Written Comment on City of Renton draft SMP Update

Submitted by Tom Schadt

This written comment on the City of Renton's draft SMP addresses concerns about the proposed prohibition on dredging in Lake Washington as it pertains to the creek deltas – and in particular the May Creek delta. The current draft of the SMP recommends prohibiting all dredging along the lake's "sensitive nearshore areas" with some minor exceptions. These exceptions are not site-specific and as a result, if implemented as proposed – the dredging prohibition would result in shoaling in front of Mr. Cugini's boathouse on the south side of the May Creek delta such that the boat house and new joint-use dock would be unusable. This type of broad-brush approach to protecting ecosystem function does not allow for site-specific variations in ecosystem perturbations, and completely over-writes a well-established federal, state, and local permitting mechanism that at least provides the opportunity to perform certain in-water actions such as dredging providing they are consistent with applicable laws, regulations, and permit guidelines.

The proposed prohibition in the case of the May Creek delta is un-warranted for a number of reasons:

- The future dredging footprint needed to maintain access to Mr. Cugini's boathouse is less than 5 % of what was historically dredged at the mouth of May Creek when Barbee Mill was in operation. So if the purpose of the prohibition is to restore function that was lost due to past dredging, at least 95 % of the May Creek delta function will be restored. However, we believe this function is at best very marginal due to the urbanized and highly altered state of the May Creek watershed, as explained below.
- May Creek experiences unusually high sediment loads due to the extensive development that has occurred in the watershed. Studies of urbanized watersheds have demonstrated a correlation between increased peak flows due to more impervious surface and increases in sediment loading to the system associated with those peak flows. An urbanized watershed such as May Creek will typically have peak flows that are 15 to 20 % higher than non-urbanized areas, and these higher flows can result in ten-fold increase in sediment loading.
- The result of the higher sediment loading in an unnatural system is an unstable delta environment that experiences conditions that are both more silty and more chemically degraded than normal due to fine sediment particles and contaminants associated with stormwater runoff of impervious surfaces. This type of unstable delta environment is typically predominantly a muddy silty substrate that does not support a healthy benthic community, and is not the type of substrate conditions (sandy gravel) used by juvenile salmonids for rearing or refuge in delta environments.
- The marginal habitat conditions in the May Creek delta and the lack of use by juvenile salmonids is supported by fish distribution studies in Lake Washington and site specific studies of the May Creek delta. Research done in 2004 on juvenile Chinook distribution in Lake Washington found that at May Creek, the density of juvenile Chinook was similar between their lakeshore

"reference" site (no creek delta present) and the May Creek delta (Tabor et al 2004). So although deltas can provide important nursery area habitat unique to the overall lake shoreline environment which should typically experience a higher usage by juvenile salmonids, use of the May Creek delta was not any more than those reference shoreline areas that did not have delta habitat. Only two Chinook salmon were ever observed in the study reach (stream west of Lake Washington Boulevard to stream mouth), near pools. This lack of fish use is likely reflective of the degraded habitat conditions. Tabor et al. (2004) suggests that small and medium-sized tributary deltas are preferred (May Creek is considered a large tributary). Tabor gives the example that the density of Chinook salmon was over 10 times higher at the Kennydale Beach delta (a small tributary) than at the May Creek delta.

- In 2007, a site specific Biological Assessment was completed as part of a permit application for maintenance dredging in front of Mr. Cugini's boathouse (Meridian, 2007) (Attached as Exhibit 17 to Cugini Family Public Hearing Submittal). That study included snorkeling observations along transects in the creek delta and along the proposed dredge area in front of Mr. Cugini's boathouse. Those observations confirmed the predominance of muddy silty substrate in front of the boathouse, the lack of a sandy gravel substrate which is the preferred shallow water habitat condition within nearshore creek deltas, and relatively few observations of juvenile salmonids. Those limited observations of salmonids (juvenile coho salmon) were associated with a sandy gravel substrate in an area of the delta that is not part of the proposed dredge area.
- In conclusion, the May Creek delta is not a unique highly functioning sensitive nearshore delta habitat within Lake Washington. Rather, it is highly degraded and is not providing significant ecosystem function that is heavily used by juvenile salmonids. If the purpose of the dredging prohibition is to protect valuable nearshore ecosystem function, conducting a small periodic (every few years or significantly less if an upstream sedimentation basin is constructed) dredging operation within a small peripheral area of the May Creek delta will not affect valuable nearshore ecosystem function. Especially given the fact that Mr. Cugini, the boathouse owner, is willing to implement a number of improvements to the boathouse structure that will benefit the nearshore environment off-setting any impacts of the minor dredging area of unstable degraded habitat.

<u>References</u>

Tabor, R.A., J.A. Scheurer, H.A. Gearns, and E.P. Bixler. 2004. Nearshore habitat use by juvenile Chinook salmon in lentic systems of the Lake Washington basin, annual report 2002. Prepared by the U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, Fisheries Division. Prepared for Seattle Public Utilities.

Meridian. 2007. Barbee Boathouse Renovation and Maintenance Dredging Project Biological Assessment. Submitted to U.S. Army Corps of Engineers, July, 2007.

Qualifications Summary for Author

Mr. Schadt has a B.S. and M.S. in Fisheries from the University of Washington. He is a principal at the consulting firm Anchor QEA, has over 30 years of experience in fisheries and environmental consulting in the northwest, and has conducted numerous fisheries investigations in nearshore habitats throughout western Washington. His firm has completed a number of projects in Lake Washington, including an inventory of Seattle Parks and Recreation's (Parks) shoreline properties to identify opportunities for salmonid habitat restoration and conservation, design and construction of habitat restoration projects on the Lake Washington shoreline, characterization of sediment quality and habitat conditions, and completing dredge permit applications for sites within Lake Washington. As a result of these types of projects, Mr. Schadt has a thorough understanding of ecosystem function and habitat conditions that provide that function within the Lake Washington nearshore environment.

Barbee Boat House Renovation and Maintenance Dredging Project

Biological Assessment

Action Agency: U.S. Army Corps of Engineers

Prepared by

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Seattle, Washington

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ACRONYMS AND ABBREVIATIONS

USACE	U.S. Army Corps of Engineers
AR	at risk
BA	biological assessment
BRT	Biological Review Team
dbh	diameter at breast height
DPS	distinct population segment
EFH	essential fish habitat
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FA	functioning appropriately
FMO	foraging, migrating and overwintering
GMA	Growth Management Act
MSA	Magnuson-Stevens Act
NMFS	National Marine Fisheries Service
NPF	not properly functioning
NR	not to reduce or retard
NTU	nephelometric turbidity unit
PCEs	primary constituent elements
PFC	properly functioning condition
PFMC	Pacific Fisheries Management Council
SPCCP	spill prevention control and countermeasure plan
SR	State Route
T&E	threatened and endangered
TRT	Puget Sound Technical Recovery Team
TSS	Total Suspended Solids
UGB	urban growth boundary
UR	unacceptable risk
USFWS	U.S. Fish and Wildlife Service
WDF	Washington Department of Fisheries
WDFW	Washington Department of Fish and Wildlife
WDG	Washington Department of Game

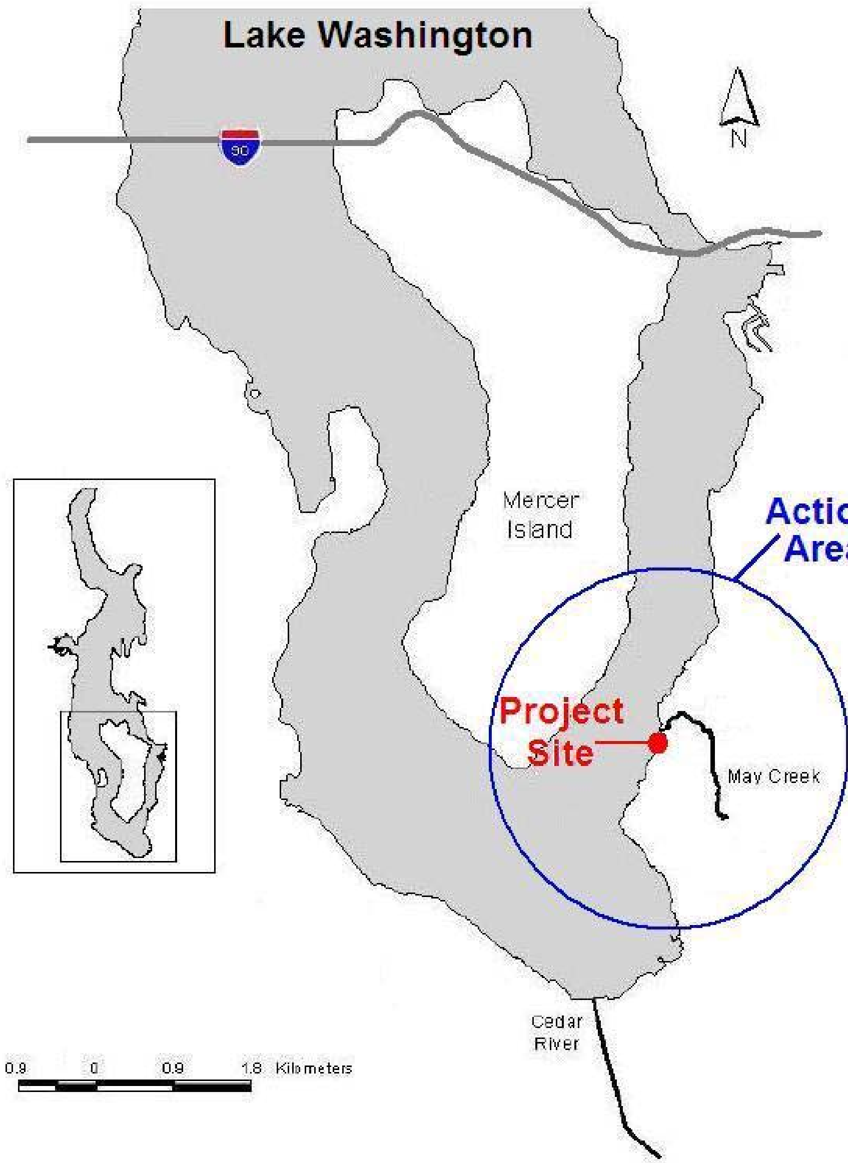
I. INTRODUCTION

This Biological Assessment (BA) was prepared for the Barbee Boat House Renovation and Maintenance Dredging Project proposed to be conducted on the southeastern shore of Lake Washington in the City of Renton[1] (Figure 1; and Appendix A - sheet 1). The purpose of the proposed project is to renovate the existing boat house to meet Washington Department of Fish and Wildlife (WDFW) and National Marine Fisheries Service (NMFS) recommendations to reduce impacts on aquatic habitat and to obtain a programmatic permit authorizing dredging for the next ten years, as needed to maintain navigational access to the boat house. While periodic maintenance dredging to remove accumulated sediments has occurred in the May Creek delta and general boat house vicinity for over 50 years, the proposed dredging action addressed in this BA is focused on the boathouse zone shown in Appendix A. Based on experience over the past 50 years, dredging would be necessary every 3 to 5 years to maintain navigational depths.

Section 7 of the Endangered Species Act (ESA) of 1973 (as amended) directs federal departments and agencies to ensure that actions authorized, funded, and/or conducted by them are not likely to jeopardize the continued existence of any federally proposed or listed species, or result in destruction or adverse modification of critical habitat for such species. Section 7(c) of the ESA requires that federal agencies contact USFWS and NMFS (NMFS and USFWS are subsequently referred to as the Services) before beginning any construction activity to determine if federally listed threatened and endangered (T&E) species or designated critical habitat may be present in the vicinity of a proposed project. A BA must be prepared if such species or habitat are present. With respect to the proposed action, federal permits from the U.S. Army Corps of Engineers (USACE) will be needed to complete the project. The Services have determined that T&E species, including the bald eagle, Puget Sound Chinook salmon, Puget Sound steelhead, and Coastal/Puget Sound bull trout may be present in the proposed project action area; therefore, this BA is required by the ESA to ensure that the boat house renovation and dredging project will not jeopardize the continued existence or recovery of these listed species.

This document also contains an Essential Fish Habitat (EFH) assessment in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, et seq.) and implementing regulations at 50 CFR 600. The MSA includes a mandate that NMFS identify EFH for federally managed marine fish. In addition, federal agencies must consult with NMFS on all activities, or proposed activities, authorized, funded or undertaken by the agency that may adversely affect EFH. The Pacific Fisheries Management Council (PFMC) has designated EFH for the Pacific salmon fishery, federally managed ground fish and coastal pelagic fisheries. The ESA consultation process can be used to address EFH (NMFS 2001). This BA addresses EFH for Chinook and coho salmon, which are the only MSA managed species that may be present in the project area. The objective of this BA is to review all pertinent and available information on the potential effects of the proposed project on MSA managed species, EFH, ESA listed T&E species, and associated critical habitats under NMFS and USFWS jurisdiction.

[1] Township 24 North, Range 5 East, Section 32, WM



Note: Adapted from Tabor et al. 2004

Figure 1. Barbee boat house project site and action area.

A. Project and Federal Action History

The proposed project would renovate the existing boat house to meet WDFW and NMFS recommendations to reduce impacts on aquatic habitat and conduct dredging to maintain navigational depths at the boat house. Dredging of the May Creek delta and boat house area has occurred for over 50 years on a 3 to 4 year cycle depending on the volume of sediment accumulation. Note that dredging of the May Creek delta is not proposed, but is discussed here to give context to previous dredging actions which have occurred within the boat house vicinity. The most recent dredging occurred in 2002. Approximately 3,000 to 4,000 cubic yards of sediment have been removed during each dredging cycle.

The dredged material was previously stockpiled on upland areas of the Barbee Mill property and sold as clean construction fill material. Previous consultations with the USACE were completed for May Creek delta dredging and for bark debris removal in Lake Washington adjacent to the mill. Bark removal work was voluntarily undertaken to restore aquatic habitat under lease agreements with the Washington Department of Natural Resources. Most recent consultations for these projects at the Barbee Mill (summarized in Table 1) resulted in a "not likely to adversely affect" determination for listed Chinook salmon and bull trout.

Table 1. Summary of recent ESA dredging consultations.

Year	USACE Project Reference #	Action	Consultation	Implementation Date
2001	195-2-0097	May Creek delta dredging	"May affect, not likely to adversely affect" for all species	2001
2002	1995-2-00997	Lake Washington bark removal	"May affect, not likely to adversely affect" for all species	2002

II. DESCRIPTION OF THE PROPOSED PROJECT AND ACTION AREA

A. Federal Action and Legal Authority

It is anticipated that the USACE will be the lead federal agency for this ESA consultation, as USACE permits are the only federal approvals (i.e. federal action) required for the proposed dredging project. Therefore, this BA follows the USACE BA template.[2] This BA is required by the ESA to ensure that dredging actions that may be authorized by the USACE under section 404 of the federal Clean Water Act are not likely to jeopardize the continued existence of any federally proposed or listed species, or result in destruction or adverse modification of critical habitat.

B. Project Purpose and Objectives

The purpose of this project is to renovate the existing boat house to meet WDFW and NMFS recommendations to reduce impacts on aquatic habitat and to obtain a programmatic permit authorizing dredging for the next ten years (as needed) to maintain navigational depths to access the boat house. Previously, permitting and ESA consultation was conducted for each individual dredging cycle, which was both costly and time consuming. The programmatic 10 year permit would reduce permitting costs and agency workload, while implementing conservation measures to ensure the long-term persistence of ESA listed species that may use the action area.[3]

Over the past 50 years, the Barbee Mill company has been affected by ongoing development in the May Creek Valley located several miles upstream of the Barbee Mill. Upstream development has resulted in higher peak flood flows due to increased

[2] http://www.nws.usace.army.mil/PublicMenu/documents/REG/BA_template.pdf
[3] HPA and DOE permits/approvals will still be required during the 10-year USACE authorization.

impervious surface in the watershed. Peak flows have increased approximately 15 to 20 percent compared to predevelopment conditions for the 2-, 25-, and 100-year flood event return intervals (King County 2001). In addition, this increased run-off has resulted in severe bank erosion and sediment transport from the upper basin, which is deposited in the May Creek delta adjacent to the Barbee Mill. Subsequent Lake Washington wave action transports fine sediment from the delta to the boat house area, which is located to the south of the May Creek delta on Lake Washington.

C. Project Description

Under the proposed action, the first dredging event would occur over a 3- to 5- day period during the fall of 2007 within the WDFW approved in-water work period. Work associated with the boathouse renovation and habitat enhancements will extend the in-water and over-water work time frame for an additional 30 to 40 days. It is anticipated that subsequent dredging events would be conducted every 3 to 5 years, occur at the same time of year and for the same duration (i.e. 7 to 10 days). Approximately 1,000 cubic yards of sediment initially would be removed to accomplish the desired navigational depth profile. Dredging would deepen the boat house area work zone by approximately 2 feet over a 10,000-square-foot area (see Appendix A sheets 2, 3, and 4). Periodic evaluation of sediment depth will trigger future dredging activities. Subsequent dredging events may require the removal of a larger or smaller volume of sediment to achieve the same depth profile. Accumulated sediments would be removed with a small dredge and clamshell bucket. Portions of the work may also be conducted with a long reach excavator from the land or an excavator mounted on a fenced flat barge. Sediments would be loaded on a barge, transported, and off-loaded at an approved fill material stockpile zone for beneficial upland uses. Approximately 20 to 30 cubic yards of clean "fish rock" (mixed sand and clean gravel) also would be placed along the shoreline immediately south of the boat house to enhance 2,000 square feet of shallow water habitat at the rockery face for juvenile Chinook salmon, or as directed by WDFW and/or NMFS (see Supplemental Sheet 1).

The boat house renovation would be completed as informally recommended by WDFW and NMFS to create a more "aquatic habitat friendly" structure. Renovation work would reduce the current extent of impacts to aquatic habitat by constructing the new boat house with materials that would substantially increase light transmission to shallow water habitat (i.e. translucent siding and roofing) and by removing 18 existing creosote pilings. In addition, two existing floating dock structures adjacent to the boat house would be recovered with metal grating to substantially increase light penetration. An approximately 150-square-foot area adjacent to the boat house would be planted with native vegetation to provide over-hanging lake shoreline cover. Appendix A presents construction details.

Based on monitoring records from previous dredging actions at the site, conservation measures such as silt curtains to reduce turbidity should not be required. During 2002 dredging, the highest turbidity values recorded were less than 7 NTU (see Appendix B for previous water quality monitoring data). However, turbidity would be monitored during future dredging. Conservation measures, such as silt curtains, would be deployed as necessary following conditions set by the WDOE 401 certification for this project. It is anticipated that the WDOE will require the deployment of a silt curtain if turbidity in the dredging zone exceeds 10 NTU above background levels.

Conducting work within the WDFW approved in-water work period and implementing conservations measures detailed in this BA, would minimize or avoid impacts to listed fish species and their habitat in the action area. Detailed information for each project element is presented below.

Timing and Duration of Work

The WDFW approved Lake Washington in-water work time, which is designed to limit impacts to aquatic species, is July 16 to December 31. The proposed project would be conducted during this time frame, once approximately every 3 to 5 years over a 10- year period. The first dredging event would occur during fall of 2007, concurrent with the boathouse renovation. Boat house renovation is a one-time activity and would occur over a 30 to 40 day period.[4] Due to the distance of the project site from bald eagle nests (greater than 0.5 miles), WDFW is not expected to require additional work time restrictions to protect bald eagle nesting.

Sediment Disposal

Sediments would be dredged and transported by barge for off-loading at the adjacent Quendall Terminals located immediately north of the delta. Dredged materials would be loaded into a dredge scow and unloaded with a long-reach excavator. Sediments would be utilized for upland beneficial uses, subject to an assessment of sampling results and chemical analysis.

Conservation Measures

Conservation measures are activities that the applicant would implement to avoid or minimize take of listed species and avoid or reduce impacts to their habitat. As part of the proposed project, the applicant would implement several conservation measures to minimize impacts to listed species. Measures are listed below.

The applicant will:

1. Limit the duration of in-water work to the extent necessary to accomplish project objectives, estimated to be 7 to 10 days of work, once every 3 to 5 years. Work would be conducted during the approved WDFW Lake Washington in-water work time (July 16 to December 31).

2. Monitor water quality during each dredging event in accordance with the WDOE 401 water quality certification. Monitoring will be conducted at least daily within and adjacent to the dredging zone in order to determine the background turbidity level and any increases caused by dredging.

[4] In-water work will be conducted during daylight hours, Monday through Friday, to minimize noise impacts to the area per City of Renton requirements.

3. If construction induced turbidity levels in the work zone exceed 10 NTU over background levels, dredging activities would be modified by employing standard methods such as silt curtains to reduce the opportunity for fish exposure to turbidity.

4. If oil or other unknown substances appear on the water surface or in dredged material while equipment is being operated, the contractor shall cease operations immediately to identify the source of the contaminant and remedy the problem. If necessary, an oil absorbent boom secured to a debris boom will be utilized to encircle the work zone to capture sheen or potential floating debris.

