steelhead (*Oncorhynchus mykiss*)

Steelhead are the anadromous form of freshwater resident rainbow or redband *O. mykiss* trout species. The present distribution of steelhead extends from Asia to Alaska, and south to the U.S.-Mexico border (Busby et al. 1996; 67 FR 21586, May 1, 2002). Unlike many salmonid species, *O. mykiss* exhibits extremely complex and plastic life history characteristics, such that their offspring can exhibit different life history forms from the parental generation. For example, offspring of resident fish may migrate to sea, and offspring of anadromous steelhead may remain in streams as resident fish (Burgner et al. 1992).

Those that are anadromous can spend up to 7 years in freshwater prior to smoltification (the physiological and behavioral changes required for the transition to salt water), and then spend up to 3 years in salt water before returning to freshwater to spawn. However, they typically return to their natal stream to spawn as 4- or 5-year-old fish. Unlike Pacific salmon, steelhead trout are iteroparous, meaning they are capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying, and those that do are usually females (Busby et al. 1996).

Over their entire range, West Coast steelhead spawning migrations occur throughout the year, with seasonal peaks of migration activity varying by location. However, even in a given river basin there might be more than one seasonal migration peak, typically referred to as winter, spring, summer, or fall steelhead runs. Although there are generally four migration seasons, steelhead are typically divided into two basic reproductive ecotypes (summer and winter), based on the state of sexual maturity at the time they enter freshwater and the duration of spawning migration (Burgner et al. 1992). The summer or stream-maturing type enters fresh water in a sexually immature condition between May and October, and sexually matures in freshwater over several months. In contrast, the winter or ocean-maturing type enters fresh water in a sexually mature condition between November and April, and spawns shortly thereafter. In basins with ecotypes, the summer run generally spawns farther upstream than winter run fish. However, the winter run of steelhead is the predominant run in Puget Sound.

Depending on water temperature, fertilized steelhead eggs may incubate in redds for 1.5 to 4 months before hatching as alevins. Following yolk sac absorption, young juveniles (fry) emerge from the gravel and begin active feeding. As they grow, steelhead move to deeper parts of the stream and establish territories and diet changes from microscopic aquatic organisms to larger organisms such as isopods, amphipods, and aquatic and terrestrial insects, primarily associated with the stream bottom (Wydoski and Whitney 1979). Riparian vegetation and submerged cover (logs, rocks, and aquatic vegetation) are important for providing cover, food, temperature stability, and protection from predators. As a result, densities of juvenile steelhead are highest in areas containing in-stream cover (Reiser and Bjornn 1979; Johnson and Kucera 1985).

Bull Trout (*Salvelinus confluentus*)

Bull trout are members of the family Salmonidae and are char native to Washington, Oregon, Idaho, Nevada, Montana, and western Canada. Compared to other salmonids, bull trout have more specific habitat requirements that appear to influence their distribution and abundance. They need cold water to survive, so they are seldom found in waters where temperatures exceed 15 to 18 degrees Celsius (°C). They also require stable stream channels, clean spawning and rearing gravel, complex and diverse cover, and unblocked migratory corridors.

Bull trout exhibit a number of life history strategies. Stream-resident bull trout complete their entire life cycle in the tributary streams where they spawn and rear. Migratory bull trout spawn in tributary streams. Juvenile fish from migratory populations usually rear from 1 to 4 years in natal streams before migrating (typically downstream) to either a larger river (fluvial form) or lake (adfluvial form), where they spend their adult life, returning to the tributary stream to spawn (Fraley and Shepard 1989). These migratory forms occur in areas where conditions allow for movement from upper watershed spawning streams to larger waters that contain greater foraging opportunities (Dunham and Rieman 1999). Resident and migratory forms may be found together, and either form can produce resident or migratory offspring (Rieman and McIntyre 1993). An anadromous form of bull trout also exists in the Coastal-Puget Sound population, which spawns in rivers and streams but rears young in the ocean. Unlike strictly anadromous species, such as Pacific salmon, bull trout can also exhibit an amphidromous life form, meaning they return seasonally to fresh water as subadults, sometimes for several years, before returning to spawn (Wilson 1997; Brenkman and Corbett 2005). The amphidromous life history form of bull trout is unique to the Coastal Puget Sound population (64 FR 58921, November 1, 1999).

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that particularly influence their distribution and abundance include water temperature, cover, channel form, spawning and rearing substrate conditions, and migration habitat (Fraley and Shepard 1989; Goetz 1989; Watson and Hillman 1997).

Watson and Hillman (1997) concluded watersheds must have specific physical characteristics to provide the necessary habitat requirements for bull trout spawning and rearing, and that these characteristics are not ubiquitous throughout the watersheds in which bull trout occur. The preferred spawning habitat of bull trout consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Bull trout typically spawn in a narrow time window of a couple weeks during periods of decreasing water temperatures, but spawning ranges from August to November depending on local conditions (Swanberg 1997). However, migratory forms are known to begin spawning migrations as early as April and to move upstream as much as 250 km (155 mi) to spawning areas (Fraley and Shepard 1989; Swanberg 1997).

