Issaquah Creek Section 206
Restoration Project

Final Environmental Assessment

King County, Washington

June 2005

US Army Corps of Engineers®
Seattle District

Environmental Resources Section
Planning Branch

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prepared by

Seattle District
U.S. Army Corps of Engineers

Environmental Resources Section
Planning Branch

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REPLY TO
ATTENTION OF

CENWS-PM-PL-ER 1 Sep 05

ISSAQUAH CREEK SECTION 206 RESTORATION PROJECT
KING COUNTY, WASHINGTON

FINDING OF NO SIGNIFICANT IMPACT

1. Background. The Seattle District, U.S. Army Corps of Engineers (Corps) proposes to improve fish passage in Issaquah Creek by replacing a deteriorated and outdated diversion dam that supplies water to the Washington State Department of Fish and Wildlife's (WDFW) Issaquah Creek Salmon Hatchery. At present, adult fish passage is only possible at a narrow range of flows and the structure causes unacceptable mortality to both adult and juvenile salmonids. The proposed project is authorized under Section 206 of the Water Resources Development Act of 1996 as amended.

2. Purpose and Need. The existing dam structure is a hindrance to both upstream and downstream fish passage that results in unacceptable mortality to both adult and juvenile salmonids including Federally listed Chinook salmon. The purpose of the project is to improve upstream and downstream fish passage while maintaining water supply to the Issaquah Creek Salmon Hatchery at Issaquah, Washington.

3. Proposed Action. The proposed action will consist of removing the existing dam and replacing it with a "fish friendly" dam. Dam removal will include removing an approximately 40 foot wide by 8 foot tall wood and concrete dam through the use of concrete saw cutting and jackhammer techniques. The new dam structure will include a spillway, fish ladder, seven grade control weirs placed at 25 foot intervals downstream of the new dam, and water supply intake that all meet or exceed current NOAA Fisheries and WDFW fish passage criteria. The proposed project will provide both upstream and downstream passage at least 90% of the time, while maintaining existing water supply to the Issaquah Creek Hatchery. The project would allow unrestricted salmonid access to over 10 miles of habitat upstream of the current dam in one of the last largely unspoiled watersheds in the Lake Washington Basin. Many species of fish that currently inhabit Issaquah Creek including Chinook salmon, coho salmon, sockeye salmon, kokanee, cutthroat trout and rainbow trout, will benefit from this project.

4. Summary of Environmental Impacts. Pursuant to the National Environmental Policy Act, an Environmental Assessment (EA) has been prepared for the proposed work. This document describes the environmental consequences of the proposed work, which are briefly summarized below.

Some increased turbidity will likely occur during the creek bypass pipe installation and removal, but best management practices will be in place to avoid and minimize potential impacts. Some vegetation including small red alder trees in the immediate project area will be removed during construction. However, native trees and shrubs and perhaps herbaceous species will be replanted in all areas that are impacted during construction. In addition, half of the project area expected to have vegetation impacted consists of non-native Himalayan Blackberry that will be replaced with native species. No significant adverse impacts to air quality are anticipated as a result of the proposed action.

Construction will take place during a time period approved by WDFW and NOAA Fisheries for in-water work which minimizes the likelihood of adverse construction impacts to Chinook, coho, sockeye, and

steelhead by allowing work when the abundance of these species is low. Additional impacts will include an increase in noise during project demolition and construction. Noise impacts to surrounding residences resulting from construction activities will be reduced by allowing only as much evening and weekend activities as is necessary to complete the project during the in-water work window.

The proposed Corps defined Area of Potential Effects (APE) was submitted to the Washington State Historic Preservation Officer (SHPO), who concurred with the Corps' APE. A cultural resource investigation was completed for the APE that included a professional field survey, archival and other background research, coordination with concerned parties, and submission of a report to SHPO and copied to the Muckleshoot Tribe. The records search indicated that there were no historic properties listed in the National Register of Historic Places (NRHP) or the Washington Office of Archaeology and Historic Preservation (OAHP) electronic historic site database within the APE. A field investigation and additional record searches produced documentation that the existing fish hatchery related diversion dam and coal mining associated railroad grade located within the APE are eligible for the NRHP and that the project had the potential to adversely affect both properties. The railroad grade has been previously disturbed and the Corps will return it to its same appearance at the end of the project. Consequently, the Corps determined that there would be no historic properties adversely affected related to disturbance of the railroad grade and the SHPO concurred.