5. Improve lake shore habitat by using a clean "fish rock" mix to enhance 2,000 square feet of shallow water habitat in the area immediately to the south of the dredging zone along the rockery.

6. Enhance the 150 square foot area to the south of the boat house with native vegetation to provide overhanging cover along the lake shore (see Appendix A, sheet 3).

7. Remove all creosote-treated pilings within the boat house and dock structures and replacing with steel piling. All piles will be driven with a vibro-hammer to minimize noise and to avoid potential fish impacts of an impact hammer.

8. Replace boat house and float wood planking with grated steel surfaces for greater light transmission.

9. Replace existing boat house siding with translucent/clear materials to substantially increase light transmission and eliminate solid skirting around the boat house.

10. Avoid dredging along shoreline slopes and shallow water habitat along the shoreline north of the dredging zone to protect near-shore habitat that may be used by rearing Chinook salmon (see Appendix A , sheet 3).

11. Conduct a post-dredge bathymetry survey to ensure that only the specified amount of material was removed.

12. Confine dredging impacts to the minimum area necessary to complete the project.

13. Prepare a summary report documenting monitoring activities immediately following the dredging to confirm that these conservation measures were implemented.

Project Environmental Permit Requirements

A Joint Aquatic Resource Permit Application (JARPA) will be submitted to WDFW for a Hydraulic Project Approval (HPA); to WDOE for a Short-term Water Quality Modification and 401 Water Quality Certification; and to the USACE for a Section 404 dredge permit.

The Barbee Company has received an exemption under the Shoreline Management Program from the City of Renton for routine maintenance dredging of the boat house area as well as a 10-year Special Grade and Fill permit for this project. A SEPA Declaration of Non-Significance-Mitigated was entered by the City's Environmental Review Committee.

In addition to navigational dredging permits, the Barbee Company is currently applying for a building permit from the City of Renton to renovate the boat house as recommended by WDFW and NMFS at the January 24, 2007 site visit.

D. Relation of Proposed Project to other Actions

The proposed project has no relationship to any other current of future actions. The sole purpose is to maintain navigational depths to the boat house and to renovate the boat house in order to reduce impacts on aquatic habitat.

E. Project Area and Action Area Defined

The project area is south of the May Creek delta within Lake Washington in the City of Renton (Township 24 North, Range 5 East, Section 32, WM). Figures in Appendix A show the dredging zone. The removal of approximately 2,000 to 4,000 cubic yards of sediment over the course of a 10 year permit period would disturb approximately 10,000 square feet (approximately 0.23 acres) of substrate within Lake Washington.

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). In order to encompass all indirect effects, such as increased turbidity during dredging and potential noise effects to bald eagles, the action area for this project encompasses the boat house zone and southern Lake Washington within approximately one mile of the boat house. A one-mile area was chosen in order to be consistent with WDFW bald eagle construction timing recommendations, which are based on distance to nesting and roosting sites. It is anticipated that the one-mile action area is more than sufficient to encompass small and temporary increases in turbidity during dredging based on water quality monitoring during previous dredging in boat house vicinity (see Appendix B for past turbidity monitoring data).

III. STATUS OF SPECIES AND CRITICAL HABITAT

A. Species Lists from the Services (NMFS and USFWS)

A list of federally listed endangered, threatened, proposed, and candidate species, and critical habitat that may occur in the action area was compiled using the NMFS and USFWS electronic species list websites and critical habitat designations. The USFWS and NMFS websites were accessed on June 28, 2007. In addition, a request for information was made to the Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) program in order to obtain official PHS maps of the action area, which show sensitive species information such as bald eagle nest locations and priority fish habitats.

Identification of Listed Species and Evolutionarily Significant Unit/Distinct Population Segment

Table 2 summarizes the federally listed, proposed, and candidate fish and wildlife species that are know to occur or may potentially occur in the action area. The table also indicates whether critical habitat or EFH has been designated or proposed for each species.

- On March 24, 1999, the NMFS listed Chinook salmon in the Puget Sound Evolutionarily Significant Unit (ESU) as threatened under the ESA (64 FR 14308), and the listing was reaffirmed on June 28, 2005.
- On March 29, 2006, in response to a petition, NMFS proposed to list the Puget Sound steelhead Distinct Population Segment (DPS) as threatened. The DPS was formally listed as a threatened species on May 11, 2007 (72 FR 26722).
- The Coastal/Puget Sound bull trout Distinct Population Segment (DPS) was designated threatened under the ESA on November 1, 1999.
- Puget Sound/Strait of Georgia coho salmon were designated as a candidate species for listing under the ESA on July 25, 1995.
- In 1978, the bald eagle was federally listed as endangered throughout the lower 48 states except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened. In July, 1995, the USFWS reclassified the bald eagle to threatened throughout the lower 48 states. On June 28, 2007 Secretary of the Interior Dirk Kempthorne announced the removal of the bald eagle from the list of threatened and endangered species. The removal will become effective 30 days after publication in the Federal Register. Upon delisting, the USFWS will continue to work with state wildlife agencies to monitor eagles for at least five years, as required by the ESA.

Table 2. Endangered Species Act (ESA) and Magnuson-Stevens Act (MSA) Species Potentially in the Action Area.

Species	ESA Status (Listing Unit)	Designated ESA Critical Habitat	Proposed ESA Critical Habitat	MSA Managed with EFH
Chinook salmon (*Oncorhynchus tshawytscha*)	ESA listed Threatened (Puget Sound ESU[1])	No	Yes	Yes
Bull trout (*Salvelinus confluentus*)	ESA listed Threatened (Coastal / Puget Sound DPS[2])	No	Yes	No
Steelhead (*Oncorhynchus Mykiss*)	ESA listed Threatened (Puget Sound DPS[2])	N/A	under development	No
Coho salmon (*Oncorhynchus kisutch*)	ESA Candidate to be listed (Puget Sound / Strait of Georgia ESU)	N/A	N/A	Yes
Bald eagle (*Haliaeetus leucocephalus*)	Delisted on June 28, 2007 (becomes effective 30 days after publication in the Federal Register)	No	No	No

[1]Evolutionary Significant Unit

[2]Distinct Population Segment

Identification of Designated and Proposed Critical Habitat and EFH

NMFS designated critical habitat for Puget Sound Chinook salmon on September 2, 2005, effective January 2, 2006. USFWS designated critical habitat for the Coastal/Puget Sound bull trout DPS on September 26, 2005, effective October 26, 2005. Proposed critical habitat for Puget Sound steelhead is currently under review by NMFS. Lake Washington is designated critical habitat at the project site for both Chinook and bull trout. The action area contains juvenile Chinook salmon rearing and migration primary constituent elements (PCEs) and adult Chinook salmon migration PCEs. Lake Washington is foraging, migration, and overwintering (FMO) critical habitat for bull trout.

The MSA defines EFH as those waters and substrate necessary for fish use in spawning, breeding, feeding, or growth to maturity. MSA manages species that may occur in the action area, including Chinook and coho salmon. Freshwater EFH for these salmon species includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to these species in Washington, Oregon, Idaho, and California. Lake Washington is designated EFH for Chinook and coho salmon. There are four major components of freshwater EFH for salmon including 1) spawning and incubation; 2) juvenile rearing; 3) juvenile migration corridors; and 4) adult migration corridors and adult holding habitat. The components of EFH in the action area include juvenile rearing and migration corridors, and adult migration corridors and holding habitat.

B. Description of Species

Chinook Salmon

Biological Requirements

In North America, the historical range of Chinook salmon extended from the Ventura River in California to Point Hope, Alaska. In northeastern Asia, the historical range extended from Hokkaido, Japan to the Anadyr River in Russia (Scott and Crossman 1973).

Throughout their range, Chinook salmon exhibit diverse and complex of life history strategies. Variation exists in age at seaward migration; freshwater, estuarine, and ocean residence; and in age and season of spawning migration (Healey 1991, Myers et al. 1998). Most of this variation is exhibited in two distinct behavioral forms commonly referred to as stream-type and ocean-type (Healey 1991). Ocean-type fish have a short, highly variable juvenile freshwater residency (from a few days to several months) and an extensive estuarine residency (Healy 1991). Adults show considerable variation in timing of entry to freshwater. Stream-type fish have long freshwater juvenile phases (one to three years), migrate rapidly to sea, live one to five years in the marine environment, and spawn far upriver in late summer to winter depending on the stock. The average age of spawners is four years (Myers et al. 1998). All Chinook salmon die after spawning (Wydoski and Whitney 1979).

Adult spring-run Chinook salmon in the Puget Sound typically return to freshwater in April and May, and spawn in August and September (WDF et al. 1993). Adults migrate to the upper portions of their respective river systems and hold in pools until they mature. In contrast, summer-run fish begin their freshwater migration in June and July and spawn in September, while summer/fall-run Chinook salmon begin to return in August and spawn from late September through January (WDF et al. 1993). Chinook salmon require clean gravel, 0.5 to 4 inches in diameter for spawning (Reiser and Bjornn 1979). Preferred water temperatures for Chinook salmon spawning ranges from 42.1 and 57°F (Reiser and Bjornn 1979). The recommended incubation temperatures range between 41 to 60°F, with an optimal egg and fry temperature of 51.8°F (Reiser and Bjornn 1979).

Juvenile Chinook salmon are typically associated with low gradient, meandering, unconstrained stream reaches (Lee et al. 1997), and require abundant habitat complexity with accumulations of large wood and overhanging vegetation (USDI 1996). Juvenile Chinook salmon often move into side channels, beaver ponds, and sloughs for over-wintering habitat. In Lake Washington, Tabor et al. (2004) found that juvenile Chinook salmon prefer shallow, low-gradient delta and shoreline habitats composed of sand and gravel substrates with overhanging vegetation and small woody debris accumulations. The preferred temperature range for Chinook salmon fry ranges from 54 to 56.8°F (Reiser and Bjornn 1979). Optimal temperature for Chinook salmon fingerlings is 62.6°F (Seymour 1956), with an upper lethal tolerance limit of 77°F (Scott and Crossman 1973; Brett 1952).

After a variable freshwater residence time, Chinook salmon juveniles migrate to estuaries. Migrations occur primarily during spring and early summer, but continue at lower levels through the fall (USFWS 1983). Chinook salmon in the Skagit River estuary occupied the inner estuarine salt marshes for 2 to 3 days before emigrating farther out in the estuary (USFWS 1983). Smolts congregated in tidal streams at low tide, with the majority of fish observed in deep, slow water over soft substrates (USFWS 1983). The highest nearshore juvenile Chinook salmon densities occurred in tidal areas without any freshwater influence (Shepard 1981).

Chinook stocks in Lake Washington exhibit ocean-type life history patterns, with juveniles typically migrating to sea within the first three months after emergence. However, juveniles have also been found to delay seaward migrations by rearing in Lake Washington for extended time periods (Wydoski and Whitney 1979).

Factors of Decline

Threats to the Chinook salmon include watershed development, such as forest practices, mining, agricultural land use, urbanization, hydropower development and water manipulation and withdrawal. Over-fishing, artificial propagation and introduction of nonnative species have also impacted Chinook salmon. Forest practices, mining, agricultural land use, urbanization, hydropower development and water withdrawal have resulted in increased sedimentation, changes in flow regimes and channel morphology, decrease in water quality and quantity, loss of riparian habitat, loss of large woody debris (LWD), and loss of LWD recruitment, higher water temperatures, decreased gravel recruitment, reduction in pools and spawning and rearing areas, rerouting of stream channels, degradation of streambanks and loss of estuarine rearing areas (Bishop and Morgan 1996; Myers et al. 1998). These changes have affected the spawning and rearing environment of Chinook salmon. Harvest, hatchery practices and the introduction of nonnative species have also impacted the expression of the varied life history strategies of Chinook salmon within the ESU.

Current and future development pose many risks to the Chinook salmon populations in Lake Washington, primarily through increased water pollution and further habitat degradation by such mechanism as increased impervious surface, which alters stream hydrology causing increased erosion and sedimentation of Chinook spawning grounds. A detailed discussion of Chinook limiting factors in the Lake Washington basin is given in Kerwin (2001).

In addition to extensive shoreline development, other factors that can compromise the survival of juvenile Chinook salmon include poor water quality and high water temperatures in the Ship Canal and Ballard Locks. All juvenile and adult anadromous salmonids must pass through the Ship Canal during migrations to and from saltwater. The significant differences in water temperature and salinity encountered at the Ballard Locks require a rapid transition by the fish and may cause severe stress. For example, recorded delays in egg development in returning adult salmon may be connected to the temperature transition when entering freshwater and prolonged exposure to high temperatures in the Ship Canal (Kerwin 2001). In addition, the sharp demarcation between the fresh and saltwater environments at the Lake Washington outlet is likely a stressor for juvenile salmonid out-migrants. The Locks are also a predation bottleneck, where heavy seal predation on adult salmon is a common and recurring problem.

Hatcheries continue to pose risk to natural spawning Chinook salmon in Lake Washington, although hatchery impacts are becoming increasingly recognized and efforts are being made to reduce hatchery effects listed populations. Several hatcheries and hatchery programs exist in the Lake Washington basin. Releases of fall-run Chinook salmon in the Lake Washington system accounted for about five percent of all Puget Sound releases from 1991 through 2000, with about 2.6 million fish per year. In Puget Sound, hatchery fish greatly outnumber natural origin fish in terms of juvenile out-migrants and adult returns (NMFS 2003).

Detailed descriptions of harvest rates for Lake Washington Chinook stocks are provided in (NMFS 2003). While harvest rates frequently change, the harvest rate of Lake Washington Chinook has diminished over time. The total exploitation rate for Chinook salmon returning to the Lake Washington watershed was 67 percent from 1983 through 1996, and 26 percent from 1997 through 2000.

Local Stock Information

Three summer-fall Chinook stocks are present in the Lake Washington basin including the North Lake Washington Tributaries, Cedar, and Issaquah stocks (WDFW 2002). The North Lake Tributaries stock is considered a mixed origin stock and similar to the non-native Issaquah stock. It is not known whether this results from recent or historical intermingling among fish from these sub-basins. The Issaquah stock is derived from the Soos Creek Hatchery Chinook and other non-local stocks. The Issaquah stock production is believed to be entirely the result of hatchery production, mostly from Issaquah Hatchery. Many more fish return than are needed at that hatchery, and surplus fish are allowed to spawn naturally.

Cedar Chinook are rated as depressed due to a long-term negative trend in escapements and chronically low escapement values. There is limited data regarding this population, although in the early 1990s, annual escapement was estimated at between 200 and 1,500 adults (WDF et al. 1993). Spawner surveys conducted in 1998, found an estimated adult Chinook escapement of 432 fish, while escapement in 1999 was estimated to be only 214 adult Chinook (Carrasco et al. 1998; Mavros et al. 1999). The Technical Recovery Team (TRT) has suggested recovery goals of 17,000 natural spawners for Lake Washington Chinook populations (TRT 2002). Recent average spawner escapement data (Table 3) indicates natural spawner escapement is well below the levels needed for Chinook recovery and sustainable tribal fishing goals.

Table 3. Lake Washington basin Chinook salmon stock recent productivity, status, and trends.

Stock	Status	Co-manager's Escapement Goal	Average Annual Escapement (period)
North Lake Washington Tributaries Chinook	Healthy	350	301 (1986-2001)
Issaquah Chinook	Healthy	Not identified	3,279 (1986-2000)
Cedar Chinook	Depressed	1,200	533 (1986-2001)

Source: WDFW 2002; NMFS 2003

In 2003 and 2004 significant numbers of adipose-clipped (hatchery) fish that were recovered in the Cedar River during spawning surveys indicate that hatchery strays may have maintained the Cedar River population (NMFS 2005).

The primary Chinook salmon stock in the project vicinity (the southern portion of Lake Washington) originates from the Cedar River. The Cedar River Chinook run, although a naturally spawning population without current supplementation from hatchery stocks, is not native to Lake Washington. May Creek (nearest stream to the project site) is not thought to have a self-sustaining Chinook salmon run and individuals using the stream are likely strays from the Cedar River. Chinook are reported to use the lower three miles of May Creek for limited spawning and rearing (Lucchetti 2002). Lucchetti (2002) rated the lower May Creek sub-basin (from mouth to RM 3.0) as moderate to high for spawning habitat. This rating signifies areas in which Chinook are known to spawn and that are characterized by adequate flows and physical attributes (e.g., channel size, gradient, and substrate) that typically support Chinook spawning (Lucchetti 2002).

Adult Cedar River Chinook salmon enter Lake Washington through the Ballard Locks from late June through September, with the run peaking in late August. Spawning occurs from mid-September through mid- to late-November, with a peak in early to mid-October (WDF et al. 1993). In the Cedar River, fry probably begin to emerge in February and continue through March and perhaps April (City of Seattle 2000), which is also probably true in May Creek as well.

Unlike most systems in which juvenile Chinook rear in rivers and estuaries, juvenile Chinook in Lake Washington rear in the littoral areas of the lake from January to July. While rearing in the south end of Lake Washington, the nocturnal distribution of juvenile Chinook salmon appears to be related to slope, substrate, and depth. Tabor et al. (2004) studied juvenile Chinook salmon use of shoreline habitats in Lake Washington and found that juvenile Chinook were concentrated in very shallow water, approximately 1.3 feet in depth, and prefer low gradient shorelines and deltas with substrates composed of sand and gravel. In comparison to lake shore reference sites, the delta sites had a higher density of juvenile Chinook salmon. On average, the delta sites had almost twice as many fish as the lake reference site. Of the delta sites studied, Tabor et al. (2004) found that juvenile Chinook appeared to use low gradient and shallow deltas that were close to natal streams (such as the Cedar River).

Tabor et al. (2004) also found that juvenile Chinook had no preference for woody debris piles alone; however, they did show a preference for woody debris piles in combination with overhanging vegetation. In fact, over 80 percent of juvenile Chinook observed during the study were found along shallow sites in association with overhanging vegetation and small woody debris.

The majority of juvenile Chinook observed by Tabor et al. (2004) were concentrated in the south end of Lake Washington from February to May, with peak abundance occurring in May. The last shoreline survey was conducted on July 14, when only one juvenile Chinook was observed out of five sample sites.

Population Trends of the ESU

In the July 2003 status review of federally-listed salmon and steelhead, the West Coast Biological Review Team (BRT) identified Puget Sound Chinook salmon as likely to become endangered in the foreseeable future. Long-term trends in abundance for naturally spawning populations of Chinook salmon in the Puget Sound ESU indicate that approximately half of the populations are declining and half are increasing in abundance (NMFS 2005). The median long-term trend in abundance over all populations is 1.0, indicating that most populations are just replacing themselves. Declines in short-term trends in natural spawner abundance are the most extreme in the Upper Sauk, Cedar, Puyallup, and Elwha populations.

Bull Trout

Biological Requirements

Bull trout, members of the family Salmonidae, are a char native to the Pacific Northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific Northwest from about 41°N to 60°N latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, the bull trout range includes Puget Sound, and various coastal rivers of Washington, British Columbia, and southeast Alaska (Bond 1992; McPhail and Carveth 1992; Leary and Allendorf 1997). Bull trout are widespread throughout tributaries of the Columbia River Basin in Washington, Oregon, and Idaho, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River Basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the MacKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brevin 1997).

Throughout their range, bull trout are primarily freshwater species that exhibit both resident and migratory life-history patterns. The entire lifecycle of the resident bull trout takes place in headwater streams. Resident fish spawn, rear, and live as adults generally in one headwater stream, although short migrations may occur. Migratory bull trout spawn and rear in headwater streams, then after two to four years rearing in their home stream, juveniles migrate downstream to larger rivers (fluvial) or lakes and reservoirs (adfluvial) where they grow to maturity. Migrations can range from a few miles to well over 50 miles (Goetz et al. 2004). Mature adults migrate back upstream to spawn in headwater reaches. There is now substantial evidence that several coastal and Puget Sound populations have an anadromous or amphidromous component in Washington (Brenkman et al. 2007; Goetz et al. 2004; Volk 2000).

Goetz et al. (2004) conducted a migration study of native char tagged in the Snohomish River basin using hydro-acoustic tags. Out of 60 fish tagged in the Snohomish River basin, 6 were detected at hydrophones in the Skagit River at Mt. Vernon. Kraemer (1999) tagged a staging char in the South Fork Sauk River (Skagit River basin) in the fall. An angler recaptured this fish the following spring in the marine area on the east side of Camano Island. Kraemer (1999) noted that anadromous char in the Puget Sound region leave the tidal areas to re-enter spawning watersheds in late May, June and early July. Similarly, Goetz et al. (2004) noted that all of the tagged char had left the nearshore marine areas and Snohomish River estuary by early to mid-August, and left the lower river for the upper watershed by late August to mid-October. Goetz et al. (2004) suspected that all fish moved into freshwater higher up into colder parts of the rivers. The highest water temperature recorded by Goetz et al. (2004) on a fish in the Snohomish/marine nearshore area was 59.9ºF.