Fraley and Shepard (1989) reported that the initiation of spawning by bull trout in the Flathead River system appeared to be related to water temperature, with spawning generally initiated when water temperatures dropped below 50°F). Goetz (1989) reported a spawning temperature range from 39°F to 50°F, but the range could be wider in some areas (Howell et al. 2010). Selection of spawning habitat by bull trout is also influenced across multiple spatial scales by hyporheic flow (Baxter and Hauer 2000), defined as a mixing of shallow groundwater and surface water beneath and lateral to a stream bed. Hyporheic flow is influenced by geomorphic complexity of the streambed and recognized to be important for surface water/groundwater interaction. Spawning areas are often associated with cold-water springs, glacial and snow melt, or groundwater upwelling (Rieman et al. 1997; Baxter et al. 1999). Fraley and Shepard (1989) also found groundwater influence and proximity to cover are important factors influencing spawning site selection. They reported the combination of relatively specific requirements resulted in a restricted spawning distribution in relation to available stream habitat. While bull trout are critically dependent on large, cold-water habitats, individuals can range widely through stream networks and use habitat that may have limited amounts of cold-water refuge (64 FR 58921, November 1, 1999).

Depending on water temperature, egg incubation is normally 100 to 145 days (Pratt 1992). Water temperatures of 34°F to 42°F have been reported for incubation, with an optimum (best embryo survivorship) temperature reported to be from 36°F to 39°F (Fraley and Shepard 1989; McPhail and Baxter 1996). Juveniles remain in the substrate after hatching. The time from egg deposition to

emergence of fry can exceed 200 days. During the relatively long incubation period in the gravel, bull trout eggs and embryos are especially vulnerable to fine sediments (i.e., fine silt to coarse sand) and water quality degradation (Fraley and Shepard 1989). Increases in fine sediment appear to reduce egg survival and emergence (Pratt 1992) by restricting intragravel circulation and/or causing entombment of newly hatched alevins (young salmon that have the yolk sac still attached). Juveniles are likely also affected by reduced interstitial habitat and cover. High juvenile densities have been reported in areas characterized by a diverse cobble substrate and a low percentage of fine sediments (Shepard et al. 1984).

Habitat requirements for bull trout are listed by USFWS in terms of functions and PCEs. Bull trout require the following habitat functions:

1) Spawning, rearing, foraging, or over-wintering habitat to support essential existing local populations
2) Movement corridors necessary for maintaining essential migratory life history forms
3) Suitable habitat that is considered essential for recovering existing local populations that have declined or that need to be re-established to achieve recovery

These functions are provided by areas containing these PCEs:

1) Water temperatures ranging from 36°F to 59°F, with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade such as that provided by riparian habitat, and local groundwater influence.
2) Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and in-stream structures.
3) Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.25 inch (0.63 centimeter) in diameter and minimal substrate embeddedness are characteristic of these conditions.
4) A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation.
5) Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity.
6) Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.
7) An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
8) Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.
9) Few or no nonnative predatory species (e.g., lake trout, walleye, northern pike, smallmouth bass); inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.

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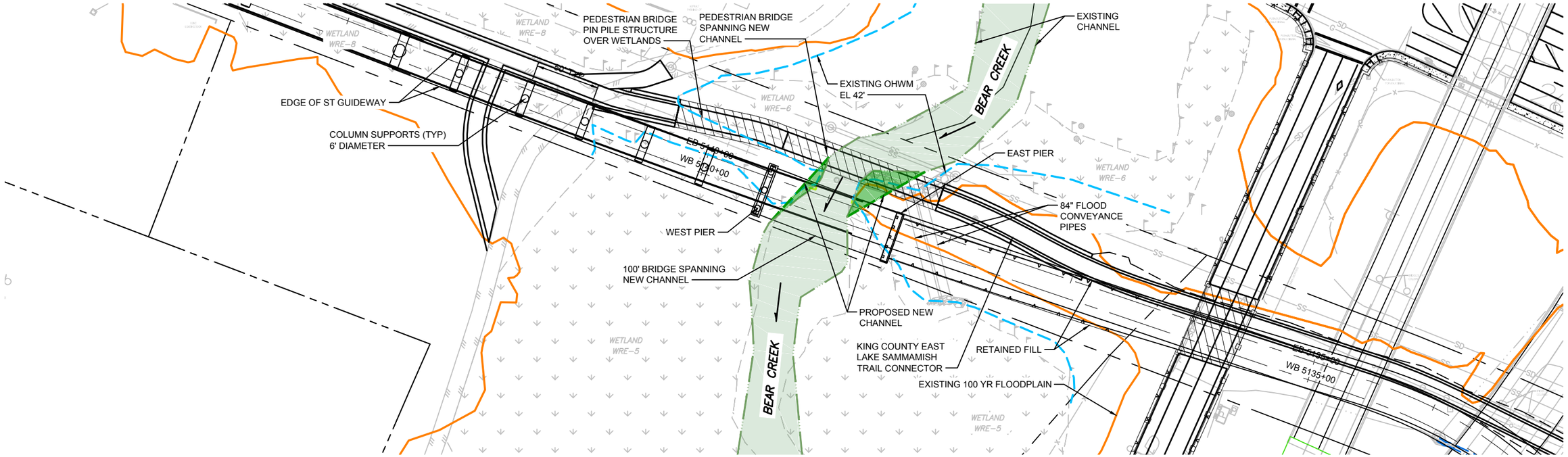
Attachment C