Adult anadromous char are thought to prey primarily on fish. A study by Brenkman (2002) at the mouth of the Hoh River on the Olympic Peninsula found that surf smelt (*Hypomesus pretious*) was the primary prey item and was found in 96 percent of the stomachs analyzed; other species included herring (*Clupea harengus pallasi*), sand lance (*Ammodytes hexapterus*) and sculpin (*Cottus* spp.). Other limited stomach content work and feeding observations in Skagit Bay and Port Susan also indicate that anadromous char feed most commonly on surf smelt, and other fish such as herring, sand lance, pink and chum salmon fry, and a number of invertebrates (Kraemer 1999). Kraemer (1999) and Brenkman (2002) suspected the distribution of char in marine waters is closely tied to the distribution of forage fish, especially spawning beaches for surf smelt and herring.

Bull trout spawning occurs in the fall from late August into December (timing varies based on local conditions) and is thought to be correlated with particular flows, water temperatures, and photo period. Peak spawning usually occurs in September and October for most populations, but the population in the Skokomish River (southern Hood Canal) peaks in October and November (Brenkman et al. 2001). Bull trout spawning generally occurs when water temperature drops below 48°F. Bull trout spawn in substrate ranging from large sand to gravel over 2 inches in diameter. In western Washington, bull trout spawning occurs above an elevation of 1,000 feet or in streams with very cold temperatures similar to high elevation streams (Kraemer 1999). Fry emerge from spring into the summer months (McPhail and Murray 1979). Mature adult bull trout can spawn more than once in a lifetime. First spawning is often noted after age four, with individuals living ten or more years (Rieman and McIntyre 1993). Sexual maturity for both sexes has been documented in fish smaller than 6 inches fork length in resident populations (Hemmingsen et al. 2001).

Bull trout appear to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993), requiring cold clean water and a high degree of habitat complexity. Habitat characteristics including water temperature, stream size, stream gradient, substrate composition, hydraulic complexity, and large wood have been associated with juvenile bull trout distribution and abundance (Dambacher et al. 1992; Rieman and McIntyre 1993). Water temperatures over approximately 50°F are thought to limit their distribution; however, bull trout may be able to migrate through reaches with elevated water temperatures for short durations. Recently, bull trout in northeast Oregon were tagged with radio transmitters and temperature loggers, and then recaptured one year after tagging. One fish captured alive and in apparent good health had experienced water temperatures over 64°F for a brief period (J. Dunham, Research Fisheries Scientist, Boise Aquatic Sciences Laboratory, Rocky Mountain Research Station, personal communication with J. Shappart, Fisheries Scientist, Meridian Environmental, September 5, 2002). More recent work employing external temperature archival tags on migratory bull trout in the Lostine River basin (eastern Oregon) suggested that bull trout did not necessarily use the coldest river reaches available in the late summer (Howell et al. 2005).

Factors of Decline

Bull trout are threatened by habitat degradation and fragmentation from past and ongoing land management activities such as mining, road construction and maintenance, timber harvest, hydropower, water diversions/withdrawals, agriculture, and grazing. Bull trout are also threatened by interactions and hybridization with introduced non-native fishes such as brook trout (*Salvelinus fontinalis*) and lake trout (*Salvelinus namaycush*). Bull trout are estimated to have occupied about 60 percent of the Columbia River Basin, and presently occur in 45 percent of their estimated historical range (Quigley and Arbelbide 1997), having declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River Basin. Although some strongholds still exist, bull trout generally occur as isolated sub-populations in headwater lakes or tributaries where migratory fish have been lost.

Although the bull trout distribution in the Coastal/Puget Sound DPS is less fragmented than the Columbia River DPS, bull trout subpopulation distribution within individual river systems has contracted and abundance has declined. The decline of the Coastal/ Puget Sound bull trout DPS has been attributed to habitat degradation, migration barriers, interaction with introduced species, water quality degradation, and past management practices. Historically, bull trout occurred throughout the Puget Sound region. Their historical distribution has been significantly reduced. Currently, bull trout persist in isolated populations of headwater streams; however, migratory components still exist in some local populations. The decline of the Coastal/Puget Sound bull trout DPS has been attributed to habitat degradation, migration barriers, interaction with introduced species, water quality degradation, and past management practices. Commercial and recreational fisheries also impact native char populations in Puget Sound. Native char are occasionally caught in sport and commercial fisheries in Puget Sound, as well as by in-river net fisheries. They are common in nearshore marine areas of Puget Sound from Everett north, and are vulnerable to beach seine and set net fisheries. Salmon test fisheries in the Skagit River catch char, especially during the spring. Most recreational fisheries in Puget Sound rivers are closed to native char harvest. Current and future population pressures on bull trout in Puget Sound and Lake Washington are the same as those listed for Chinook.

Local Stock Information

The following Lake Washington bull trout information is summarized from USFWS (2004) unless otherwise cited. The Cedar River watershed upstream of the Masonry Dam supports the only known self-sustaining population of bull trout in the Lake Washington basin. The Chester Morse Lake bull trout core area is located within the Cedar River in the upper reaches of the Cedar River drainage, upstream of a natural migration barrier at Lower Cedar Falls (river mile 34.4). The level of emigration of bull trout occurring from Chester Morse Lake to the lower Cedar River is unknown. The only means for bull trout to leave the reservoir complex and pass to the lower Cedar River is during use of the emergency spill gates and/or the smaller spillway near the south end of the Masonry Dam. These gates are rarely opened except under emergency conditions of high reservoir elevation (e.g., the 1990 flood) or for special operational purposes. It is presumed impossible for live fish to pass through the other structure used to release water from Masonry Pool (Masonry Dam spill valve/Howell-Bunger valve). It is possible that bull trout successfully pass through the spill gates when water is released and thereby gain access to the ‘canyon reach’ and the lower Cedar River, but no accurate estimate of numbers of fish passing the dam has been made.

No spawning activity or juvenile rearing has been observed and no distinct spawning populations are known to exist in Lake Washington outside of the upper Cedar River above Lake Chester Morse. The potential for spawning in the Lake Washington basin is believed to be very low as a majority of accessible habitat is low elevation (below 500 feet) and thus not expected to have the proper thermal regime to sustain successful spawning. However, there are some coldwater springs and tributaries that may come close to suitable spawning temperatures and that may provide thermal refuge for rearing or foraging during warm summer periods. These include Rock Creek (tributary to the Cedar River below Landsburg Diversion) and Coldwater Creek, a tributary to Cottage Lake Creek immediately below Cottage Lake. In addition, the upper reaches of Holder and Carey creeks, the two main branches of Issaquah Creek, have good to excellent habitat conditions and may hold potential for bull trout spawning due to their elevation and aspect. However, despite survey efforts by King County (Berge and Mavros 2001), no evidence of bull trout spawning or rearing has been found.

The connection with the Chester Morse Lake core area is one-way only, and currently the level of connectivity with other core areas is unknown. However, a number of observations of subadult and adult-sized bull trout have been made in Lake Washington and at the Ballard Locks (Shepard and Dykeman 1977; KCDNR 2000). Observations of bull trout in the Ballard Locks and cursory hydroacoustic tagging suggest that these fish may be migrating to the Lake Washington area from other watersheds such as the Stillaguamish or Snohomish systems (Goetz et al. 2004). Bull trout have been caught in Shilshole Bay and the Ballard Locks during late spring and early summer in recent years. In 2000, eight adult and subadult fish (mean size 14.5 inches) were caught in Shilshole Bay below the locks between May and July. These fish were found preying upon juvenile salmon (40 percent of diet) and marine forage fish (60 percent of diet) (Footen 2000 and 2003). In 2001, five adult bull trout were captured in areas within the Ballard Locks and immediately below the Locks. One bull trout was captured in the large lock in June, and in May one adult was captured while migrating upstream through the fish ladder in the adult steelhead trap. Three adult bull trout were also captured below the tailrace during the peak of juvenile salmon migration on June 18 (Goetz et al. 2004).

Population Trends of the Species in Washington State

Of the 80 populations of bull trout identified in Washington State, 14 (18 percent) are healthy, 2 (3 percent) are depressed, 6 (8 percent) are critical, and the status of 58 (72 percent) is unknown (WDFW 1998). Adult population size is highly variable, ranging from as many as 10,000 spawners per year throughout the Skagit River basin to possibly less than 100 in the White River basin.

Currently, the USFWS is conducting a five year review to assess the best available information on how bull trout have fared since they were listed for protection across their range in the lower 48 states in 1999. This will include analyses of population trends and threats to the species. The purpose of a five year review is to ensure that the classification of a species as threatened or endangered is accurate.

Coho Salmon

Biological Requirements

The coho salmon life history roughly consists of 18 months of freshwater rearing followed by 18 months of ocean rearing (Weitkamp et al. 1995). Coho salmon typically spawn in relatively shallow tributary streams from October through February. Spawning generally occurs in temperatures ranging from 42 to 49°F. Coho salmon spawning gravel ranges from 0.5 to 4 inches (Reiser and Bjornn 1979). Fry emerge in the spring and occupy most stream habitats, but are usually associated with the channel margin. Coho salmon fry densities are greatest in backwater pools, beaver dam pools, and off-channel areas (WDW 1991).

At least one year of freshwater residence is normal for juvenile coho (USFWS 1986a). Coho salmon parr are frequently associated with side channels, wetlands, and off-channel sloughs for rearing (Sandercock 1991). Other important juvenile habitats include large wood accumulations, undercut banks, and complex pool habitats. Coho salmon juveniles are generally absent in channels lacking cover. Mason and Chapman (1965) reported that juvenile coho are aggressive and territorial soon after emergence, and establish intraspecific dominance hierarchies. Where coho and Chinook salmon juveniles occurred together in streams, the coho were socially dominant, defending optimum feeding territory (Stein et al. 1972). Water temperatures that average between 50 to 59°F in the summer are considered optimum for juvenile coho salmon rearing (USFWS 1986a). Bell (1973) reported the upper lethal limit to be 78.5°F. Out-migration of smolts to marine areas usually occurs from April to August of the year following their hatching, with peak migrations in May in nearly all areas (USFWS 1986a).

Factors of Decline

Concerns with this ESU included genetic integrity of individual stocks and declining environmental and habitat conditions. Risk factors associated with Puget Sound coho salmon stocks include high harvest rates, widespread habitat degradation, hatchery practices, and unfavorable ocean conditions. The genetic fitness of Puget Sound coho salmon stocks has been affected by widespread artificial propagation that includes inter-basin transfers of broodstock, and by hatchery fish escapement and introgression with wild populations (Weitcamp et al. 1995). Coho salmon are also MSA-managed species in Puget Sound and have designated EFH.

Risk factors associated with Puget Sound coho salmon stocks include high harvest rates, widespread habitat degradation, hatchery practices, and unfavorable ocean conditions. The genetic fitness of Puget Sound coho stocks has been affected by widespread artificial propagation that includes inter-basin transfers of broodstock, and by hatchery fish escapement and introgression with wild populations (Weitcamp et al. 1995). Current and future population pressures on coho salmon in Puget Sound and Lake Washington are the same as those listed for Chinook.

Local Stock Information

Coho runs in Lake Washington are heavily influenced by hatchery production; therefore, recent studies have not been able to fully evaluate the status of self-sustaining naturally spawning coho populations in the region. Trends in both hatchery and wild escapements in Lake Washington are showing a decline that may be attributable to urbanization, high harvest rates, habitat degradation, and poor ocean conditions (Fresh 1994; WDF et al. 1993). Naturally spawning coho escapement (which could be a mix of native and hatchery origin coho) in Lake Washington was as high as 30,000 fish in 1970 and declined to less than 2,000 in 1992 (Fresh 1994).

Index escapement values for Cedar River coho in the 1990s have declined to levels far below those observed in the 1980s, so the stock is now rated depressed by WDFW due to both the long-term negative trend in the index values and the chronically low nature of the indicator values. The Lake Washington/Sammamish tributaries coho stock is also rated as depressed by WDFW for the same factors (WDFW 2002). Available spawning survey information for May Creek suggests the same negative trend. Spawning surveys conducted in 1976, 1977, and 1985 found peak coho adult spawner densities in lower May Creek at 23, 5, and 55 coho per mile, respectively, while surveys in 1992 and 1993 found peak densities of only 2 fish per mile (Foster Wheeler 1995).

Population Trends of the Species

The Puget Sound/Strait of Georgia coho salmon ESU includes populations from drainages of Puget Sound and Hood Canal, the Olympic Peninsula east of Salt Creek, and the Strait of Georgia from the east side of Vancouver Island (north to and including Campbell River) and the British Columbia mainland (north to and including Powell River), excluding the upper Fraser River above Hope. WDF et al. (1993) identified 40 coho populations within the boundaries of the Puget Sound/Strait of Georgia ESU. While most were sustained by natural production, only three of these populations were determined to be of native origin.

Weitkamp et al. (1995) noted that while coho salmon within the Puget Sound ESU were abundant, and with some exceptions run sizes and natural spawning escapements generally stable, there are substantial risks to whatever native production remains. The Puget Sound coho ESU remains a candidate for listing under the federal Endangered Species Act. From 1991 through 2000, the annual run size of coho populations entering Puget Sound was 669,000, of which 44 percent were derived from natural spawning. Over this same period, wild coho escapement increased, which is primarily attributed to a reduction in Puget Sound fisheries, allowing more fish to reach spawning grounds even though total run sizes decreased. High harvest rates and a recent decline in average size of spawners is a concern because of the potential for reduced fecundity and/or productivity (Weitkamp et al. 1995). Hatchery coho programs are also intensive in Puget Sound, influencing population trends. From 1991 through 2000, an average of approximately 24 million hatchery-produced juvenile coho were released into Puget Sound annually. Over this period, total hatchery releases decreased from about 40 million in 1991 to less than 10 million in 2000 (PSMFC 2002).

Steelhead Trout

Biological Requirements

Unless otherwise cited, the following steelhead information is summarized from the federal register proposal to list Puget Sound steelhead as threatened (50 CFR Part 223). Steelhead is the name commonly applied to the anadromous form of the biological species *Oncorhynchus mykiss*, which includes rainbow trout). The present distribution of steelhead extends from Kamchatka in Asia, east to Alaska, and extending south along the Pacific coast to the U.S. Mexico border.

O. mykiss exhibit a complex suite of life-history traits and can be anadromous (i.e. steelhead), or freshwater residents (rainbow or redband trout), and under some circumstances yield offspring of the opposite life-history form. Steelhead juveniles generally migrate to sea at age 2 to 3, but can spend up to 7 years in freshwater. Peak outmigration to the sea is generally in the late spring and early summer. Steelhead generally spend 1 to 2 years at sea before returning to freshwater to spawn. *O. mykiss* may spawn more than once, whereas the Pacific salmon species are principally spawn once and die. As with most salmonids, spawning typically occurs in streams where the water is cool, clear, and well oxygenated. The optimum spawning temperature for steelhead is about 45°F, but they have been reported spawning at temperatures of 39 to 55°F.

After emergence, steelhead fry form small schools and inhabit the margins of the stream. As they grow larger and more active, they slowly begin to disperse downstream. Steelhead prefer relatively small, fast flowing streams with a high proportion of riffles and pools. Most steelhead in their first year of life in riffles, but some larger fish also inhabit pools or deep fast runs. Instream cover such as large rocks, logs, root wads, and aquatic vegetation are very important for juvenile steelhead. This cover provides resting areas, visual isolation from competing salmonids, food, and protection from predators. Often steelhead densities are highest in streams with abundant instream cover. The preferred water temperature for rearing steelhead ranges from 50 to 55°F.

Factors of Decline

Factors leading to the decline of the Puget Sound steelhead DPS are essentially the same as described previously for Puget Sound Chinook salmon and generally include habitat degradation by human disturbance such as forestry, agriculture, and general urbanization. Access to large reaches of spawning and rearing habitat has been blocked by dams and other manmade barriers. Hatchery practices have had genetic and life history effects, and lead to competition between naturally produced and hatchery fish. Over-harvest has reduced abundance. Particular to Lake Washington, adult winter steelhead have experienced a high rate of predation by California sea lions (*Zalophus californianus*) below the fish ladder at the Ballard Locks (BRT 2005).

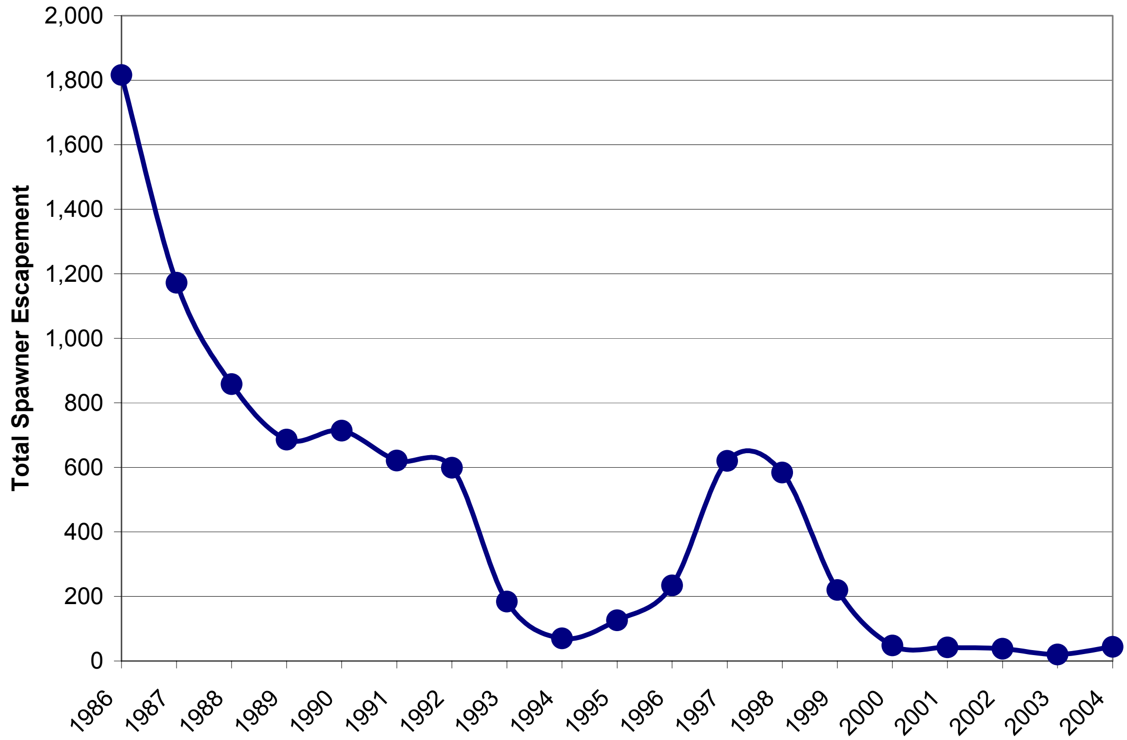
Local Stock Information

Unless otherwise cited, the following Lake Washington steelhead information is summarized from the WDFW salmon and steelhead stock inventory (WDFW 2002). Only a winter steelhead stock is present in the Lake Washington subbasin. Abundance of this stock has greatly declined over the past decade. The escapement goal for Lake Washington winter steelhead is 1,600 adult fish. However, from 2000 to 2004, the total Lake Washington winter steelhead spawner escapement estimate ranged from only 20 to 48 fish (Figure 2), far below the escapement goal. WDFW considers the status of the Lake Washington stock as "critical" due to chronically low escapements and a short-term severe decline in escapement.

Spawning takes place throughout the Lake Washington basin including the Sammamish River and its tributaries, Issaquah Creek, Coal Creek, May Creek, the lower Cedar River and several smaller Lake Washington tributaries. Spawning occurs from mid-December through early June. WDFW considers the Lake Washington stock as native to the subbasin.

Population Trends of the Species

An overwhelming majority of the BRT concluded that Puget Sound steelhead are likely to become endangered within the foreseeable future throughout all or a significant portion of their range (BRT 2005), primarily due to habitat degradation, overall low abundance and declining populations trends.



Note: Data are total escapement estimates based on redd counts in the Cedar River and in Issaquah and Bear creeks.
Source: WDFW 2002

Figure 2. Lake Washington total winter steelhead adult escapement estimate.

Bald Eagle

Biological Requirements

The bald eagle is found throughout North America. The largest breeding populations in the contiguous United States occur in the Pacific Northwest states, the Great Lakes states, Chesapeake Bay and Florida. The bald eagle winters over most of the breeding range, but is most concentrated from southern Alaska and southern Canada southward.

In Washington, bald eagles are most common along the coasts, major rivers, lakes and reservoirs (USFWS 1986b). Bald eagles require accessible prey and trees for suitable nesting and roosting habitat (Stalmaster 1987). Food availability, such as aggregations of waterfowl or salmon runs, is a primary factor attracting bald eagles to wintering areas and influences the distribution of nests and territories (Stalmaster 1987; Keister et al. 1987). Bald eagle nests in the Pacific Recovery Area are usually located in uneven-aged stands of coniferous trees with old-growth forest components that are located within one mile of large bodies of water. Factors such as relative tree height, diameter, species, form, position on the surrounding topography, distance from the water, and distance from disturbance appear to influence nest site selection. Nests are most commonly constructed in Douglas fir or Sitka spruce trees, with average heights of 116 feet and size of 50 inches dbh (Anthony et al. 1982 in Stalmaster 1987). Bald eagles usually nest in the same territories each year and often use the same nest repeatedly. Availability of suitable trees for nesting and perching is critical for maintaining bald eagle populations. The average territory radius ranges from 1.55 miles in western Washington to 4.41 miles along the lower Columbia River (Grubb 1976; Garrett et al. 1988).