Plan and Profiles of Guideway and Pedestrian Bridge Crossings at Bear Creek



LEGEND:

- EXISTING BEAR CREEK CHANNEL BANKS
- EXISTING BEAR CREEK CHANNEL
- PROPOSED BEAR CREEK CHANNEL BANKS
- PROPOSED BEAR CREEK CHANNEL WIDENING
- 100 YEAR FLOODPLAIN
- EXISTING OHWM
- BEAR CREEK FLOW ARROW

No.	DATE	DSN	CHK	APP	REVISION

DESIGNED BY: X. XXXXXX
DRAWN BY: X. XXXXXX
CHECKED BY: X. XXXXXX
APPROVED BY: X. XXXXXX

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

SUBMITTED BY: | DATE: | REVIEWED BY: | DATE:

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SOUNDTRANSIT

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FILENAME: RLE-BEARCREEK-BA
CONTRACT No.:
DATE: 11/27/17

DOWNTOWN REDMOND LINK EXTENSION
RTC TO DOWNTOWN REDMOND

BEAR CREEK

DRAWING No.: CAP-2
LOCATION ID:
SHEET No.: #### REV:

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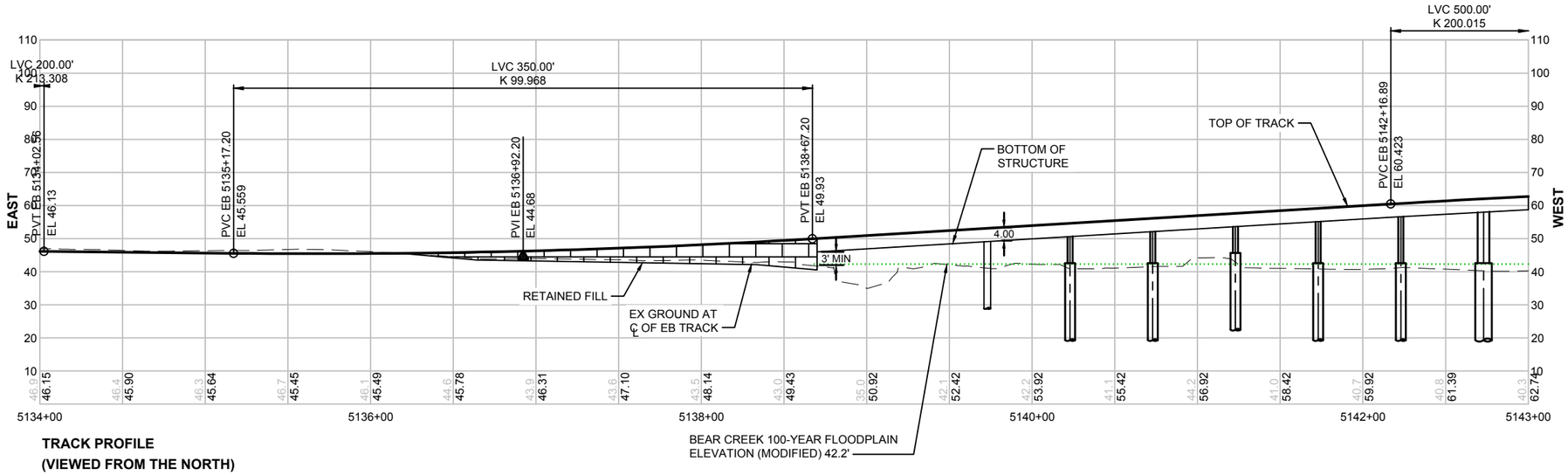
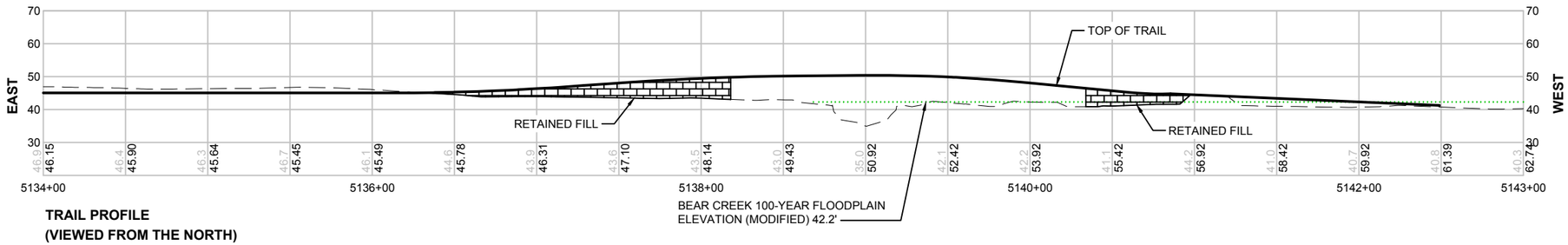