In Washington, courtship and nest building activities normally begin in January, with eaglets hatching in mid-April or early May. Eaglets usually fledge in mid-July (Anderson et al. 1986). A number of habitat features are desirable for wintering bald eagles. During the winter months bald eagles are known to band together in large aggregations where food is most easily acquired. The quality of wintering habitat is tied to food sources and characteristics of the area that promote bald eagle foraging. Key contributing factors are available fish spawning habitat with exposed gravel bars in areas close to bald eagle perching habitat. Bald eagles select perches that provide a good view of the surrounding territory, typically the tallest perch tree available within close proximity to a feeding area (Stalmaster 1987). Tree species commonly used as perches are black cottonwood, big leaf maple, or Sitka spruce (Stalmaster and Newman 1979).

Wintering bald eagles may roost communally in single tree or large forest stands of uneven ages that have some old-growth forest characteristics (Anthony et al. 1982 in Stalmaster 1987). Some bald eagles may remain at their daytime perches through the night but bald eagles often gather at large communal roosts during the evening. Communal night roosting sites are traditionally used year after year and are characterized by more favorable microclimatic conditions. Roost trees are usually the most dominant trees of the site and provide unobstructed views of the surrounding landscape (Anthony et al. 1982 in Stalmaster 1987). They are often in ravines or draws that offer shelter from inclement weather (Hansen et al. 1980; Keister et al. 1987). A communal night roost can consist of two birds together in one tree, or more than 50 in a large stand of trees. Roosts can be located near a river, lake, or seashore and are normally within a few miles of day-use areas, but can be located as far away from water as 17 miles or more. Prey sources may be available in the general vicinity, but close proximity to food is not as critical as the need for shelter that a roost affords (Stalmaster 1987).

Bald eagles utilize a wide variety of prey items, although they primarily feed on fish, birds and mammals. Diet can vary seasonally, depending on prey availability. Given a choice of food, however, they typically select fish. Many species of fish are eaten, but they tend to be species that are easily captured or available as carrion. In the Pacific Northwest, salmon form an important food supply, particularly in the winter and fall. Birds taken for food are associated with aquatic habitats. Ducks, gulls and seabirds are typically of greatest importance in coastal environments. Mammals are less preferred than birds and fish, but form an important part of the diet in some areas. Deer and elk carcasses are scavenged, and in coastal areas eagles feed on whale, seal, sea lion and porpoise carcasses (Stalmaster 1987).

Factors of Decline

Bald eagle populations have increased in number and expanded their range. The improvement is a direct result of recovery efforts including habitat protection and the banning of DDT and other persistent organochlorines. However, habitat loss continues to be a long-term threat to the bald eagle in the Pacific Recovery Area of Washington, Idaho, Nevada, California, Oregon, Montana, and Wyoming. Urban and recreational development, logging, mineral exploration and extraction, and other forms of human activities are adversely affecting the suitability of breeding, wintering, and foraging areas. On June 28, 2007 Secretary of the Interior announced the removal of the bald eagle from the list of threatened and endangered species. The removal will become effective 30 days after publication in the Federal Register. Upon delisting, the USFWS will continue to work with state wildlife agencies to monitor eagles for at least five years, as required by the ESA.

Local Population Information

Bald eagles are known to occur in the action area for this proposed project (i.e. within one mile of the boat house). The WDFW Priority Habitats and Species maps for the vicinity of Township 24, Range 5 E, Section 32, indicate that three bald eagle nests occur within one mile, but greater than 0.5 miles of the project site. All three nests are located to the west of the May Creek delta on the southeastern tip of Mercer Island. One of the nests was reported to have blown out in 1999. However, another nest was reported as active over the last seven years (2004 observation). It is reasonable to assume that bald eagles may fly over the project site and that they may forage in the action area based on the presence of documented nest sites and forage species, such as waterfowl, seagulls, and salmon, which occur in and around May Creek and the southern portion of Lake Washington.

Population Trends of the Species

Bald eagle populations have increased in number and expanded their range. The improvement is a direct result of recovery efforts including habitat protection and the banning of DDT and other persistent organochlorines. The 1996 information provided by WDFW (WDFW unpub. data) indicates that 589 nests were known to be occupied and 0.93 young/nest were produced. This is well above the recovery goal of 276 pairs for Washington, but below the recovery criteria of an average of 1.00 young/nest. In many areas, the numbers of nesting pairs and the reproductive rates have been more than double the targets. Recently, WDFW has changed bald eagle protection policies and no longer requires construction windows to minimize noise disturbance during nesting. WDFW now only focuses on protection of trees that could be used for roosting, perching, or nesting.

IV. ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). An environmental baseline that does not meet the biological requirements of a listed species may increase the likelihood that adverse effects of the proposed action will result in jeopardy to a listed species or in destruction or adverse modification of a designated critical habitat.

A. Description of the Action Area and Project Area

As described in Section II(E), the action area for the proposed project encompasses boat house zone and areas within approximately one mile of the project site. The environmental baseline of the action area is generally described below, including the Lake Washington subbasin and May Creek, which is the nearest stream known to support salmon and steelhead spawning.

Action Area

May Creek

May Creek drains approximately 14 square miles between the Coal Creek and Cedar River basins. The basin contains approximately 26 miles of mapped streams, two small lakes, and over 400 acres of wetlands (Foster Wheeler 1998). Historically, the watershed was forested with predominantly coniferous stands. Over recent decades, land uses in the western one-third of the basin have changed to intensive residential development, with some industrial development in the lowermost reaches. The eastern two-thirds of the watershed retains a mix of rural residential, small farms, and some forested areas (King County 2001). Developed communities in the watershed include Renton, Newcastle, and around Lake Boren, Honey Creek, and Lake Kathleen (Foster Wheeler 1998).

The Urban Growth Boundary (UGB), established in accordance with the Washington State Growth Management Act (GMA), bisects the May Creek basin, which limits urban-scale development from encroaching on the headwaters of the basin. Land development in the lower basin has substantially reduced forest cover, increased impervious surfaces, and filled wetlands. Currently, the amount of effective impervious surface coverage basin-wide is approximately 7 percent. Under current zoning, full build-out would result in approximately 12 percent of the May Creek basin being covered in impervious surfaces (King County 2001). This is significant, as basin-wide impervious surface areas of 10 percent or greater have been found to have significant impacts on the health of aquatic ecosystems (May et al. 1997; Booth and Reinelt 1993; Karr 1991). Logging, coal mining, and agricultural activities have resulted in channelized streams, floodplain encroachment, and eroding slopes in the May Creek watershed.

The lower four miles of May Creek are within an urbanized area. This portion of the creek experiences high sediment loading and lacks current and future sources of LWD (Foster Wheeler 1998). The lack of LWD has resulted in loss of habitat complexity, specifically pool habitat. Sediment deposition in lower May Creek has increased due to forest removal, the presence of rock quarries, and the expansion of road networks. Vegetation removal throughout the basin has resulted in higher maximum flows and lower minimum flows. Higher flows than what naturally occurred can result in stream substrate scour, which may negatively impact salmon redds (Foster Wheeler 1998). The increase in flood flows has resulted in additional erosion of hillsides, flooding and sediment deposition in May Valley, erosion in the canyon downstream of the valley, and flooding and sediment deposition near the mouth of May Creek (King County 2001). Peak flows have increased moderately in May Valley, on the order of 15 to 20 percent greater than the predevelopment conditions for the 2-, 25-, and 100-year return intervals (King County 2001).

From approximately RM 3.9 to 7.0, the riparian area of May Creek is heavily impacted by grazing (Foster Wheeler 1998). Agricultural activities in May Valley have drained historic wetlands and channelized May Creek (Buchanan 2003). The South Fork of May Creek (originating at RM 7.0) goes dry in the summer from RM 7.0 to 9.1. A 128-foot-long culvert blocks anadromous fish passage at RM 7.7. The North Fork of May Creek parallels State Route (SR) 900, resulting in degraded riparian conditions and channelization. Three quarries along the North Fork contribute to high sediment loading in the system (Foster Wheeler 1998). The East Fork of May Creek flows into the South Fork at RM 7.2. Habitat conditions in the East Fork are highly degraded due to the presence of man-made berms, culverts, and man-made ponds (Foster Wheeler 1998). Almost all of the basin's nearly 80 identified wetlands have been disturbed by deforestation, filling, draining, agricultural practices, or buffer removal, with much of this disturbance occurring since the wetlands were first inventoried in 1983 (King County 2001).

The May Creek Basin Action Plan (King County 2001) includes several goals, one of which is to protect and enhance fish and wildlife habitat and water quality in the basin. Implementation of habitat restoration actions under the Basin Plan is dependent on funding availability. Restoration work along May Creek has recently taken place; the Barbee Mill Company has substantially improved the vegetated cover in the May Creek riparian area upstream from the lowermost bridge to Lake Washington Boulevard by planting willows, cottonwoods, grasses, and other native vegetation. In this area, the vegetated stream buffer ranges in width from 5 to over 100 feet.

Despite the current habitat conditions, the lower reaches of May Creek experience the heaviest use by fish (Foster Wheeler 1998). Steelhead, cutthroat trout, Chinook, coho, and sockeye salmon spawn in May Creek. Spawning gravel, although embedded, likely supports successful incubation (Buchanan 2003). The primary limiting factor for Chinook and sockeye in May Creek likely is available spawning area and incubation success (Foster Wheeler 1998). The primary limiting factor for coho, steelhead, and cutthroat in May Creek likely is the availability of high quality rearing and over-wintering habitat (Foster Wheeler 1998).

Lake Washington

Unless otherwise cited, the following description of the Lake Washington basin is from Kerwin (2001). Lake Washington is approximately twenty miles long and is bordered by the cities of Seattle, Renton, Bellevue, Kirkland, and Kenmore. The Lake Washington/ Lake Sammamish area includes two major rivers systems, the Cedar and Sammamish, and three large lakes (Lake Union, Lake Washington, and Lake Sammamish). It also includes numerous smaller streams such as Bear, North, and Swamp creeks that drain into the system from the north.

Historically, Lake Washington had a vegetated shoreline of wetlands, trees, brush, and other mixed vegetation that created a diverse nearshore habitat for juvenile salmonids. The shoreline's natural structural complexity was beneficial for fish and other aquatic species. Larger conifers that grew in the riparian area provided shade and contributed plant material (branches, needles) and terrestrial insects to the aquatic food chain. The

United States Fish Commission Bulletin published in 1898 describes the lake as follows; "Only in a few places along the shore of the entire lake is the bottom sufficiently free from snags, fallen trees, and other material to permit the successful hauling of nets".

In the past 150 years, the Lake Washington/Lake Sammamish watershed has been dramatically altered from its historical condition. Habitat degradation started with heavy logging of old growth forest throughout much of the watershed in the late 19th century. In 1901, the City of Seattle began diverting water out of the upper Cedar River to serve as its main water supply. Between 1910 through 1920, the natural Lake Washington outlet was redirected from the Black River to the Lake Washington Ship Canal and Ballard Locks, which were excavated to connect Lake Washington to Lake Union and then to Puget Sound. Previously Lake Union was a freshwater lake that was not connected to Lake Washington and had no outlet to Puget Sound. The redirection of the Lake Washington outlet ultimately resulted in the lowering of the lake level by about 9 to 10 feet and the loss of over ten miles of shoreline and approximately 1,000 acres of wetlands. Shallow lake margins and wetlands are generally considered to be high quality and preferred habitats for juvenile salmonids such as Chinook and coho salmon. During that same decade, the Cedar River was redirected from the Black River into the south end of Lake Washington.

In the ensuing years, the most important cause of physical change to the watershed area has been the expansion of urban and suburban development. In the upper Cedar River, land is devoted almost entirely to preservation of forests. Residential, industrial, and commercial uses prevail in the lower reaches of virtually all the streams. Today, approximately eighty percent of the existing shoreline is lined with bulkheads that reduce the remaining shallow water habitat and change shallow water substrates. Over 2,700 piers extend into the lake, introducing a different pattern of shade from that produced by shoreline vegetation and changing the underwater habitat from complex (horizontal fallen trees with branches) to simple (vertical smooth pilings). Piers are also used heavily as ambush cover by non-native species such as bass, which may prey heavily on native juvenile salmonids. These actions have removed the complex and diverse plant community and associated food web from the shallow water habitat.

The current lake level is artificially regulated within a two-foot range. The high water/low water regime is reversed from the natural state. High water occurs during the summer for extensive operation of the Ballard Locks. Low water occurs during the winter to protect property from winter wave action.

Despite the heavy alteration of the Lake Washington basin, it continues to support numerous salmonid stocks. The three watersheds in the basin with the largest salmonid populations, the Cedar River, and Bear and Issaquah creeks, support Chinook, sockeye, coho, kokanee, steelhead, rainbow and coastal cutthroat trout as well as native char. Maps illustrating known and presumed distributions for each of these species are available in Kerwin (2001). Additionally, at least 40 non-native fish species (of which approximately 24 persist) have been introduced into the Lake Washington basin, most notably smallmouth and largemouth bass, creating numerous trophic interactions with native species, most notably predation on native salmonids. Sockeye salmon in the lake system are believed to be primarily the descendants of fry transplanted from Baker Lake in the 1930s. While many species have been introduced, native species such as Cedar River pink and chum salmon have been extirpated.

Project Area

On April 9 and May 6, 2005, Meridian Environmental fisheries biologists completed detailed aquatic habitat and fish presence surveys at the project site. Areas surveyed were (1) around the boat house; (2) within the proposed dredging zone water-ward of the boat house; and (3) in the May Creek delta area. The objective of these surveys was to:

- document the existing aquatic habitat conditions;
- determine the species composition and average densities of aquatic macrophytes; and
- describe the distribution and relative abundance of fish species observed during the survey.

An additional objective was to compare the results of 2005 surveys with the results of fish habitat and fish population surveys completed within and near the project area in 1993, 2000, and 2001 (Harza 1993; Harza 2000; Meridian Environmental, Inc. and Harza 2001). It should be noted that the timing of the 2005 surveys was designed to coincide with the expected residence period of juvenile coho and Chinook salmon.

Survey Methods

Ten underwater (SCUBA) transects were placed between the north end of the May Creek delta and the existing boat house (Figure 3). Only transects 4 and 10 are within the current project area. Only transect 10 would be affected by the dredging addressed in this BA. While the project does not propose disturbance to the May Creek delta, survey results from the delta are included here to provide additional context on habitat conditions and fish use of the general project area.

Transects ranged from 25 to 245 feet in length, and extended approximately 395 feet into Lake Washington. Transects 1 through 4 were shallow-water snorkel survey transects located along the north and south shoreline adjacent to the delta, up to the lowermost access bridge at the mouth of May Creek. Transects 5 through 9 paralleled each other, oriented from roughly 0° to 180°, and transect 10 extend from the south end of transect 9 to the existing boat house (Figure 3). The transects were placed to document varying habitat types.

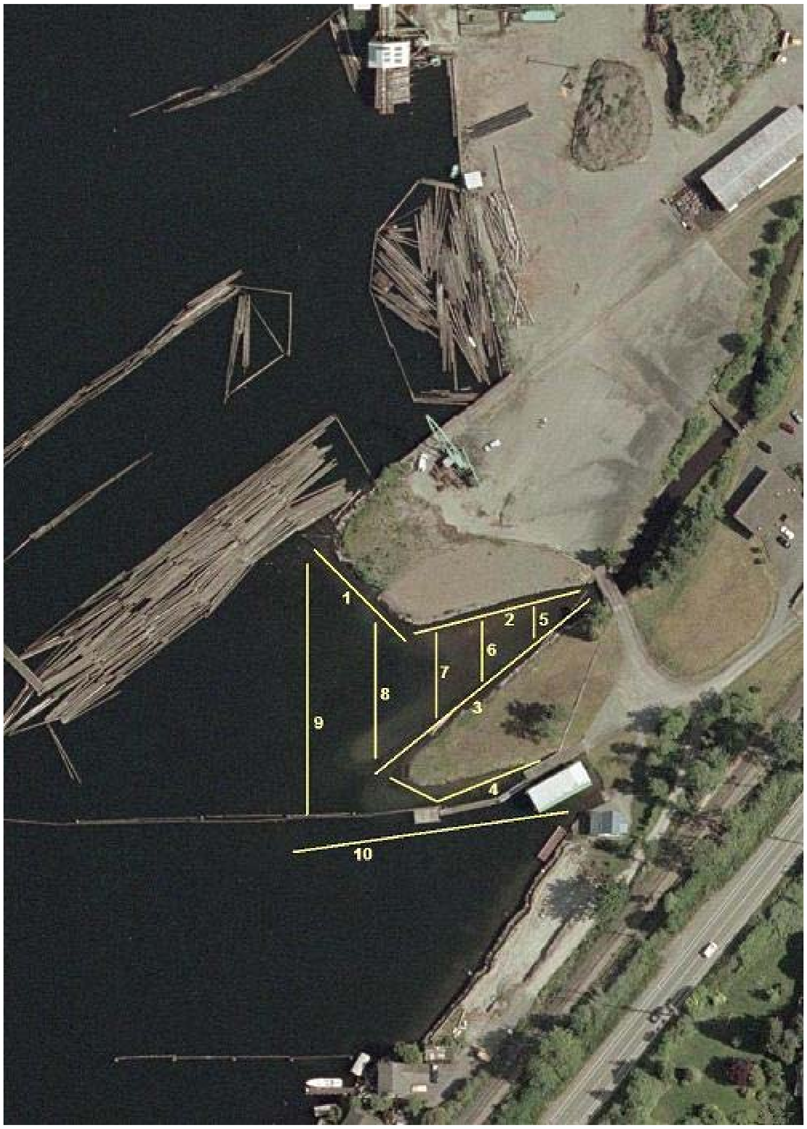


Figure 3. 2005 SCUBA/snorkel survey transect locations.

On April 9, 2005, two fisheries biologists used snorkeling equipment and SCUBA to swim each of the 10 survey transects approximately three feet above the surface of the lake bed. While swimming each transect, both divers counted and identified fish to species. When fish were observed, divers also recorded the depth, dominant and subdominant substrate, and underwater visibility. Fish age classes and species associations were also noted. Aquatic macrophyte densities were visually estimated along each transects at a series of one to three square yard stations. At each station, macrophyte densities were visually estimated as low (less than or equal to 10 stems per square yard), moderate (11 to 100 stems per square yard), or high (greater than 100 stems per square yard). Aquatic macrophyte species composition and relative abundance was also estimated/recorded at each station. Underwater photographs of representative habitat conditions and fish were also taken along selected transects.

On May 6, 2005, a fisheries biologist used snorkeling equipment to survey the littoral zone of the delta and surrounding shoreline (transects 1 through 4) (Figure 3). The survey focused on the littoral zone and surrounding shoreline because this is the area of the lake that is most likely to be occupied by ESA listed Chinook and other salmonids (Tabor et al. 2004). The biologist identified, counted, and attempted to photograph each fish species observed and also recorded the depth, dominant and subdominant substrate, and underwater visibility.

Survey Results

Fish Use

Over the last several years numerous salmonid species have been documented near the Barbee boathouse area, including juvenile coho, Chinook, and sockeye salmon, and rainbow and cutthroat trout. Non-salmonid species documented include largemouth and smallmouth bass, pumpkinseed sunfish, yellow perch, northern pikeminnow, three-spine stickleback, prickly sculpin, dace, and shiner (Harza 1993; Harza 2000; and Buchanan 2003).

Fish species observed during the April and May 2005 aquatic habitat and fish population surveys included juvenile Chinook, coho, and sockeye salmon, rainbow trout; three-spine stickleback; and prickly sculpin (Tables 4 and 5). As in past surveys, the majority of all fish observed in 2005 were found in relatively shallow water (less than 6 feet deep) along transects 1 through 4. Typically these fish were associated with overhead and underwater cover in the form of riprap, emergent vegetation, submerged logs, the existing dock, and the small culvert located adjacent to the existing dock. In 2005, the majority of the coho and Chinook were found to be associated with the outlet of the culvert located adjacent to the dock (the eastern end of Transect 4) (Figure 3); however, coho and rainbow trout were also observed using nearshore emergent vegetation as cover.