TRACK PROFILE
(VIEWED FROM THE NORTH)



TRAIL PROFILE
(VIEWED FROM THE NORTH)

No.	DATE	DSN	CHK	APP	REVISION

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DRAWN BY: X. XXXXXX
CHECKED BY: X. XXXXXX
APPROVED BY: X. XXXXXX

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

SUBMITTED BY: | DATE: | REVIEWED BY: | DATE:

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SOUNDTRANSIT

SCALE: H: 1"=40' V: 1"=20'
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CONTRACT No.:
DATE: 11/27/17

DOWNTOWN REDMOND LINK EXTENSION
RTC TO DOWNTOWN REDMOND

BEAR CREEK

DRAWING No.: CAP-3
LOCATION ID:
SHEET No.: #### REV:

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Attachment D

Best Management Practices and Minimization Measures from the 2010 East Link BA

Chapter 2

Best Management Practices and Minimization Measures

To avoid and/or minimize potential impacts from construction and operation of the East Link Project, the following conservation measures will be implemented.

2.1 Water Quality Protection During Construction

- A temporary erosion and sediment control (TESC) plan will be developed and implemented for all projects requiring clearing, vegetation removal, grading, ditching, filling, embankment compaction, demolition, and/or excavation. BMPs defined in the TESC plan will be used to control sediments from all vegetation removal or ground-disturbing activities.
- A spill prevention control and countermeasures (SPCC) plan will be developed prior to beginning construction. The SPCC plan will identify the appropriate spill containment measures to be employed during construction.
- The contractor will adhere to water quality standards as stated in the 401 Water Quality Certificate and NPDES permit issued for the project.
- Erosion control devices (e.g., silt fences) will be installed, as needed, to protect surface waters and other critical areas.
- Erosion control blankets or an equally effective BMP will be installed on steep slopes that are susceptible to erosion and where ground-disturbing activities have occurred. This will prevent erosion and assist with establishment of native vegetation.
- Material that may be temporarily stored for use in project activities will be covered with plastic or other impervious material during rain events to prevent sediments from being washed from the storage area to surface waters.
- All temporary and permanent erosion and sedimentation control measures will be inspected on a regular basis, maintained, and repaired to ensure continued performance of their intended function.
- Silt fences will be inspected after each rainfall, and at least daily during prolonged rainfall.
- Turbid water will be prevented from discharging to streams and wetlands. Turbid wastewater may be routed to temporary or permanent detention facilities, or to upland areas that provide adequate infiltration.
- All equipment to be used for construction activities will be cleaned and inspected prior to arriving at the project site to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly. Should a leak be detected on heavy equipment used for the project, the equipment will be repaired before use.
- Construction equipment and vehicles will be maintained to prevent them from leaking fuel or lubricants.
- Uncured concrete and/or concrete byproducts will be prevented from coming in contact with streams or water conveyed directly to streams during construction in accordance with (WAC 220-110-270(3).
- A concrete truck chute cleanout area or equally effective BMP shall be established to properly contain wet concrete.

2.2 General Best Management Practices for Construction Near All Sensitive Areas

- Sound Transit will ensure compliance with all local, state, and federal permits received for the project.

- Revegetation of construction easements and other areas will occur either during or immediately after the project is completed. All disturbed riparian vegetation will be replanted. Trees will be planted when consistent with light rail safety standards. Riparian areas will be replanted with native species.
- The project will delineate the construction limits for vegetated and habitat areas to prevent unintended effects to riparian vegetation, wetlands, woodlands, and other sensitive sites outside of the construction limits. The construction limits will be clearly marked with high-visibility construction fencing prior to any ground-disturbing or construction-related activities, and no work in these sensitive areas will occur.
- Heavy equipment will operate from above the OHWM wherever possible.
- Soil or rock stockpiles, excavated materials, and excess soil materials will be prevented from eroding into sensitive habitats, including water channels, wetlands, and riparian areas outside of the construction limits by high water or storm runoff.
- During construction, there may be a need for nighttime work over water. If there is, and if it occurs during a period when listed species may be present, BMPs such as shielding will be used to minimize light spillage.

2.3 Specific Conservation Measures for Work in Lake Washington (Segment A)

(Not Applicable to Downtown Redmond Link Extension)

- For the east channel, in-water v ... work windows, which are currently between July 16 and ... 1, to avoid potential impacts on salmonids. In-water work west ... n the regulatory work window, which is currently from July 16 to December 31.
- Barges and other in-water equipment will have spill response equipment available in the event of an accidental spill during in-water work.
- BMPs will be employed to ensure that no construction debris is allowed to enter the water.