Aquatic Macrophytes

Six species of aquatic macrophytes have been documented in the project vicinity; elodea (*Elodea canadensis*), Eurasian milfoil (*Myriophyllum spicatum*), white-stemmed pondweed (*Potamogeton prelongus*), curly-leaf pondweed (*P. crispis*), American wild celery (*Vallisneria americana*), and common water nymph (*Najas guadalupensis*) (Harza 1993; Harza 2000; Meridian Environmental, Inc. and Harza 2001). Elodea is a native species found throughout most of Lake Washington. It is nodally rooting and forms large mats in shallow water, nearshore areas. Eurasian milfoil is a non-native species that first appeared in Lake Washington in the mid-1970s. This species spreads rapidly, and now dominates the aquatic macrophyte community in the nearshore areas of the lake (Harza 1993). According to Kerwin (2001), Eurasian milfoil has colonized a large percentage of the littoral zone and replaced much of the native aquatic vegetation present in littoral areas of Lake Washington. Curly-leaf pondweed also forms mats of vegetation in lakes and streams, and provides a large area of leaf surface. It is native to Europe, introduced in North America, and known to occur in both central and western Washington. American wild celery is also native to eastern North America; however, Hitchcock et al. (1969) notes that it was introduced into several lakes in Washington, including Lake Washington (Harza 1993). Common water nymph exists throughout Washington and is often found in ponds, lakes and sluggish streams to depths of 12 feet.

Table 4. Summary of April 9, 2005 SCUBA survey results (only transects 4 and 10 are within the current project site).

Transect Number	Survey Method and Station Number	Bearing	Distance (feet)	Depth (feet)	Substrate	Aquatic Macrophyte Density [a]	Aquatic Macrophyte Species	Comments / Fish Observations
1	Snorkel Survey	138°	115	0-2.6	Riprap cobble and sand	Low	*Elodea canadensis*	Visibility approximately 3.3 feet. No fish observed (used light to see into riprap areas)
2	Snorkel Survey	76°	180	0-3.3	Riprap cobble, sand, and gravel	None observed	None observed	Visibility approximately 2.6 feet. Two dead sticklebacks. One dead crayfish. No live fish observed. (Used light to see into riprap areas)
3	Snorkel Survey	230°	280	0-3.3	Riprap cobble, sand, and gravel	Low	Floating Eurasian Milfoil	Visibility approximately 3.3 feet. Two sculpin (alive) under riprap.
4	Snorkel Survey	115° and 70°	150	0-3.3	Riprap cobble, sand, and gravel	Low	*Elodea canadensis* and sparse Eurasian Milfoil (floating)	Approximately 150 coho fry, two sockeye salmon fry, and five Chinook salmon fry (see Figure 4). All salmonids were observed near the culvert outlet and under the existing dock structure. Pulses of turbid water out of the culvert appeared to attract salmon fry (actively feeding). One eight-inch-diameter western pond turtle was observed mid-transect. Visibility approximately 3.9 feet.
5	Snorkel Survey	180°	25	0-3.3	Rip-rap edges, gravel and sand mid-channel	None observed	None observed	No fish observed. Gravel extends out approximately 2.6 feet from riprap followed by sand at mid-channel. Sand substrate across approximately 90 percent of the channel.
6	Snorkel Survey	180°	35	0-3.9	Rip-rap edges, gravel and sand mid-channel	None observed	None observed	No fish observed. Sand across approximately 90 percent of the channel. Gravel and cobble on edges of channel only, near the toe of shore armor.
7	Snorkel Survey	180°	80	0-4.3	Rip-rap edges, gravel and sand mid-channel	None observed	None observed	No fish observed. Sand across approximately 90 percent of the channel. A "pit" measuring approximately 8.2 feet deep was observed at mid-transect. Gravel and cobble on edges of channel only, near the toe of shore armor.

Transect Number	Survey Method and Station Number	Bearing	Distance (feet)	Depth (feet)	Substrate	Aquatic Macrophyte Density [a]	Aquatic Macrophyte Species	Comments / Fish Observations
8	Snorkel Survey	180°	115	0-8.2	Rip-rap edges, gravel and sand mid-channel	None observed	None observed	No fish observed. Sand across approximately 90 percent of the channel.
9	SCUBA 1	180°	80	4.3	Silt	Moderate	*Elodea canadensis* and sparse Eurasian Milfoil	No fish observed. Numerous (1,000's) *Neomysis mercedis* (possum shrimp) observed throughout the transect.
9	SCUBA 2	180°	165	10.5	Silt	Moderate	Eurasian Milfoil, *Elodea canadensis*, and *Potamogeton crispis* (curly-leaf pondweed)	No fish observed. Numerous *Neomysis mercedis*.
9	SCUBA 3	180°	245	19.7	Silt	None observed	None observed	No fish observed. Numerous *Neomysis mercedis*.
10	SCUBA 1	90°	80	13.1	Silt	Moderate	*Elodea canadensis* and Eurasian Milfoil	One dead sculpin. No live fish observed. Numerous *Neomysis mercedis*. One freshwater mussel.
10	SCUBA 2	90°	165	10.5	Silt	Moderate	*Elodea canadensis* and Eurasian Milfoil	No fish observed. Numerous *Neomysis mercedis*.
10	SCUBA 3	90°	245	6.6-9.8	Silt/Sand	Low	*Elodea canadensis* and Eurasian Milfoil	No fish observed. Numerous *Neomysis mercedis*. Series of three pits measuring 6.6 to 9.8 feet deep located near the boat house entrance. Total transect length = 245 feet.

[a] Low = less than or equal to 10 stems per square yard.
Moderate = 11 to 100 stems per square yard.
High = greater than 100 stems per square yard.

Table 5. Summary of May 6, 2005 snorkel survey results (only transect 4 is within the current project site).

Transect Number	Survey Method / Station Number	Bearing	Distance (m)	Depth (m)	Substrate	Aquatic Macrophyte Density[a]	Aquatic Macrophyte Species	Comments / Fish Observations
1	Snorkel Survey	138°	115	0-3.9	Riprap cobble and sand	Low	*Elodea canadensis* and curly pondweed	Visibility approximately 4.9 feet. One large stickleback in riprap.
2	Snorkel Survey	76°	180	0-3.9	Riprap cobble, sand, and gravel	None observed	Soft rush along shoreline.	Visibility approximately 4.9 feet. One rainbow trout fry (using soft rush as cover), 2 coho salmon fry and 8 large sticklebacks using riprap as cover.
3	Snorkel Survey	230°	280	0-4.9	Riprap cobble, sand, and gravel	Low	None	Visibility approximately 3.9 feet. Five coho salmon fry, 2 rainbow trout fry and 12 sticklebacks using riprap as cover.
4	Snorkel Survey	115° and 70°	145	0-4.9	Riprap cobble, sand, and gravel	Low	*Elodea canadensis*	Visibility approximately 3.9 feet. Approximately 30 coho fry, 6 rainbow trout, and 20 sticklebacks. The majority of the coho and rainbow trout fry were observed near the culvert outlet and under the existing dock structure; however, additional coho and rainbow trout were observed using emergent vegetation as cover.

[a] Low = less than or equal to 10 stems per square yard.
Moderate = 11 to 100 stems per square yard.
High = greater than 100 stems per square yard.

Figure 4. Coho salmon juveniles feeding near the culvert outlet (eastern end of transect 4) located adjacent to the existing dock structure (2005 SCUBA survey).

Based on the results of underwater surveys conducted in 1993, 2000, and 2001 (Harza 1993; Harza 2000; Meridian Environmental, Inc. and Harza 2001), the distribution and abundance of these macrophyte communities fluctuates considerably on a seasonal basis. In general, high densities of elodea, Eurasian milfoil, and curly-leaf pondweed have been observed in the nearshore portion (depths less than 12 feet) during the summer months (Harza 2000). The highest abundance is typically seen in depths of 6 to 9 feet, especially in areas with sandier substrates. Along the deeper water transects (greater than 12 feet), the distribution of aquatic macrophytes is patchier and less abundant. Very few if any macrophytes are found in depths greater than 15 feet (Harza 1993 and 2000). During the winter and early spring the densities of these species are relatively low, as most of their growth occurs during the summer months.

In 2005, biologists observed low to moderate densities of elodea, Eurasian milfoil, and curly-leaf pondweed in the project vicinity (Table 4). Densities were highest along transects 9 and 10 at depths less than 12 feet (Figure 3) and lowest along transects 1, 3 and 4. No aquatic macrophytes were observed along transects 2, 5, 7, and 8 (Table 4). Overall, elodea was the dominant aquatic plant species both in distribution and abundance.

Shoreline Condition

As discussed previously, the littoral zone and shoreline of Lake Washington has been extensively modified in the past 150 years due to the change in lake level; construction of piers, docks, and bulkheads; removal of LWD; and the expansion of Eurasian milfoil and other non-native aquatic macrophytes (Fresh and Lucchetti 2000). The previously hardstem bulrush and willow-dominated shoreline community has been replaced by developed and hardened shorelines with landscaped yards. According to Toft (2001), an estimated 71 percent of the Lake Washington shoreline is armored with riprap or bulkheads and approximately 2,737 residential piers have been built. This loss of natural shoreline has reduced the occurrence of complex shoreline habitat features such as overhanging and emergent vegetation, woody debris (especially fallen trees with branches and/or rootwads intact), and gravel/cobble beaches, which has reduced the availability of refuge habitat and forage for juvenile salmonids.

Like most of the shoreline along Lake Washington, the shoreline in the proposed project area is armored with riprap; however, a very limited amount of emergent vegetation (soft rush, grasses, sedges, etc.) was observed growing along transect 4. In 2005, juvenile rainbow trout, coho salmon, and sticklebacks were observed using this emergent vegetation as cover along transect 4. Water depths in the areas dominated by riprap substrate range from 0 to approximately 3 feet deep.

<u>Substrate</u>

Riprap, cobble, sand and gravel were observed along transect 4 (outside proposed dreding zone); however, silt and sand were the only surficial substrates observed along transect 10 (within the proposed dredging zone).

Overall Aquatic Habitat Complexity

The dock, boat house, and culvert provide overhead cover for juvenile salmonids at depths less than approximately two feet; however, at depths greater than two feet, these structures likely provide cover for nonnative predators such as largemouth and smallmouth bass. The riprap shoreline surrounding the area may directly affect predation on juvenile salmonids by eliminating shallow-water refuge habitat or, indirectly, by the eliminating shoreline vegetation. The large interstitial spaces found within the riprap shoreline may also provide ambush habitat for large native sculpin (known to prey on juvenile salmonids). As discussed previously, overhanging riparian vegetation and emergent vegetation is extremely limited in the project area. In summary, the proposed project area would be considered poor juvenile salmonid rearing habitat due to the lack of overhanging vegetation and lack of shallow water structure such as shallow emergent vegetation and small woody debris (brush).

B. Environmental Baseline Matrix

For proposed actions that affect freshwater habitat, the Services usually define the biological requirements for listed species in terms of a concept called properly functioning condition (PFC). PFC is the sustained presence of natural habitat-forming processes in a watershed (e.g., riparian community succession, bedload transport, precipitation runoff pattern, channel migration) that are necessary for the long-term survival of the species through the full range of environmental variation. PFC, then, constitutes the habitat component of a species' biological requirements. The indicators of PFC vary between different landscapes based on unique physiographic and geologic features. For example, aquatic habitats on timberlands in glacial mountain valleys are controlled by natural processes operating at different scales and rates than are habitats on low-elevation coastal rivers or lake systems.

In the NMFS PFC framework, baseline environmental conditions are described as “properly functioning” (PFC), “at risk” (AR), or “not properly functioning” (NPF). USFWS also has a PFC framework that defines baseline environmental conditions in terms of “functioning appropriately” (FA), “functioning at risk” (AR), or “functioning at unacceptable risk” (UR). The PFC concept includes a recognition that natural patterns of habitat disturbance will continue to occur. For example, floods, landslides, wind damage, and wildfires result in spatial and temporal variability in habitat characteristics, as will anthropogenic perturbations. If a proposed project would be likely to impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat toward PFC, it will usually be found likely to jeopardize the continued existence of the species or adversely modify its critical habitat, or both, depending upon the specific considerations of the analysis. Such considerations may include, for example, the species’ status, the condition of the environmental baseline, the particular reasons for listing the species, any new threats that have arisen since listing, and the quality of the available information.

In this section of the BA, we summarize existing environmental conditions and parameters for the action area, and present the status of each indicator as PFC, AR, or NPF following the NMFS and USFWS "pathways and indicators" matrices (Table 6). For the purposes of this analysis we have integrated the NMFS and USFWS matrices in order to facilitate an analysis of the effects of the proposed project on bull trout, steelhead, and Chinook salmon simultaneously. For consistency we have used the terms PFC, AR, or NPF (NMFS terminology) for rating specific environmental indicators applicable to bull trout from the USFWS (1998) matrix. For practical purposes, PFC, AR, or NPF (NMFS terminology) are equivalent to FA, AR, and UR (USFWS terminology). Criteria for PFC, AR and NPF are described in detail in NMFS (1996) and USFWS (1998), but summarized for each indicator following Table 6 along with justification for the status of each indicator in the action area. The effects that the proposed project may have on each environmental indicator are analyzed subsequently in Section V(E).

It is important to note that the current status of a particular environmental indicator may not be related to a proposed project. For example, road density in the Lake Washington basin may rate as “not properly functioning” under existing conditions even though the proposed project has no influence on this indicator. In addition, the 1996 NMFS matrix was originally designed by the U.S. Forest Service to evaluate timber harvest activities on rangeland watersheds. Therefore, not all of the parameters below are necessarily applicable to the small spatial scale of the proposed project, although it is still a useful tool in characterizing the baseline conditions, which can be used to assess potential effects of the proposed project.

Table 6. Matrix of indicators and pathways for documenting the environmental baseline on relevant indicators.

Pathway Indicators	Baseline Environmental Conditions		
	Function	**Description**	**Cause of Degradation from PFC**
Water Quality			
Temperature	NPF	High water temperatures present during bull trout spawning, incubation, and migration, and during Chinook and steelhead spawning, rearing, and migration	Loss of riparian vegetation due to development; natural low watershed elevation
Sediment/Turbidity	NPF	High sediment loads in May Creek and Lake Washington	Increased runoff due to development has increased bank erosion and sediment transport in May Creek and resultant fine sediment in the project area of Lake Washington
Chemical Contamination/ Nutrients	NPF	303(d) reaches present	Residential and commercial development has increased polluted runoff (point and non-point sources), agricultural / hobby farm run-off to May Creek, which flows into the lake adjacent to the project site
Habitat Access			
Physical Barriers	AR	Man-made instream structures present	Ballard Locks is a predation bottleneck and is a quick transition between salt and freshwaters, which is undesirable for salmon smolts
Habitat Elements			
Substrate	NPF	High fine sediment loads in May Creek and Lake Washington	Increased runoff due to development has increased bank erosion and sediment transport in May Creek and resultant sediment accumulation in the lake at the project site
Large Woody Debris	NPF	Little LWD along the lake shore	Development, historic wood removal, loss of riparian forest
Pool Frequency and Quality	NPF	NA not applicable to lake habitat type	NA
Off-Channel Habitat	NPF	Little if any wetland/off-channel habitat present along the lake shore	Wetland degradation and wetland loss due to development, lowering of Lake Washington
Refugia	NPF	No pristine PFC aquatic habitat present in the action area	Wide -scale urbanization has degraded the Lake Washington subbasin

Pathway Indicators	**Baseline Environmental Conditions**		
	Function	**Description**	**Cause of Degradation from PFC**
Channel Conditions and Dynamics			
Width/Depth Ratio	NPF	NA (not applicable) to lake habitat type	NA
Streambank Condition	NPF	Lake Washington's shore is extensively hardened with bulk-heads and piers	Shoreline armoring along the lake for residential and commercial development
Floodplain Connectivity	NPF	Limited floodplain connectivity	Lake Washington was lowered, permanently dewatering shallow wetlands and lake margin habitat.
Flow/Hydrology			
Change in Peak/Base Flow	NPF	Not applicable to lake habitat type	NA
Increase in Drainage Network	NPF	Not applicable to lake habitat type	NA
Watershed Conditions			
Road Density and Location	NPF	High road density	Lake Washington is a highly urbanized area with a well developed road network
Disturbance History	NPF	Massive human caused landscape altering events have occurred	Diversion of the Cedar River, lowering of Lake Washington and general urbanization have dramatically altered the historic landscape
Riparian Reserves	NPF	Few forested areas compared to historic conditions	Wide-spread clearing in the Lake Washington subbasin
Local Population Characteristics (bull trout only; USFWS matrix criteria)			
Population Size	NA	No local bull trout subpopulation in the action area, although foraging individuals may be present from other basins such as the Snohomish and Stillaguamish, or from the upper Cedar River	No bull trout subpopulations are known or suspected to occur in May Creek; the Cedar River population is resident above a natural barrier and was not historically connected to Lake Washington
Growth and Survival	NA	Same as above	Same as above
Life History Diversity and Isolation	NA	Same as above	Same as above
Persistence and Genetic Integrity	NA	Same as above	Same as above

NA = Not Applicable

Water Temperature

For Chinook and steelhead, NMFS (1996) defines PFC as water temperatures ranging from 50 to 57°F. AR conditions range from 57 to 60°F for spawning and from 57 to 64 °

for migration and rearing. NPF is defined as greater than 60°F for spawning and greater than 64°F for rearing. USFWS (1998) defines PFC for bull trout as water temperatures ranging from 35.6 to 41°F for incubation, 39.2 to 53.6°F for rearing, and 39.2 to 48.2°F for spawning. NPF is defined as temperatures outside the above criteria, with rearing areas and migration corridor temperatures over 59°F.

Water temperatures in the area (East Mercer Channel) are generally below 50°F during the winter and between 62 to 75°F during the summer at depths of 3.3 feet. At a depth of 33 feet, water temperatures are about 45°F in the winter and between 59° and 68°F during the summer (http://dnr.metrokc.gov/wlr/waterres/lakes/site0840.htm). Under the USFWS (1998) criteria these values would rate as NPF for bull trout spawning and incubation and summer migration corridors. Under the NMFS (1996) criteria, these values would rate between NPF and AR for Chinook and steelhead spawning, rearing and migration.

Sediment/Turbidity

NMFS (1996) and USFWS (1998) define PFC as containing less than 12 percent fines in gravel, and NPF is defined as having greater than 17 percent surface fines (greater than 20 percent surface fines under USFWS 1998).

The project area surficial substrate in the dredging zone is composed of silt and sand (transect 10). This condition is likely caused by the increased erosion and sedimentation deposition occurring in May Creek and in the May Creek delta. According to King County (2001), sediment deposition has occurred from natural erosion but has been accelerated by increased storm water runoff from upstream development and changes in the watershed land cover. Based on the documentation of increased erosion and sedimentation, this indicator is likely NPF.

Chemical Contamination/Nutrients

NMFS (1996) and USFWS (1998) define PFC as characterized by low levels of contamination with no 303(d) designated reaches, and NPF is defined as high levels of chemical contamination and nutrients and more than one 303(d) listed reach.

Lake Washington is a 303(d) water body for fecal coliform concentrations. In addition, WDOE has given several public warnings regarding Lake Washington fish consumption due to high levels of mercury contamination (WDOH 2004). Based on known water quality degradation in Lake Washington, this indicator rates as NPF.

Physical Barriers

NMFS (1996) and USFWS (1998) define PFC as man-made barriers that allow upstream and downstream passage at all flows without significant levels of mortality or delay, and NPF as man-made barriers that do not allow upstream and downstream fish passage at a range of flows.

The fish passage facilities at the Ballard Locks provide adult access to Lake Washington and smolt passage to the Puget Sound; however, the Locks are a predation bottleneck.

Heavy seal predation on adult salmon at the Locks is a common and recurring problem. In addition, the sharp demarcation between the fresh and saltwater environments at the Lake Washington outlet is likely a stressor for juvenile salmonid out-migrants. Therefore, the “Physical Barriers” indicator should be considered AR.

Substrate

NMFS (1996) and USFWS (1998) define PFC as reach embeddedness of less than 20 percent and NPF as embeddedness greater than 30 percent.

The substrate in the project area is comprised of sand and silt based on SCUBA surveys. According to King County (2001) fine sediment deposition in lower May Creek is an ongoing problem. This fine sediment is transported immediately to the south to the boat house area by wave action. Based on chronic fine sediment deposition in lower May Creek and the boat house area, this indicator rates as NPF.

Large Woody Debris

NMFS (1996) and USFWS (1998) define PFC as greater than 80 pieces of wood per mile, which are greater than 24 inches in diameter and greater than 50 feet long. NPF is defined as wood that does not meet the criteria of PFC and sources of LWD recruitment are lacking.

Surveys of the project area found no LWD in the project area (Harza 1993; Harza 2000; Meridian Environmental and Harza 2001). Therefore, this indicator rates as NPF.

Off-channel Habitat

NMFS (1996) and USFWS (1998) define PFC for off-channel habitat as many backwaters with cover and low energy, off-channel areas, including ponds and oxbows. NPF is defined as a watershed with few or none of these habitat types.

Lowering of Lake Washington in the early 1900s resulted in the loss of over ten miles of shoreline and approximately 1,000 acres of wetlands. Shallow lake margins and wetlands are generally considered to be high quality and preferred habitats for juvenile salmonids such as Chinook and coho salmon. Based on loss of wetlands this indicator rates as NPF.

Refugia

NMFS (1996) defines PFC for refugia as habitat refugia that is adequately buffered by intact riparian reservesand that is sufficient in size, number and connectivity to maintain viable populations and subpopulations. NPF is defined as adequate habitat refugia that do not exist.