2.4 Specific Conservation Measures for Work Adjacent to Mercer Slough

(Not Applicable to Downtown Redmond Link Extension)

- For the culvert extension, drain ... area and back into the channel downstream in a manner that ... ed.
- Armoring will be placed at and ... fall to prevent erosion.
- The retaining wall on both sides of the shoreline alcove will be constructed in the dry, using erosion control measures to keep disturbed soil from entering into the channel.

2.5 Specific Conservation Measures for Work Over Bear Creek and the Sammamish River (Segment E)

- Over-water work will comply with the provisions of the Hydraulic Project Approval.
- ~~Support columns will be placed outside the OHWM.~~
- ~~No in-water work is anticipated to be necessary to complete this section of guideway~~.
- BMPs will be employed to ensure that no construction debris is allowed to enter the water.
- Native riparian trees or shrubs will be replanted after construction. Monitoring and adaptive management of revegetated areas will ensure survival of revegetated areas.

2.6 Mitigation for Wetland, Wetland Buffer, and Stream Impacts

- Sound Transit is coordinating with resource agencies on identifying compensatory mitigation sites for wetland and wetland buffer impacts. These sites will not include in-water work where listed species are present.
- A monitoring plan and adaptive management plan will be implemented for revegetated sensitive areas or buffers. The plans will verify 100 percent survival of all installed native trees and shrubs 1 year after installation. The performance criteria will be met if all dead plants are replaced at the end of the first year. Native woody species (planted and volunteer) will maintain a density of four plants per 100 square feet in each plant community by the end of the 3-year period. Plant communities will be identified in the mitigation plan.
- Mitigation for impacts on the Unnamed Tributary to Kelsey Creek will be approved by the appropriate permitting agencies and jurisdictions prior to construction.

2.7 Design and Operation Best Management Practices

- Permanent stormwater runoff treatment and flow control facilities will be installed to meet the requirements of the Stormwater Management Manual for Western Washington (Ecology 2005).
- Stormwater conveyance and management facilities that promote infiltration will be incorporated where applicable and permittable.
- Runoff treatment BMPs that are best suited to the site conditions and best capable of achieving the required levels of treatment will be selected, designed, and installed. These may include natural or engineered dispersion BMPs; biofiltration BMPs such as vegetated filter strips, rain gardens, biofiltration swales, or media filters; wet-pool BMPs; and infiltration BMPs.
- Existing drainage configurations will not be rerouted to the extent that stormwater from one basin or subbasins is conveyed and discharged to another unless no other practical option is available.
- Operations will not cause impacts from overwater lighting, because the tracks will have no overhead lighting and the train headlights will point parallel to the tracks.

Examples of design measures on light rail vehicles to prevent pollution resulting from mechanical lubricants include the following:

- Sealed housing roller bearings for all axle bearings
- Enclosed and sealed motor bearings
- Enclosed truck bearings designed to exclude dirt
- Sealed door mechanisms
- Enclosed, sealed electrical conduits
- On-board batteries contained within sealed enclosures
- Air conditioners with refrigerant enclosed in sealed system and motors with sealed bearings

2.8 Weed Control

- If herbicide use is required during the monitoring period, the type and application of the pesticide should be chosen based upon City of Seattle Tier Tables (http://www.seattle.gov/environment/Pesticides.htm) or other locally accepted methodology. Additionally, Sound Transit's integrated Pest Management Plan (IPM) will provide guidance regarding pesticide use and IPM practices.

Attachment E

Species Lists

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
Phone: (360) 753-9440 Fax: (360) 753-9405
http://www.fws.gov/wafwo/

In Reply Refer To: October 20, 2017
Consultation Code: 01EWFW00-2017-SLI-1169
Event Code: 01EWFW00-2018-E-00162
Project Name: Downtown Redmond Link Extension

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated and proposed critical habitat, and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. The species list is currently compiled at the county level. Additional information is available from the Washington Department of Fish and Wildlife, Priority Habitats and Species website: http://wdfw.wa.gov/mapping/phs/ or at our office website: http://www.fws.gov/wafwo/species_new.html. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether or not the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species, and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). You may visit our website at http://www.fws.gov/pacific/eagle/for information on disturbance or take of the species and information on how to get a permit and what current guidelines and regulations are. Some projects affecting these species may require development of an eagle conservation plan: (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Also be aware that all marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas. The importation of marine mammals and marine mammal products into the U.S. is also prohibited. More information can be found on the MMPA website: http://www.nmfs.noaa.gov/pr/laws/mmpa/.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Related website:
National Marine Fisheries Service:
http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
(360) 753-9440

Project Summary

Consultation Code: 01EWFW00-2017-SLI-1169

Event Code: 01EWFW00-2018-E-00162

Project Name: Downtown Redmond Link Extension

Project Type: TRANSPORTATION

Project Description: Extension of light rail facilities and service into Downtown Redmond, Washington.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/47.65989359197506N122.13481446656812W

Counties: King, WA

Endangered Species Act Species

There is a total of 5 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Streaked Horned Lark *Eremophila alpestris strigata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7268	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus*	Threatened

Population: U.S.A., conterminous, lower 48 states
There is **final** critical habitat for this species. Your location is outside the critical habitat.

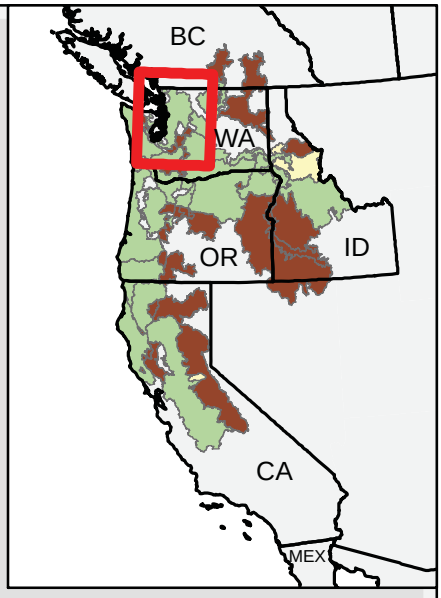
Species profile: https://ecos.fws.gov/ecp/species/8212

Critical habitats

There are no critical habitats within your project area under this office's jurisdiction.

Puget Sound Chinook Salmon Evolutionarily Significant Unit

Current as of January 2015



Nooksack River
North Fork Nooksack River
Bellingham
Skagit River
North Fork Stillaguamish River
South Fork Stillaguamish River
Port Angeles
Glines Canyon Dam
Dungeness River
Elwha River
Everett
Sultan River
Snohomish R.
North Fork Skykomish River
Skykomish River
Dosewallips River
Seattle
Cushman Dam
SF Skokomish R.
North Bend
Green River
Howard Hanson Dam
Tacoma
Puyallup River
Olympia
Nisqually River
La Grande Dam