USFWS (1998) defines PFC for refugia as habitats capable of supporting strong and significant populations of bull trout that are protected, well distributed, and connected for all life stages and forms. NPF is defined as the absence of habitat and refugia.

The action area has been extensively altered over the past 100 years by human development and the Lake Washington/Cedar/Sammamish watershed is likely one of the most highly disturbed urban watersheds in the state. Although adequate bull trout habitat exists in the upper Cedar River, no bull trout refugia exists in the action area due to high summer water temperatures. The action area also lacks adequate local refugia for Chinook and steelhead due to extensive riparian, instream, and shoreline habitat alterations. Therefore, this indicator rates as NPF.

Streambank Condition

NMFS (1996) defines PFC as greater than 90 percent (80 percent under USFWS criteria) of any stream reach of which 90 percent or more is stable NPF is defined as less than 80 percent stability. The USFWS (1998) defines NPF as less than 50 percent of any stream reach that is characterized as at least 90 percent stable.

The shoreline along the action area is developed and bulkheaded. The banks are not actively eroding, but the bulkheads have disrupted natural shoreline processes. In addition, over 2,700 piers extend into Lake Washington. Lowering of the lake in the early 1900s substantially altered the Lake Washington shoreline, resulting in the loss of approximately 10 miles of lake shore perimeter. Due to extensive alteration of the Lake Washington shoreline, this indicator rates as NPF.

Floodplain Connectivity

NMFS (1996) and USFWS (1998) define PFC as well-connected, off-channel areas with overbank flows of sufficient frequency to maintain function. NPF is defined as a severe reduction in hydrologic connection with off-channel habitats.

Lake Washington has been lowered, disconnecting the mouths of streams from their floodplains. Therefore this indicator rates as NPF.

Road Density and Location

NMFS (1996) and USFWS (1998) define PFC as less than 1 mile of road per square mile with no valley bottom roads and NPF as greater than 2.4 miles of road per square mile with many valley bottom roads.

The action area has been heavily urbanized and has a well developed road network. Road densities, although not estimated for this analysis, likely rate as NPF.

Disturbance History

NMFS (1996) and USFWS (1998) define PFC as having less than 15 percent equivalent clear-cut area (entire watershed) with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area; and for Northwest Forest Plan area (except adaptive management areas), 15 percent retention of late successional old growth timber in the watershed.

The “Disturbance History” indicator rates as NPF based on extensive historic and ongoing development.

Riparian Reserves

NMFS (1996) and USFWS (1998) define PFC as a riparian reserve system that provides adequate shade, LWD recruitment, habitat protection, and connectivity to all sub-watersheds. This reserve must be greater than 80 percent intact and the vegetation must be greater than 50 percent similar to the potential natural community composition.

Riparian habitat in the action area along Lake Washington has been highly altered and extensively cleared, primarily for residential development. This indicator rates as NPF.

Population Size

USFWS (1998) defines FA as the mean subpopulation size or a local habitat capacity of more than several thousand individuals and all life stages evenly represented in the subpopulation. AR is defined as fewer than 500 adults in subpopulation but more than 50.

The Lake Chester Morse bull trout population in the upper Cedar River would be classified as FA under the USFWS criteria; however, this is a naturally resident population located upstream of a passage barrier. In addition, the Cedar River historically was not connected to Lake Washington. There are no known current or historic (but now extinct) bull trout populations located within the Lake Washington basin, except for the Chester Morse population. However, it appears that individuals from the Chester Morse population may pass downstream into Lake Washington and that anadromous bull trout migrate to the Lake Washington vicinity from other basins such as the Stillaguamish, Snohomish, and possibly the Skagit River basins.

Bull trout typically exhibit a patchy distribution, even in pristine watersheds. There is no indication that a bull trout population historically would have occupied May Creek. Generally, self sustaining local bull trout subpopulations are only found in watersheds that have accessible stream habitat above the average winter snow line (where winter snowpack accumulates) which is approximately 900 feet in western Washington (USFWS 2004). The May Creek watershed headwaters only extend to an elevation of approximately 500 feet, with no areas of winter snowpack accumulation. Bull trout spawning in May Creek would not be expected currently or historically because the water temperature regime is likely too warm due to the low elevation and lack of substantial cold springs, glaciers, or winter snowpack. As there is no current or historic local self-sustaining bull trout population or subpopulation indigenous to the action area, this indicator is not applicable.

Growth and Survival

USFWS (1998) defines FA as a subpopulation with the resilience to recover from short-term disturbances in 5 to 10 years. Additionally, the subpopulation is increasing or stable, with at least 10 years of data to support such a trend.

As discussed above, there is no known current or historic bull trout subpopulation indigenous to the action area, therefore this indicator is not applicable.

Life History Diversity and Isolation

USFWS (1998) defines FA as presence of the migratory form with subpopulations in close proximity to other spawning and rearing groups. There is high likelihood of neighboring subpopulations straying and adults mixing with other groups. UR is defined as an absence of the migratory form and the subpopulation is isolated to a local stream and unlikely to support more than 2,000 fish.

As discussed above, there is no known current or historic bull trout subpopulation indigenous to the action area; therefore, this indicator is not applicable. While this indicator is meant to apply to local subpopulations within an action area, there may be migratory bull trout straying from other basins, such as the Snohomish and Stillaguamish River basins or the upper Cedar River.

Persistence and Genetic Integrity

USFWS (1998) defines FA as possessing high connectivity among more than five subpopulations with at least several thousand fish each. UR is defined as having little or no connectivity and subpopulations that are in low numbers or in decline. As discussed above, there is no known current or historic bull trout subpopulation indigenous to the action area; therefore, this indicator is not applicable.

V. EFFECTS OF THE ACTION ON FISH SPECIES

"Effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Effects of the action that reduce the ability of a listed species to meet its biological requirements may increase the likelihood that the proposed action will result in jeopardy to that listed species or in destruction or adverse modification of a designated critical habitat.

The proposed action may affect Chinook, steelhead, and bull trout by causing physical changes to the environmental baseline and through indirect effects to the species. These effects may impact migrating and rearing juvenile Chinook and steelhead within the action area. The major concern of the proposed action is the alteration of Chinook and bull trout critical habitat caused by dredging. The proposed action includes dredging, creosote pile replacement, fish rock placement, vegetation enhancement, and associated construction activities to render the boat house and two floating docks more "fish friendly".

A. Direct Effects

In this section we analyze the direct effects of the proposed project on three primary elements that may be influenced by the action. These elements are direct effects on individual fish, such as harassment or actual mortality through contact with the dredging equipment and pile removal/replacement; direct effects on habitat by physically disturbing the substrate and removing sediments from the boat house area; and direct effects on water quality during dredging and fish rock placement.

Direct Effects on Fish

Take of bull trout in the near-shore area of Lake Washington during the summer is extremely unlikely. Water quality monitoring in 2002 (within the silt curtain of the dredging zone and immediately outside the silt curtain) strongly suggest that water temperatures during July and August (proposed dredge timing) exceed the generally reported upper limit of bull trout temperature tolerance of approximately 59°F. Recently, bull trout in northeast Oregon tagged with radio transmitters and temperature loggers suggested that some bull trout may use waters up to approximately 62 to 64°F (Howell et al. 2005). However, temperatures in the dredging zone (within the silt curtain) from July to late September 2002 exceeded 65°F and averaged 69.4°F. Due to probable high water temperatures outside the species tolerance range in the dredging zone during summer, it would be extremely unlikely for bull trout to be present in the dredging area and, therefore, take of individual bull trout is not expected. Bull trout are unlikely to be present in the fall due to low abundance and their tendency to migrate to headwater spawning sites in the fall (Goetz et al. 2004).

Adult Chinook typically migrate into Lake Washington at the Ballard Locks in mid-June, peaking in late-August (Kerwin 2001). Spawning typically occurs from mid-September through November (Kerwin 2001). Juvenile Chinook rearing occurs from approximately January through June (Kerwin 2001). Most juvenile Chinook move through the Ballard Locks by the end of June, although the entire out-migration period is unknown (Kerwin 2001). Although the proposed in-water work window of mid-July to the end of December is the period approved by WDFW to limit impacts to migrating adult and juvenile Chinook salmon, this time period overlaps with the latter part of the juvenile Chinook rearing and out-migration period and with the beginning of the adult migration period. Therefore, there is some chance that adult or juvenile Chinook salmon may be present in the dredging zone and may be temporarily harassed and displaced by dredging activities. However, it is anticipated that juvenile and adult Chinook would avoid direct contact with the clamshell dredging equipment, and would not be physically injured or killed by the dredging activities.

Coho begin entering Lake Washington in late-August and continue to enter the lake through early December. Most coho spawning occurs in November and December (Kerwin 2001). Juvenile coho typically rear for 12 to 14 months in freshwater. In Lake Washington, the peak of the outmigration occurs in early May (Kerwin 2001). Juvenile coho have been observed in the May Creek delta and adult coho are known to spawn in May Creek in the fall. The proposed dredging period, while optimally designed to avoid the presence of juvenile and adult anadromous salmonids, does overlap with the coho rearing and out-migration time and adult coho migration. It is most likely that coho juveniles may be present during dredging and may be temporarily displaced, but as with Chinook, it is not anticipated that coho would come into direct contact with dredging equipment and be physically injured or killed.

Adult steelhead spawn from mid-December through early June in the Lake Washington basin. Adults migrate to spawning grounds beginning in the fall. Adult steelhead do not necessarily die after spawning and post-spawn adults (kelts) migrate downstream back to saltwater after spawning. Therefore, adult steelhead could be present in Lake Washington from the fall through the early summer. Juveniles can spend several years in freshwater before migrating to saltwater. Therefore, juvenile steelhead could be present in Lake Washington all year. Similar to Chinook and coho, there is some chance that adult or juvenile steelhead may be present in the dredging zone and may be temporarily harassed and displaced by dredging activities. However, it is anticipated that adult and juvenile steelhead would avoid direct contact with the clamshell dredging equipment, and would not be physically injured or killed by the dredging activities.

Direct Effects on Habitat

It is apparent from Tabor et al. (2004) that juvenile Chinook salmon in the south end of Lake Washington prefer shallow (1 to 2 feet in depth) stream delta habitat with sand and gravel substrates. Delta habitat would not be dredged as part of the proposed project. In addition, the dredging zone is already greater than the depths preferred by rearing juvenile Chinook (i.e. 1 to 2 feet deep). Currently, the aquatic habitat located around the May Creek delta and along the shoreline of the lake to the south is not heavily used by juvenile Chinook (Tabor et al., 2004 and Table 4). Even though the proposed project would impact shoreline habitats that are not known to be preferred by juvenile Chinook, the project proponent would enhance the lake shore margin with a "fish rock" gravel mix to create additional shallow water habitat, which Tabor et al. (2004) suggests might be preferred by rearing Chinook.

Furthermore, to mitigate any potential dredging affects on juvenile Chinook habitat, the project proponent would renovate the boat house to meet current WDFW and NMFS recommendations. The primary purpose is to substantially increase light penetration. The current boat house and floating docks are composed of materials that allow essentially no light penetration.

Similar information regarding juvenile steelhead and coho use of Lake Washington shoreline habitat is not available; however, many rainbow trout (same species as steelhead) and coho were observed by Tabor et al. (2004) and during the SCUBA surveys conducted in 2005. Based on the SCUBA survey observations, it appears that a deepened boat house area would not necessarily be less preferred than a shallow delta for juvenile steelhead and coho.

Due to the overall lack of abundance and information concerning habitat use by bull trout in Lake Washington, effects of dredging on bull trout habitat use is unknown, but is suspected to be negligible.

The effect on forage species habitat is likewise unknown, but due to the relatively small area, the effect is suspected to be very small.

Direct Effects on Water Quality

The proposed dredging project has the potential to increase turbidity (i.e. reduce water clarity) and increase total suspended solids (TSS) within and near the proposed action area. Replacement of the 18 creosote pilings also has the potential to increase turbidity. Turbidity and TSS levels have been reported to cause physiological stress, reduce growth, and adversely affect salmonid survival. The potential for adverse effects depends upon several factors including: the duration of TSS increases, the area of the turbidity plume, the amount and velocity of ambient water (dilution factor), the size of suspended sediments, and other factors. In the case of the proposed project, increases in suspended sediments and turbidity would be localized at the point of dredging and increases would last for only short periods of time, expected to be less than several hours.

Evidence suggests that salmonids are well adapted to short term increases in turbidity, as such conditions are frequently experienced in natural settings as a result of storms, landslides, or other natural phenomena (Redding et al. 1987; NMFS 2003). It is chronic exposure to increased turbidity that has been found to be the most potentially damaging to salmonids (The Watershed Company et al. 2000). Studies have found that when habitat space is not limiting, salmonids will move to avoid localized areas of increased turbidity, thereby alleviating the potential for adverse physiological impacts (Bisson and Bilby 1982; NMFS 2003). Juvenile salmon have been shown to avoid areas of unacceptably high turbidity (Servizi and Martens 1991), although they may seek out areas of moderate turbidity (10 to 80 NTU), presumably as cover against predation (Cyrus and Blaber 1987a, 1987b). Studies have found that fish that inhabit waters with elevated TSS may experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998). In such cases, salmonids may actually increase foraging activity, as they use turbid water as a sort of cover from predators (Gregory 1993). However, feeding efficiency of juveniles is impaired by turbidities in excess of 70 NTU, well below sublethal stress levels (Bisson and Bilby 1982). Reduced preference by adult salmon returning to spawn has been demonstrated where turbidities exceed 30 NTU (20 mg/L suspended sediments); however, Chinook salmon exposed to 650 mg/L of suspended volcanic ash were still able to find their natal streams (Whitman et al. 1982).

The highest turbidity values recorded during the most recent dredging activity in 2002 were less than 7 NTU, and turbidity measured in the dredging zone was on average less than 1 NTU greater than turbidity outside the dredging zone (Table 7 and Appendix B). Overall turbidity values of less than 7 NTU are very low, and the effect of slightly increasing turbidity by 1 or 2 NTU on listed fish species should be considered discountable. Washington state water quality regulations allow a short term increase of 10 NTU when background turbidity is less than 50 NTU (WAC 273-201A-030). Based on the 2002 monitoring results, future dredging would likely meet this standard.

Based on these data and the scientific literature cited above, it is unlikely that the short-term (7 to 10 days every 3 to 5 years) and localized elevation of turbidity (less than 5 NTU elevation above background turbidity levels) generated by the proposed project would rise to the levels that would be expected to cause harm to Chinook, steelhead, or bull trout that may be present in the dredging zone.

Table 7. Turbidity monitoring during 2002 May Creek delta dredging (11 days of sampling over the dredging period).

	Within silt curtain (in dredge zone)	Outside silt curtain (out of dredge zone)
Minimum	1.1 NTU	1.1 NTU
Average	2.1 NTU	1.4 NTU
Maximum	5.2 NTU	3.1 NTU

In-water work such as dredging and piling replacement also has the potential to degrade water quality though the spill of toxic substances, such as fuel or hydraulic fluid from dredging or pile placement equipment. This potential is best reduced by maintaining equipment in proper working condition and by maintaining a spill prevention control and countermeasure plan (SPCCP). Typically, a SPCCP would specify areas for equipment maintenance and refueling, spill prevention and emergency response strategies, requirements for keeping emergency response spill containment kits onsite, and for having trained personnel be onsite during in-water work. A SPCCP would be developed by the dredging contractor and approved by appropriate agencies, such as the WDOE, before dredging occurs. Preparation of a SPCCP would limit the potential for toxic material spills during dredging and pile replacement.

Direct Effects on Bald Eagles

Bald eagles are known to use the southeastern tip of Mercer Island for nesting, within one mile of the proposed project. The nearest nest is approximately 0.75 miles to the west. WDFW conducted several studies in the 1990s on the ecology of bald eagle in western Washington with an emphasis on the effects of human activity (WDFW 1998). These results indicate that noise disturbance from construction and machinery has little impact on bald eagle nest success. Based on this information, WDFW no longer has a requirement to limit construction noise in the winter during eagle nesting and roosting, although the work timing restrictions are recommended.

WDFW's current bald eagle management strategy focuses on the retention of significant trees that may be used for perching, nesting, or roosting. No trees would be affected during dredging. In addition, the dredging would be conducted in the summer after nesting is complete and, therefore, would be consistent with the recommended bald eagle work timing restrictions. Currently, no work type or timing restrictions are recommended for projects located greater than 0.25 miles from nesting sites, except for pile driving. The proposed dredging project is located more than 0.5 mile from known nesting sites, would not include pile driving, and would not disturb any trees. Therefore, the proposed project is assumed to have no impact on bald eagle nesting or roosting habitats or nesting success.

Timing restrictions are also recommended for work within 0.25 mile of bald eagle roosting, perching, or feeding habitat. As bald eagle nests are located within one mile of the project site, it is possible that they may forage (feed) within 0.25 mile of the project. If a project is within 0.25 mile of bald eagle foraging habitat, no construction is allowed from October 31 to March 31. Dredging would occur between July 15 and December 31, and therefore, may overlap with this timing recommendation. Due to the highly urbanized nature of the project site and south Lake Washington area, eagles that may be present in the action area are likely habituated to human activity and therefore, the proposed project is assumed to have no impact on bald eagle roosting, perching, or foraging.

B. Indirect Effects

Indirect effects could affect the Chinook, bull trout, steelhead and coho prey base (e.g. aquatic macroinvertebrates and small forage fish), or through the creation of deep water habitat conditions that favor species known to prey on juvenile salmonids (i.e. large trout, bass, and sculpin). ESA-listed salmonids feed on certain macroinvertebrates, and therefore any loss of these prey items via dredging or disposal may harm these species. However, these effects would be localized to deepwater areas of low importance to these species. As a result, short-term impacts to macroinvertebrate abundance and diversity are likely to be limited. In addition, the establishment of overhanging riparian vegetation would likely increase the abundance and rate of terrestrial insects falling into the shallow margins of the lake to some degree, which would result in an increase in the juvenile salmonid prey base along the lake margin.

Indirect effects on bald eagles would primarily arise through impacts on their forage base, such as salmon. Although the project may adversely affect Chinook and coho salmon individuals in the action area, this effect is not anticipated to rise to the level that would cause a perceptible decline in the bald eagle forage base within the south Lake Washington area. Of note is that the May Creek delta area has been dredged for more than 50 years. Over the last 30 years, bald eagle abundance in Puget Sound has substantially increased (WDFW 1998), giving evidence that continuation of the May Creek delta dredging would not adversely affect bald eagles at the population level.

C. Effects from Interdependent and Interrelated Actions

No interdependent or interrelated actions have been identified in association with the proposed dredging and boat house renovation project.

D. Effects from Ongoing Project Activities

These effects are the same as previously described under direct effects of dredging. The only ongoing portion of the proposed project would be the periodic dredging of the boat house area to maintain navigational depths every 3 to 5 years.

E. Description of How the Environmental Baseline would be Affected

As discussed previously, the PFC framework for ESA consultation characterizes baseline environmental conditions as "properly functioning," "at risk," or "not properly functioning." If a proposed project is likely to impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat toward PFC, it is usually found likely to jeopardize the continued existence of the species, or adversely modify its critical habitat, or both, depending on the specific consideration of the analysis. Such considerations may include, for example, the species' status, the condition of the environmental baseline, the particular reasons for listing the species, any new threats that have arisen since listing, and the quality of available information. Actions that do not compromise a species' biological requirements to the degree that appreciably reduces the species' viability and chances of survival in the action area are considered not to reduce or retard.

The project would provide an overall increase in water quality by removal of the toxic creosote pilings, increasing primary productivity and the fish forage base within the lake by increasing light transmission, increasing shoreline edge shallow water habitat, and increasing overhanging vegetation compared to existing conditions. Therefore, the proposed project would result in an overall improvement to the aquatic habitat environmental baseline of Lake Washington.

F. Cumulative Effects

Cumulative effects are defined in 50 CFR § 402.02 as "those effects of future State, tribal, local or private actions, not involving Federal activities, that are reasonably certain to occur in the action area." All areas within approximately one mile of the May Creek delta could be affected cumulatively by the proposed action. Potential cumulative effects may arise due to increased development in the action area. Expansion of the local economy and diversification will likely contribute to population growth. This growth is expected to increase demand for electricity, water, and buildable land in the action area which will, in turn, increase demand for transportation, communication and other social infrastructure. These actions will affect habitat features such as water quality and quantity which will directly affect the listed aquatic species. This is currently evidenced by the fact that runoff, erosion, and sedimentation has increased in May Creek as development has increased (King County 2001). It is expected that this trend would continue and be further exacerbated as additional development and as impervious surfaces increase upstream in the watershed. As sediment deposition increases in the delta due to future development in the upper May Creek watershed and sediment is transported to the boat house area by wave action, more frequent dredging of the boat house area may be required to maintain navigational depths.

G. Take Analysis

Due to the overall lack of migratory bull trout within the Lake Washington basin, take of bull trout as a result of the proposed project is extremely unlikely. Steelhead and Chinook could easily avoid the dredging and pile placement zone; therefore, direct mortality of these species is not expected. The potential displacement of a few Chinook should not be considered harassment because the attributes of the boat house zone are not considered as preferred habitat for Chinook following the results of Tabor et al. (2004). Similarly, potential displacement of a few steelhead should not be considered harassment as there appears to be ample nearby habitat of similar condition which any displaced steelhead could occupy. Therefore, take of Chinook and steelhead should be considered discountable.

H. Critical Habitat Effects Analysis

This critical habitat analysis determines whether the proposed project would destroy or adversely modify designated critical habitat for listed species by examining any change in the conservation value of the essential features of that critical habitat. This analysis relies on statutory provisions of the ESA, including those in Section 3 that define “critical habitat” and “conservation,” in Section 4 that describe the designation process in Section 7 that sets forth the substantive protections and procedural aspects of consultation, and on agency guidance for application of the “destruction or adverse modification” standard. With respect to designated critical habitat, the following analysis relies only on the statutory provisions of the ESA, and not on the regulatory definition of “destruction or adverse modification” at 50 CFR 402.02.

The action area is designated critical habitat for Chinook. Juvenile Chinook may use the boat house area for foraging and rearing and adult Chinook may use the area as a migration corridor. The proposed project would have no influence on the ability of adult Chinook to migrate to spawning tributaries. Furthermore, current habitat conditions would not be considered optimal for juvenile Chinook rearing (Tabor et al. 2004). The proposed project would improve habitat conditions for rearing juvenile Chinook by creating additional shallow water shoreline areas and by increasing overhanging vegetation to some degree by adding native vegetation to the shoreline south of the boat house. Primary productivity and the fish forage base would be improved by allowing greater light penetration to the lake bed substrate by renovating the boat house and floating docks with light transmitting materials.

While the effects of this project may temporarily affect water quality through increased turbidity and reduce the fish forage base by removing lake sediments that contain benthic invertebrate, overall these attributes would be improved by increasing primary productivity by increasing light transmission, removing the toxic creosote pilings, and enhancing shallow water habitats with gravel and overhanging vegetation. Therefore, the proposed project would not result in long-term destruction or adverse modification of designated Chinook salmon critical habitat, but would result in a net improvement of critical habitat.

Due to the very small project area, and overall lack of migratory bull trout juveniles or adults within the Lake Washington basin, we conclude that bull trout critical habitat primary constituent elements would not be affected by the proposed project. Designated bull trout critical habitat would not be destroyed or adversely modified.

VI. EFFECTS DETERMINATION FOR LISTED SPECIES AND DESIGNATED CRITICAL HABITAT

The primary objective of this BA is to determine the effect that the proposed project would have on ESA listed Chinook salmon, steelhead, bull trout, and bald eagles. This determination will be used by NMFS and USFWS to determine whether the proposed project is likely to jeopardize the continued existence of the listed species or to adversely modify their critical habitats (if applicable). To facilitate and standardize the determination of effects for ESA consultations, the Services use the following definitions for listed species (USFWS and NMFS 1998):

No effect: This determination is only appropriate "if the proposed project will literally have no effect whatsoever on the species and/or critical habitat, not a small effect or an effect that is unlikely to occur." Furthermore, actions that result in a "beneficial effect" do not qualify as a no-effect determination.

May affect, not likely to adversely affect: The appropriate conclusion when effects on the species or critical habitat are expected to be beneficial, discountable, or insignificant. Beneficial effects have contemporaneous positive effects without any adverse effects to the species or habitat.

May affect, likely to adversely affect: The appropriate conclusion when there is "more than a negligible potential to have adverse effects on the species or critical habitat." In the event the overall effect of the proposed project is beneficial to the listed species or critical habitat, but may also cause some adverse effects to individuals of the listed species or segments of the critical habitat, then the proposed project is "likely to adversely affect" the listed species or critical habitat. It is not possible for NMFS to concur on a "not likely to adversely affect" determination if the proposed project will cause harm to the listed species.

Implementation of the conservation measures included in the proposed project would benefit listed Chinook, steelhead, and bull trout by increasing shallow water overhanging vegetation, light penetration and primary productivity, and increasing shoreline shallow water habitat, which has been shown to be used more by juvenile Chinook when compared to existing conditions of the boat house area. Take of any species is unlikely, and designated bull trout and Chinook critical habitat would not be destroyed or adversely modified. Therefore, the proposed project "may affect", but is "not likely to adversely affect" Chinook, steelhead, and bull trout.

The proposed project has been evaluated for potential impacts to bald eagle nest sites, roost sites, foraging areas, and forage base. No significant trees for roosting, perching, or nesting would be affected by the proposed project; no trees of any kind would be disturbed. In addition, the project would likely have no measurable impact on the eagle forage base. The project would also be conducted during the approved work time to limit impacts on bald eagle roosting, perching, and foraging. However, a "no affect" determination cannot be made in this case since there is a small chance that foraging bald eagles may be disturbed during construction. This potential for disturbance should be considered discountable due to the overall high level of background noise and disturbance present in the vicinity of the project derived from general human activity within the highly urbanized action area. Take of bald eagles is extremely unlikely. Therefore, the proposed project "may affect", but is "not likely to adversely affect" the bald eagle.

VII. ESSENTIAL FISH HABITAT

The MSA established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. Pursuant to the MSA, federal agencies must consult with NMFS on all actions or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (Section 305(b)(2)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting this definition of EFH, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). "Adverse effect" means any impact that reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

An EFH consultation with NMFS is required for any federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities. The objectives of this EFH consultation are to determine whether the proposed project would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

A. Description of the Proposed Action

The proposed project and action area are described in Section II of this document.

B. Appropriate Fisheries Management Plan(s)

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: Chinook, coho, and Puget Sound pink salmon (PFMC 1999). Freshwater EFH for Pacific salmon includes all streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers, and longstanding, naturally impassable barriers (PFMC 1999). Detailed descriptions and identification of EFH for salmon are found in Appendix A to Amendment 14 of the Pacific Coast Salmon Plan (PFMC 1999). In the Lake Washington basin, EFH is designated for Chinook and coho salmon; therefore, EFH is designated in the action area of the proposed project.

C. Effects of the Proposed Action

As previously described in Sections V and VI of this document, the proposed project would result in the improvement of aquatic habitat. The effects on Chinook salmon critical habitat are the same as for designated EFH.

D. Proposed Conservation Measures

Proposed conservation measures to minimize impacts to designated Chinook and coho salmon EFH are the same as those described in Section II C.

E. Conclusion

Following the listed conservation measures, as outlined in Section II C of this document, the proposed project may cause a short-term negligible increase in turbidity/suspended sediment and a reduction in benthic invertebrates in the dredging zone. However, overall long-term water quality would be improved by removal of the toxic creosote pilings. Primary productivity and the fish forage base would also be improved as a result of increased light penetration into the lake and through the addition of overhanging vegetation along the shoreline. Therefore, the proposed project would not adversely affect designated EFH for Chinook and coho salmon, and would not hinder a sustainable fishery for these two species.

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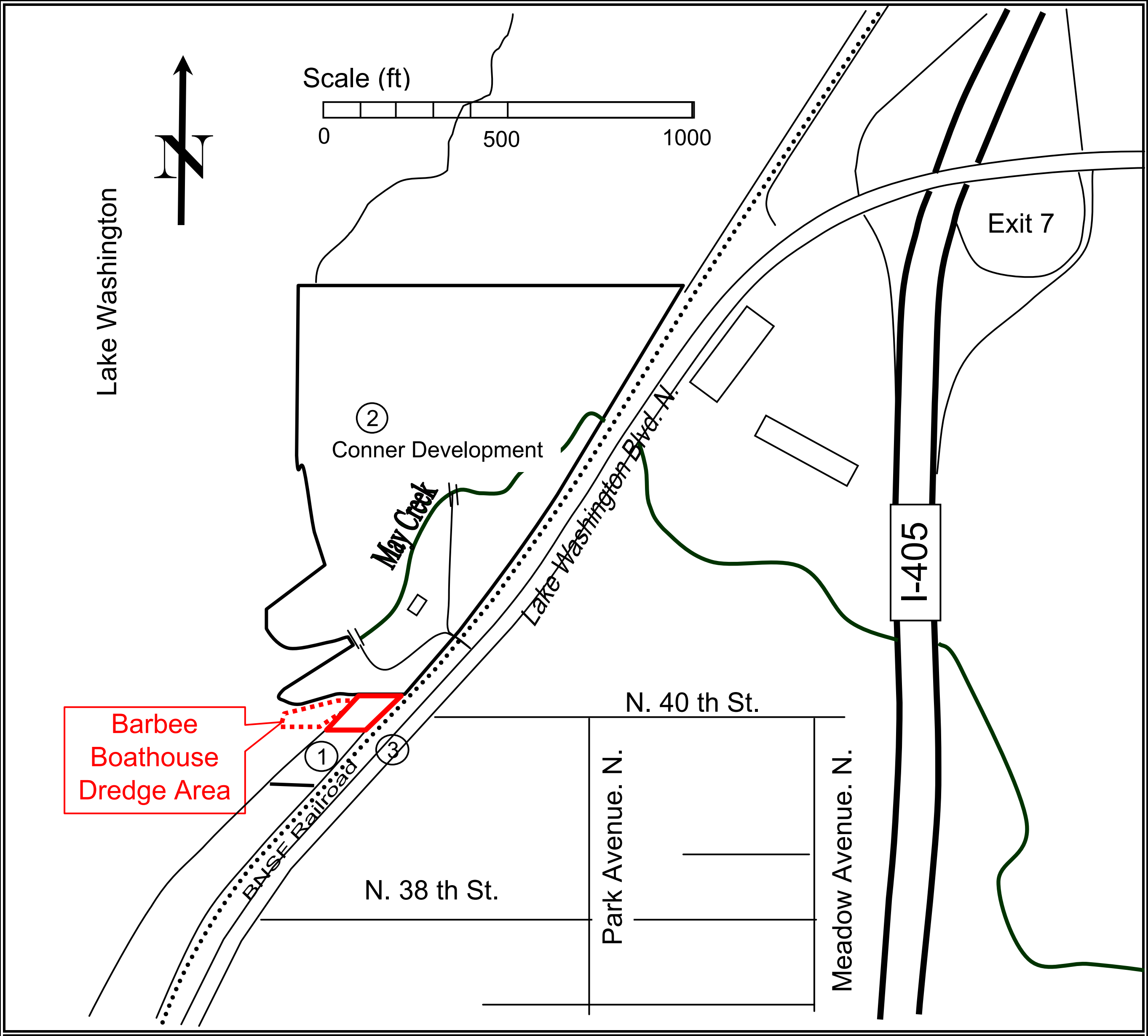
Appendix A

Proposed Project Drawings



Maintenance Dredging - Barbee Boathouse

VICINITY MAP

LOCATION:
3901 Lake Washington Blvd. N
Renton, Washington (King County)
Latitude: 47N 31' 40" Longitude: 122W 12' 29"
Section Township Range: NW 32 24 05

APPLICANT:
Barbee Mill Company
P.O. Box 359
Renton, WA 98055
425-226-3900

SHEET
1 of 4

ADJACENT PROPETRTY OWNERS:
(1) Cugini Family
(3) Burlington Northern-Sante Fe
(2) Conner Development

DATUM:
USACE/Seattle District (NAD 83). Reference: 200501279
Base Map: OTAK (Kirkland, WA)

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Rev. 7/5/07

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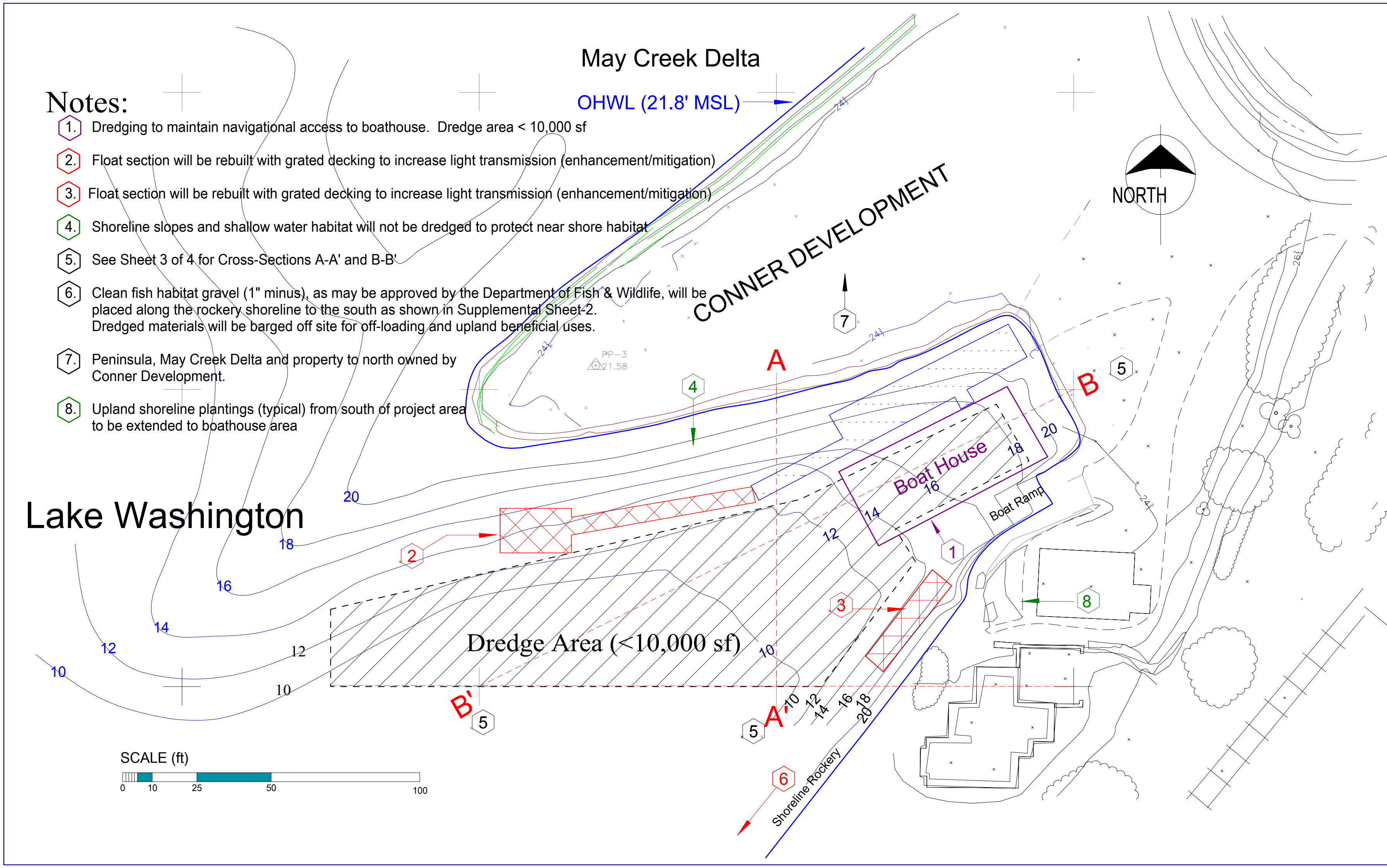
Notes:

1. Dredging to maintain navigational access to boathouse. Dredge area < 10,000 sf
2. Float section will be rebuilt with grated decking to increase light transmission (enhancement/mitigation)
3. Float section will be rebuilt with grated decking to increase light transmission (enhancement/mitigation)
4. Shoreline slopes and shallow water habitat will not be dredged to protect near shore habitat
5. See Sheet 3 of 4 for Cross-Sections A-A' and B-B'
6. Clean fish habitat gravel (1" minus), as may be approved by the Department of Fish & Wildlife, will be placed along the rockery shoreline to the south as shown in Supplemental Sheet-2. Dredged materials will be barged off site for off-loading and upland beneficial uses.
7. Peninsula, May Creek Delta and property to north owned by Conner Development.
8. Upland shoreline plantings (typical) from south of project area to be extended to boathouse area



Maintenance Dredging - Barbee Boathouse

DATUM:
USACE / Seattle District (NAD83)
BASE MAP: OTAK (Kirkland, WA)
USACE REFERENCE:

APPLICATION BY:
Barbee Company
P.O. Bos 359
Renton, WA 98056

EXISTING CONTOUR ELEVATIONS

SHEET
2 of 4

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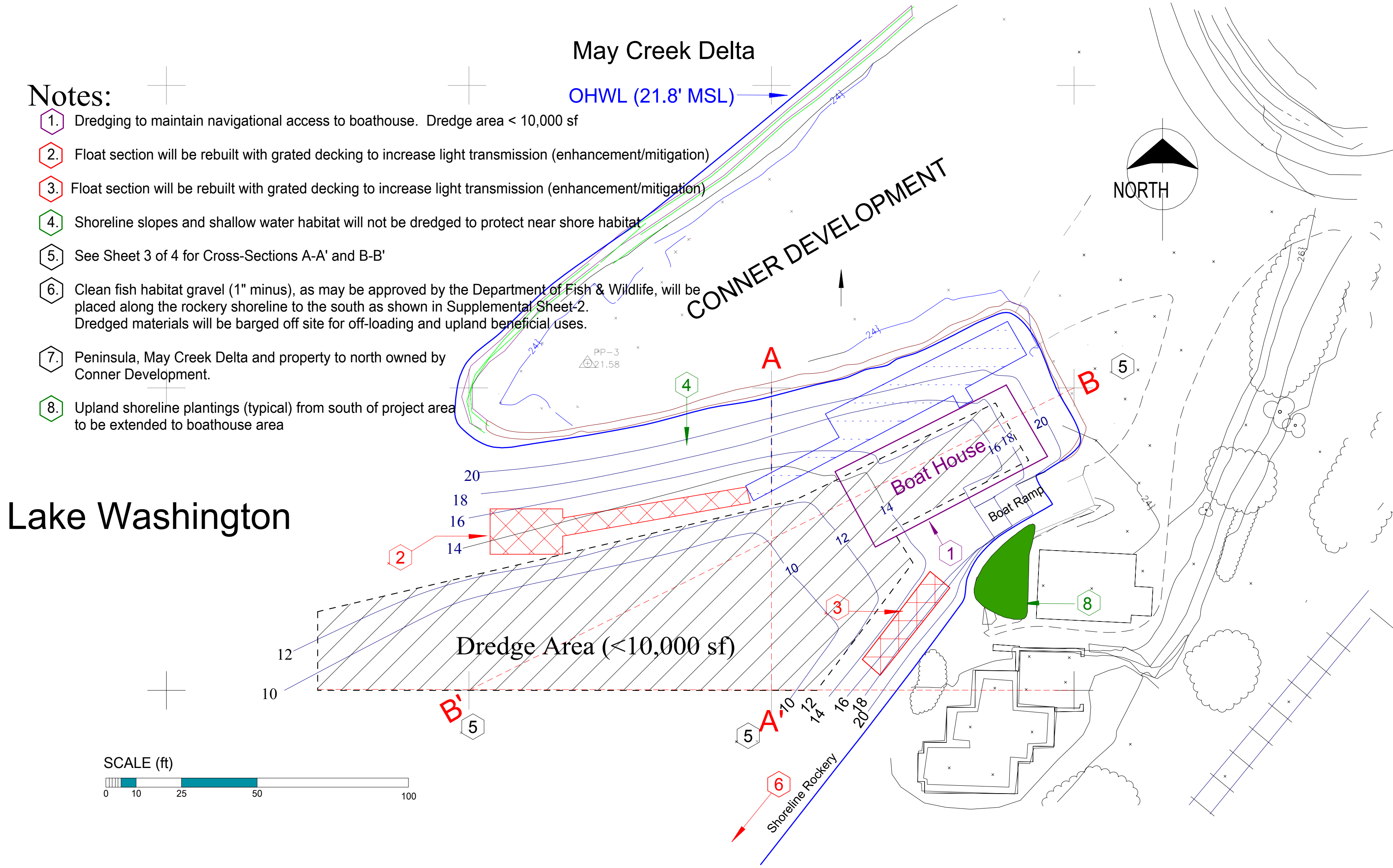
Notes:

1. Dredging to maintain navigational access to boathouse. Dredge area < 10,000 sf
2. Float section will be rebuilt with grated decking to increase light transmission (enhancement/mitigation)
3. Float section will be rebuilt with grated decking to increase light transmission (enhancement/mitigation)
4. Shoreline slopes and shallow water habitat will not be dredged to protect near shore habitat
5. See Sheet 3 of 4 for Cross-Sections A-A' and B-B'
6. Clean fish habitat gravel (1" minus), as may be approved by the Department of Fish & Wildlife, will be placed along the rockery shoreline to the south as shown in Supplemental Sheet-2. Dredged materials will be barged off site for off-loading and upland beneficial uses.
7. Peninsula, May Creek Delta and property to north owned by Conner Development.
8. Upland shoreline plantings (typical) from south of project area to be extended to boathouse area



Maintenance Dredging - Barbee Boathouse

DATUM:
USACE / Seattle District (NAD83)
BASE MAP: OTAK (Kirkland, WA)
USACE REFERENCE:

APPLICATION BY:
Barbee Company
P.O. Bos 359
Renton, WA 98056

PROPOSED CONTOURS

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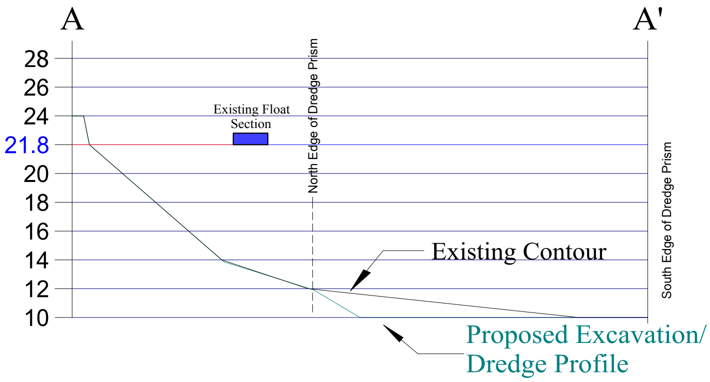
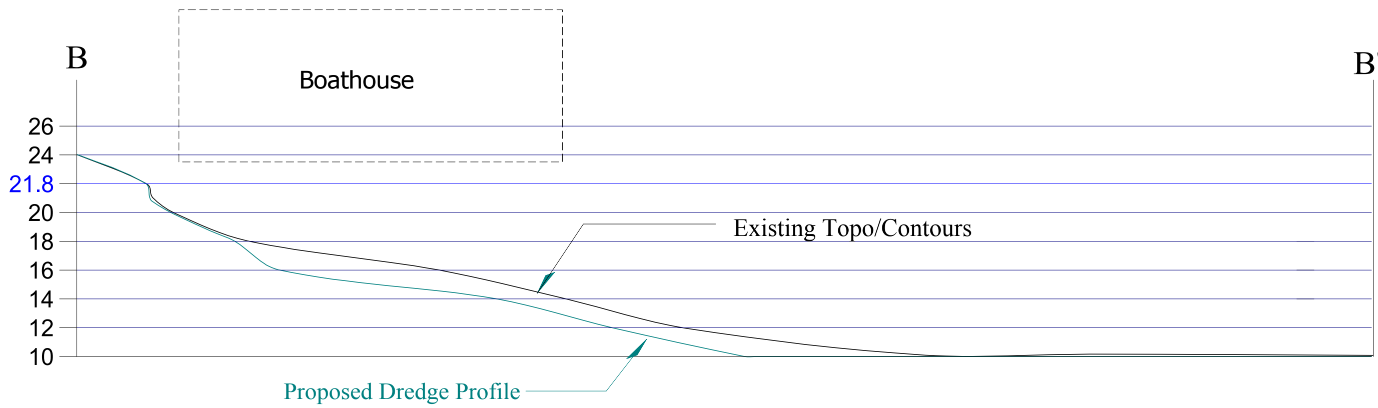


Cross Section A-A" runs north to south (see Sheets 2 & 3). Proposed Maximum dredge depth is EL = 10' (MSL). Vertical Exageration 2.5 x



Cross Section B-B' runs northeast to southwest (see Sheets 2 & 3).
Proposed Maximum dredge depth at EL = 10' (MSL). Vertical Exageration 2.5 x
Cross Section B-B' extends from the boathouse area to the edge of the dredge prism.

Notes:

1. All elevations shown are MSL (mean sea level).
2. Estimated Dredge Volume = 1,000 cy every 3-5 years. As sediment in the May Creek Delta to the immediate north builds up, dredge volumes will likely increase to maintain navigational depth.
3. Sediment to be dredged with a small clamshell bucket or excavated with a barge mounted exavator.
4. Dredged materials will be placed in a small scow and offloaded with an excavator for upland beneficial uses. Alternatively, if permitted, dredged materials (typically gravel, coarse sand, and finer materials may be placed along rockery to the south to enhance shallow water habitat for aquatic plants and fishes.
5. A debris boom and/or turbidity curtain will be employed as BMPs if visual turbidity is observed or measured above anticipated water quality certification requirements.

Maintenance Dredging - Barbee Boathouse

DATUM:
USACE / Seattle District (NAD83)
BASE MAP: OTAK (Kirkland, WA)
USACE REFERENCE: 200501279

APPLICATION BY:
Barbee Mill Company
3901 Lake Washington Blvd. N
Renton, WA 98056

CROSS SECTIONS

SHEET 4 of 4

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Revised 7/5/06

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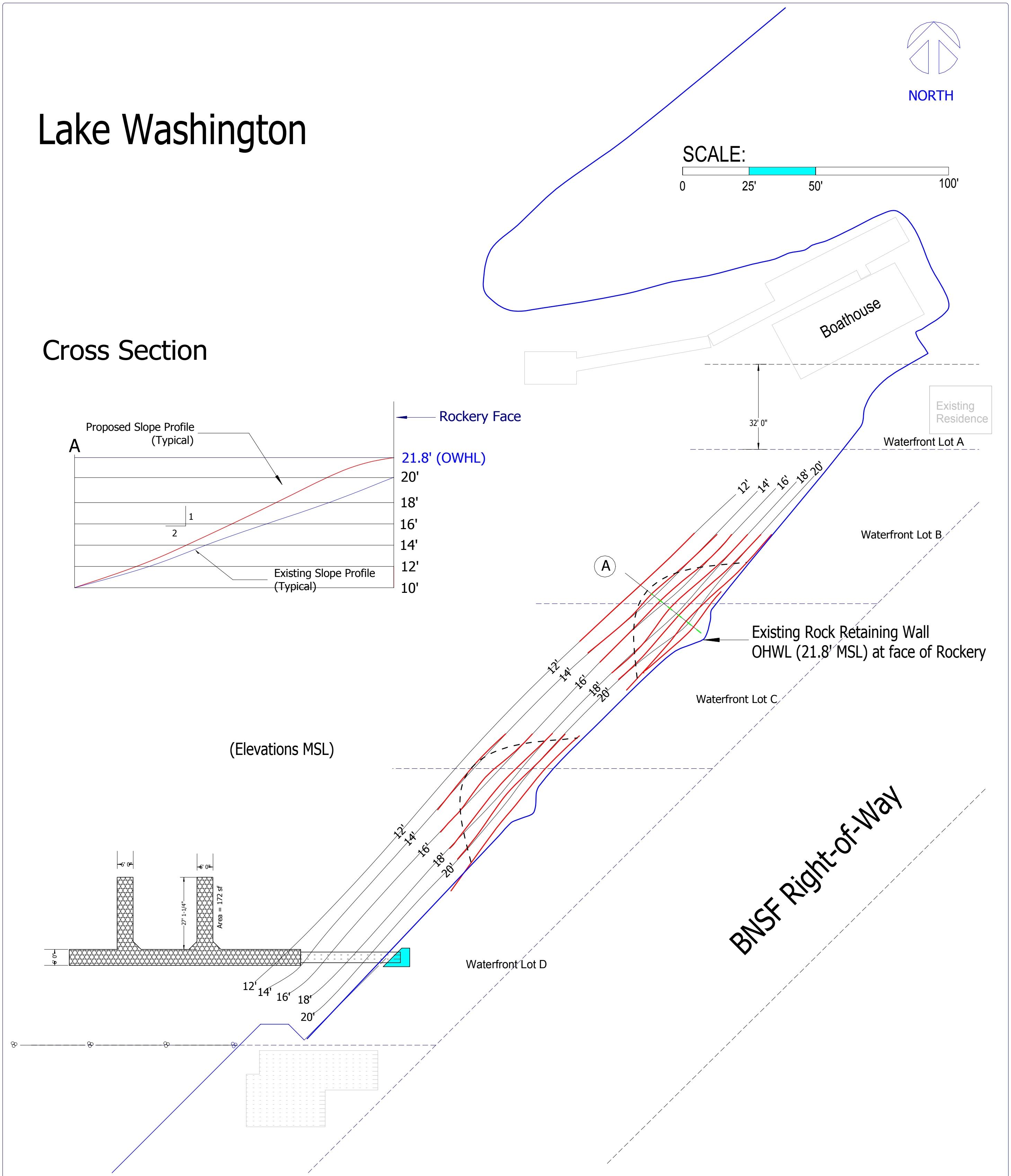

Maintenance Dredging - Barbee Boathouse Mitigation
Shoreline Habitat Enhancement at Rockery

= Existing Depth Profile

= Proposed Shallow-water Habitat Placement Profile

Supplemental
Sheet - 1

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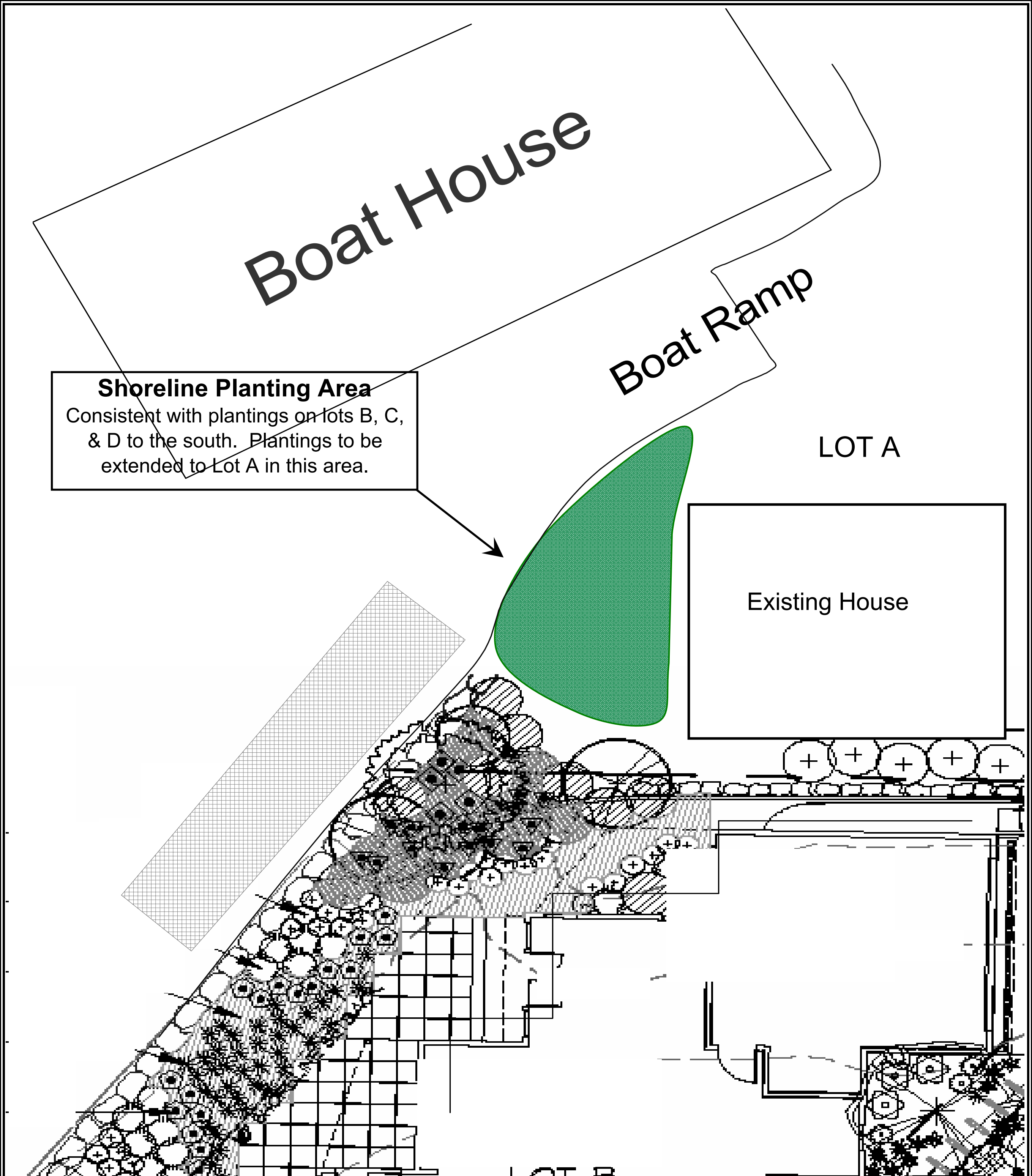

Maintenance Dredging - Barbee Boathouse Mitigation
Shoreline Habitat Enhancement at Existing House

Supplemental Sheet - 2

Planting Plan for Lots B, C, & D to the south developed for Shared-Use Dock. COE Reference #2002-1-0027

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Appendix B

Water Quality Monitoring During 2002 Dredging

Sampling Location	Dredge Location	O_2 (mg/l)	Turbidity (NTU)	Water Temp. °C
7/25/2002				
Station 1 - Pedestrian Bridge*	Bark Area A	8.1	1.25	20.2
Station 2 - Vehicle Bridge*	Bark Area A	8.3	1.11	19.2
Station 3 - SW Point*	Bark Area A	8.4	1.15	20.9
Station 4 - Boom Dock (Area A)	Bark Area A	8.4	1.20	22.6
Station 5 - Water Dock (Area C)	Bark Area A	- -	- -	- -
Station 6 - Active Dredge Area	Bark Area A	9.2	1.21	22.9
Station 7 - Scow Unloading Area	Bark Area A	8.4	1.11	19.5
8/7/2002				
Station 1 - Pedestrian Bridge*	Bark Area A	9.4	1.40	22.2
Station 2 - Vehicle Bridge*	Bark Area A	11.2	1.63	15.6
Station 3 - SW Point*	Bark Area A	8.8	2.13	21.6
Station 4 - Boom Dock (Area A)	Bark Area A	8.6	2.55	20.2
Station 5 - Water Dock (Area C)	Bark Area A	8.7	no data	20.2
Station 6 - Active Dredge Area	Bark Area A		(see Station 4)	
Station 7 - Scow Unloading Area	Bark Area A	9.4	5.20	20.7
8/12/99				
Station 1 - Pedestrian Bridge*	Bark Area A	10.0	1.76	15.5
Station 2 - Vehicle Bridge*	Bark Area A	9.7	2.70	15.8
Station 3 - SW Point*	Bark Area A	9.4	3.10	19.6
Station 4 - Boom Dock (Area A)	Bark Area	8.5	4.80	21.8
Station 5 - Water Dock (Area C)	Bark Area	9.2	1.90	22.6
Station 6 - Active Dredge Area	Bark Area	8.5	4.10	21.0
Station 7 - Scow Unloading Area	Bark Area A	8.8	3.90	22.0
8/21/99				
Station 1 - Pedestrian Bridge*	Bark Area B	10.6	1.21	13.8
Station 2 - Vehicle Bridge*	Bark Area B	9.2	1.78	13.9
Station 3 - SW Point*	Bark Area B	8.5	3.07	21.4
Station 4 - Boom Dock (Area A)	Bark Area B	8.2	1.66	21.4
Station 5 - Water Dock (Area C)	Bark Area B	8.3	2.67	21.6
Station 6 - Active Dredge Area	Bark Area B	7.8	4.70	21.6
Station 7 - Scow Unloading Area	Bark Area B	7.5	3.48	21.5
9/16/99				
Station 1 - Pedestrian Bridge*	Bark Area B	10.0	1.12	20.7
Station 2 - Vehicle Bridge*	Bark Area B	9.7	1.18	17.1
Station 3 - SW Point*	Bark Area B	8.9	1.19	18.7
Station 4 - Boom Dock (Area A)	Bark Area B	8.7	1.18	22.5
Station 5 - Water Dock (Area C)	Bark Area B	8.5	1.19	20.5
Station 6 - Active Dredge Area	Bark Area B	8.6	1.15	20.3
Station 7 - Scow Unloading Area	Bark Area B	8.8	1.16	19.5
9/17/99				
Station 1 - Pedestrian Bridge*	Bark Area B	8.9	1.12	20.7
Station 2 - Vehicle Bridge*	Bark Area B	9.2	1.18	17.1
Station 3 - SW Point*	Bark Area B	9.4	1.19	18.7
Station 4 - Boom Dock (Area A)	Bark Area B	9.0	1.18	22.5
Station 5 - Water Dock (Area C)	Bark Area B	8.8	1.19	20.5
Station 6 - Active Dredge Area	Bark Area B	8.6	1.15	20.3
Station 7 - Scow Unloading Area	Bark Area B	9.1	1.16	19.5

Sampling Location	Dredge Location	O_2 (mg/l)	Turbidity (NTU)	Water Temp. °C
9/19/99				
Station 1 - Pedestrian Bridge*	Bark Area B	8.7	1.24	20.7
Station 2 - Vehicle Bridge*	Bark Area B	9.4	1.24	17.1
Station 3 - SW Point*	Bark Area B	9.3	1.25	18.7
Station 4 - Boom Dock (Area A)	Bark Area B	9.0	1.27	22.5
Station 5 - Water Dock (Area C)	Bark Area B	9.1	1.28	20.5
Station 6 - Active Dredge Area	Bark Area B	8.6	1.48	20.3
Station 7 - Scow Unloading Area	Bark Area B	9.0	1.25	19.5
9/24/99				
Station 1 - Pedestrian Bridge*	Bark Area B	9.2	1.10	15.8
Station 2 - Vehicle Bridge*	Bark Area B	9.7	1.14	15.9
Station 3 - SW Point*	Bark Area B	9.0	1.35	16.4
Station 4 - Boom Dock (Area A)	Bark Area B	8.7	1.78	18.8
Station 5 - Water Dock (Area C)	Bark Area B	8.7	1.28	19.1
Station 6 - Active Dredge Area	Bark Area B	8.3	5.10	18.9
Station 7 - Scow Unloading Area	Bark Area B	8.7	2.36	18.7
9/26/99				
Station 1 - Pedestrian Bridge*	Bark Area B	8.9	1.21	15.1
Station 2 - Vehicle Bridge*	Bark Area B	9.1	1.15	15.9
Station 3 - SW Point*	Bark Area B	8.9	1.23	16.1
Station 4 - Boom Dock (Area A)	Bark Area B	8.7	1.68	17.1
Station 5 - Water Dock (Area C)	Bark Area B	8.3	1.31	17.0
Station 6 - Active Dredge Area	Bark Area B	8.2	3.80	18.4
Station 7 - Scow Unloading Area	Bark Area B	8.8	1.85	16.4
10/21/99				
Station 1 - Pedestrian Bridge*	Bark Area C	10.6	1.12	11.7
Station 2 - Vehicle Bridge*	Bark Area C	10.4	1.11	11.7
Station 3 - SW Point*	Bark Area C	8.9	1.18	15.6
Station 4 - Boom Dock (Area A)	Bark Area C	8.9	1.13	15.6
Station 5 - Water Dock (Area C)	Bark Area C	9.6	1.41	15.5
Station 6 - Active Dredge Area	Bark Area C	8.9	2.71	15.5
Station 7 - Scow Unloading Area	Bark Area C	8.8	1.81	15.5
10/28/99				
Station 1 - Pedestrian Bridge*	May Creek Delta	10.0	1.13	10.0
Station 2 - Vehicle Bridge	May Creek Delta	10.1	1.16	10.1
Station 3 - SW Point	May Creek Delta	10.0	1.74	14.2
Station 4 - Boom Dock (Area A)	May Creek Delta	8.9	1.46	14.2
Station 5 - Water Dock (Area C)*	May Creek Delta	9.6	1.38	14.1
Station 6 - Active Dredge Area	May Creek Delta	8.9	1.96	13.9
Station 7 - Scow Unloading Area	May Creek Delta	8.8	2.13	14.3

* Monitoring station outside of silt curtain

Excerpts from Recently Approved
Redmond Shoreline Mater Program Update

Piers and Docks

Piers and docks can have significant impacts on the natural features and *scenic values of the shoreline, navigation, water-dependent recreation and* public access, native plant, fish, and wildlife habitat and water quality. However, residential piers and docks are long-established uses on Lake Sammamish, and a preferred shoreline use under the Shoreline Management Act, and as such, may continue to be utilized and located on the lake.

Landfills, Excavation and Dredging

Landfills, excavation and dredging in the shoreline can destroy the natural character of the shoreline, remove native shoreline vegetation, introduce invasive plants, create unnaturally heavy erosion and siltation problems, and reduce the existing water surface area. The result is often significant damage to water quality and fish and wildlife habitat. However, in some instances these activities may be necessary on a limited basis for implementing desired or necessary shoreline objectives. For example, dredging may be the only immediate means to restore the natural functions of a degraded stream area, or to accommodate a water-dependent use. For these reasons, Shoreline Master Program policies allow only limited landfill, excavation and dredging activities.

USES AND ACTIVITIES	SHORELINE ENVIRONMENT				
	Aquatic	Natural	Urban Conser-vancy	Shoreline Residen-tial	High Intensity/ Multi-Use
use permitted in this Table					
Fill & excavation for water-dependent use, bridge or public access	P	C	P	P	P
Fill & excavation for ecological restoration	P	P	P	P	P
Dredging	P	P	P	P	P
Water withdrawals and diversions	P	P	P	P	P
Flood control structures and activities	P	C	P	P	P
Environmental & cultural interpretation; scientific research; cultural access[3]	P	P	P	P	P