County Boundary

Class

ESU Boundary

Historical Watershed: Anthropogenically Blocked

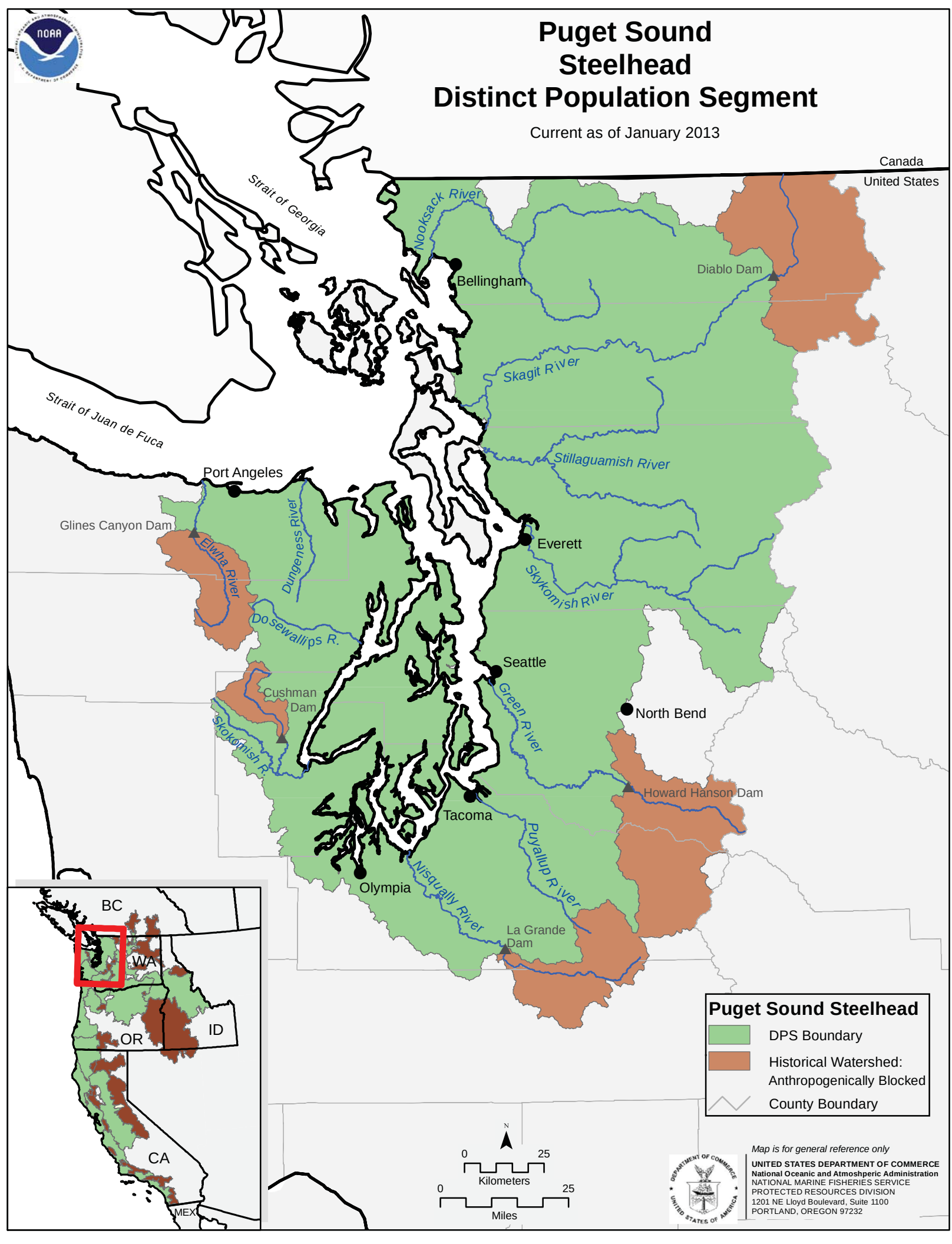
N

0 22.5 Kilometers

0 22.5 Miles

Map is for general reference only

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmoshperic Administration
NATIONAL MARINE FISHERIES SERVICE
PROTECTED RESOURCES DIVISION
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232


Puget Sound
Steelhead
Distinct Population Segment
Current as of January 2013
Canada
United States
Strait of Georgia
Strait of Juan de Fuca
Nooksack River
Bellingham
Diablo Dam
Skagit River
Stillaguamish River
Port Angeles
Glines Canyon Dam
Elwha River
Dungeness River
Everett
Skykomish River
Dosewallips R.
Seattle
Cushman Dam
Skokomish R.
Green River
North Bend
Howard Hanson Dam
Tacoma
Puyallup River
Olympia
Nisqually River
La Grande Dam
BC
WA
OR
ID
CA
MEX
Puget Sound Steelhead
DPS Boundary
Historical Watershed: Anthropogenically Blocked
County Boundary
N
0
25
Kilometers
0
25
Miles
Map is for general reference only
UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmoshperic Administration
NATIONAL MARINE FISHERIES SERVICE
PROTECTED RESOURCES DIVISION
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232

Updated Species Lists – June 2018

In June 2018, project biologists reviewed the USFWS and NMFS websites to determine whether new species have been listed or critical habitats have been designated that were not addressed in the BA submitted for consultation. An updated version of the list obtained from the USFWS Information for Planning and Consultation system has been added to this appendix; the species and critical habitats in the updated list do not differ from those in the original list obtained from USFWS. NMFS has no formal process for determining the currency of species lists; the listing information at their website in June 2018 was unchanged from what was included in the BA.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
Phone: (360) 753-9440 Fax: (360) 753-9405
http://www.fws.gov/wafwo/

In Reply Refer To:
Consultation Code: 01EWFW00-2017-SLI-1169
Event Code: 01EWFW00-2018-E-02335
Project Name: Downtown Redmond Link Extension

June 14, 2018

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated and proposed critical habitat, and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. The species list is currently compiled at the county level. Additional information is available from the Washington Department of Fish and Wildlife, Priority Habitats and Species website: http://wdfw.wa.gov/mapping/phs/ or at our office website: http://www.fws.gov/wafwo/species_new.html. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

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http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). You may visit our website at http://www.fws.gov/pacific/eagle/for information on disturbance or take of the species and information on how to get a permit and what current guidelines and regulations are. Some projects affecting these species may require development of an eagle conservation plan: (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Also be aware that all marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas. The importation of marine mammals and marine mammal products into the U.S. is also prohibited. More information can be found on the MMPA website: http://www.nmfs.noaa.gov/pr/laws/mmpa/.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Related website:
National Marine Fisheries Service: http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
(360) 753-9440

Project Summary

Consultation Code: 01EWFW00-2017-SLI-1169

Event Code: 01EWFW00-2018-E-02335

Project Name: Downtown Redmond Link Extension

Project Type: TRANSPORTATION

Project Description: Extension of light rail facilities and service into Downtown Redmond, Washington.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/47.65989359197506N122.13481446656812W

Counties: King, WA

Endangered Species Act Species

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Streaked Horned Lark *Eremophila alpestris strigata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7268	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus*	Threatened

Population: U.S.A., conterminous, lower 48 states

There is **final** critical habitat for this species. Your location is outside the critical habitat.

Species profile: https://ecos.fws.gov/ecp/species/8212

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Attachment F

HI-RUN Model Output

HI-RUN Pollutant Loading Subroutine Modeling Input and Results for the Downtown Redmond Link Extension

TDA 1

Input Summary

Run Date/Time: 10/27/17 15:03
Outfall ID: Downtown Redmond Link Extension
Rain Gauge: Puget East 40
Description:

Discharge Areas

Subbasin 1 - Baseline Conditions - 1.06 acres
basic treatment - 0% infiltration - 0.41 acres
no treatment - 0% infiltration - 0.65 acres

Subbasin 1 - Proposed Conditions - 1.03 acres
basic treatment - 0% infiltration - 0.38 acres
no treatment - 0% infiltration - 0.65 acres

Load Analysis

	TSS Load (lb/yr)		Dissolved Copper Load (lb/yr)		Dissolved Zinc Load (lb/yr)	
	Baseline	**Proposed**	**Baseline**	**Proposed**	**Baseline**	**Proposed**
Max	30823	53751	0.615	0.67	12.4	13
75th Percentile	645	646	0.044	0.043	0.317	0.31
Median	332	331	0.029	0.028	0.193	0.19
25th Percentile	176	174	0.019	0.019	0.121	0.12
Min	6	4.3	0.002	0.003	0.011	0.012
P (exceed)		**0.499**		**0.488**		**0.488**

TDA 2

Input Summary

Run Date/Time: 10/27/17 15:05
Outfall ID: Downtown Redmond Link Extension
Rain Gauge: Puget East 40
Description:

Discharge Areas

Subbasin 1 - Baseline Conditions - 0.18 acres
basic treatment - 0% infiltration - 0.18 acres

Subbasin 1 - Proposed Conditions - 0.18 acres
basic treatment - 0% infiltration - 0.18 acres

Load Analysis

	TSS Load (lb/yr)		Dissolved Copper Load (lb/yr)		Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
Max	1834	1523	0.069	0.055	0.373	0.36
75th Percentile	17.3	17	0.006	0.006	0.033	0.033
Median	7.54	7.6	0.004	0.004	0.021	0.021
25th Percentile	3.29	3.3	0.003	0.003	0.013	0.013
Min	0.045	0.029	0	0	0.001	0.001
P (exceed)		**0.501**		**0.498**		**0.499**

TDA 3

Input Summary

Run Date/Time: 10/27/17 15:07
Outfall ID: Downtown Redmond Link Extension
Rain Gauge: Puget East 40
Description:

Discharge Areas

Subbasin 1 - Baseline Conditions - 1.84 acres
basic treatment - 0% infiltration - 1.73 acres
no treatment - 0% infiltration - 0.11 acres

Subbasin 1 - Proposed Conditions - 1.69 acres
basic treatment - 0% infiltration - 1.69 acres

Load Analysis

	TSS Load (lb/yr)		Dissolved Copper Load (lb/yr)		Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
Max	11146	15377	0.607	0.79	3.14	3.4
75th Percentile	283	162	0.064	0.058	0.356	0.31
Median	155	70	0.043	0.038	0.236	0.2
25th Percentile	85.3	31	0.029	0.024	0.156	0.12
Min	4.54	0.42	0.003	0.002	0.019	0.009
P (exceed)		**0.3**		**0.439**		**0.419**

TDA 4

All runoff from PGIS will infiltrate; the model was not run for this TDA.

TDA 5

Input Summary

Run Date/Time: 10/27/17 15:10
Outfall ID: Downtown Redmond Link Extension
Rain Gauge: Puget East 40
Description:

Discharge Areas

Subbasin 1 - Baseline Conditions - 8.33 acres
infiltration bmp - 100% infiltration - 8.32 acres
no treatment - 0% infiltration - 0.01 acres

Subbasin 1 - Proposed Conditions - 8.18001 acres
infiltration bmp - 100% infiltration - 8.18 acres
no treatment - 0% infiltration - 0.00001 acres

Load Analysis

	TSS Load (lb/yr)		Dissolved Copper Load (lb/yr)		Dissolved Zinc Load (lb/yr)	
	Baseline	**Proposed**	**Baseline**	**Proposed**	**Baseline**	**Proposed**
Max	516	0.44	0.013	0	0.12	0
75th Percentile	9.28	0.008	0	0	0.004	0
Median	4.56	0.004	0	0	0.002	0
25th Percentile	2.22	0.002	0	0	0.001	0
Min	0.031	0	0	0	0	0
P (exceed)		**0**		**0**		**0**

TDA 6

Input Summary

Run Date/Time: 10/27/17 15:11
Outfall ID: Downtown Redmond Link Extension
Rain Gauge: Puget East 40
Description:

Discharge Areas

Subbasin 1 - Baseline Conditions - 4.94 acres
basic treatment - 80% infiltration - 4.08 acres
infiltration bmp - 100% infiltration - 0.86 acres

Subbasin 1 - Proposed Conditions - 5.12 acres
basic treatment - 80% infiltration - 3.63 acres
infiltration bmp - 100% infiltration - 1.49 acres

Load Analysis

	TSS Load (lb/yr)		Dissolved Copper Load (lb/yr)		Dissolved Zinc Load (lb/yr)	
	Baseline	Proposed	Baseline	Proposed	Baseline	Proposed
Max	1671	1705	0.065	0.064	0.497	0.33
75th Percentile	15.7	14	0.006	0.005	0.03	0.027
Median	6.66	5.9	0.004	0.003	0.018	0.017
25th Percentile	2.8	2.5	0.002	0.002	0.011	0.01
Min	0.001	0.003	0	0	0	0
P (exceed)		**0.475**		**0.454**		**0.458**

TDA 7

P(exceed) = 0 for dissolved copper and 0 for dissolved zinc because all existing PGIS (0.39 acre) will be removed, and no new PGIS will be created.