The Corps determined that removal of the dam would adversely affect an historic property and the SHPO concurred. Subsequently, the proposed mitigation measures addressing the adverse effect to the dam were formulated in a memorandum of agreement (MOA) with the SHPO, the Washington Department of Fish and Wildlife, and the City of Issaquah. The King County Historic Preservation Officer signed the MOA on behalf of the City of Issaquah. Mitigation measures for removal of the dam are to fully document the structure in a Historic American Buildings Survey/Historic American Engineering Record report (HABS/HAER) in medium format prior to demolition. Submittal to and acceptance by the SHPO of the HABS/HAER report will complete the Section 106 process.

Cumulative impacts of the proposed project have been evaluated and are expected to incrementally enhance ecological functions and values, particularly with regard to salmonid passage and habitat utilization.

5. Finding. Based on the analysis described above and provided in more detail in the EA, this project is not a major federal action significantly affecting the quality of the human environment and, therefore, does not require an environmental impact statement.

1 Sep 05
Date

Debra M. Lewis
Colonel, Corps of Engineers
District Engineer

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1.0 BACKGROUND

1.1 PROJECT AUTHORITY

The proposed project is authorized under Section 206 authority of the Water Resources Development Act (WRDA) of 1996, P.L. 104-303. This authority authorizes the Secretary of the Army to carry out aquatic ecosystem restoration and protection projects if the Secretary determines that the project will improve the quality of the environment, is in the public interest, and is cost-effective. This Environmental Assessment (EA) is in accordance with EC 1105-2-214, Project Modifications for Improvement of the Environment and Aquatic Ecosystem Restoration. The Washington Department of Fish and Wildlife (WDFW), by letter dated April 18, 2001, requested federal assistance in planning, designing and conducting a stream restoration project along Issaquah Creek. WDFW is the local sponsor.

1.2 STUDY, PURPOSE, SCOPE & PARTNERSHIP

1.2.1 Purpose

This report addresses the need and justification for implementing a restoration project along Issaquah Creek. The project would consist of replacing an existing dam structure, which is a hindrance to both upstream and downstream fish passage, while maintaining an existing auxiliary water supply to the Issaquah Hatchery. If implemented, the project would allow dwindling salmonid populations to return to one of the last largely unspoiled watersheds in the Lake Washington Basin.

1.2.2 Scope

The scope of the current study and project area is focused on the dam and adjacent areas, including 10 feet upstream of the dam and roughly 200 feet downstream. Beyond the direct project area, connectivity to the upstream and downstream areas has also been addressed. Flow conveyance considerations have been considered downstream through the City of Issaquah to Lake Sammamish. The salmonid production potential of the watershed upstream of the existing dam has also been considered to assess project benefits.

1.2.3 Corps Involvement & Partnership with Other Entities

The Issaquah Creek Restoration Project was born of a motivated team of private, governmental and tribal interests, and continues to benefit from this broad base of support. The project stakeholders and partners include WDFW, the Muckleshoot Tribe, US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the Friends of Issaquah Hatchery (FISH). The Seattle District Corps of Engineers (Corps), at the request of the WDFW, requested funding under Section 206 of WRDA 1996 to conduct a reconnaissance evaluation for the proposed project. The Corps received funding in Spring 2001 to prepare the Preliminary Restoration Plan, which is the vehicle used to determine whether there is federal interest to continue to investigate the potential project. The Preliminary Restoration Plan was submitted to Corps Headquarters in August 2001. The District received approval and funding to begin the Project Planning and Design (PDA) phase in October 2001 with a scheduled completion of PDA in April 2004.

1.3 PROJECT LOCATION AND HISTORY

The existing dam is located at river mile (RM) 3.5 on Issaquah Creek in Section 33, T24 N, R6E, City of Issaquah, King County, Washington. Downstream of the project area, the creek runs through the City of Issaquah and into Lake Sammamish State Park before it empties into Lake Sammamish. Upstream of the project the creek flows primarily through forested areas, draining approximately 55 square miles of quality habitat.

In 1936, in response to growing demands of fish resources and diminishing returns, the Washington State Department of Fish and Wildlife (WDFW) began supplementing salmon production through operation of the Issaquah Creek Fish Hatchery as a salmon production facility in the City of Issaquah. Two dams were constructed to support the hatchery, the lower dam or “barrier dam” located at the hatchery site and an upper dam, “diversion dam”. This project focuses on the upper dam – and its associated fish passage problems.

The intake structure or diversion dam located ½ mile upstream of the hatchery has supplied water to the hatchery since 1960 through diverting creek flow and creating the elevation head necessary to deliver a gravity flow water supply. In 1972 the gravity intake was reconstructed, the walls at the intake were raised one foot, two additional pools were added to the fish ladder, and a new screen structure incorporated. Since then, the hatchery has become a historical and cultural feature as well as a fish production facility.

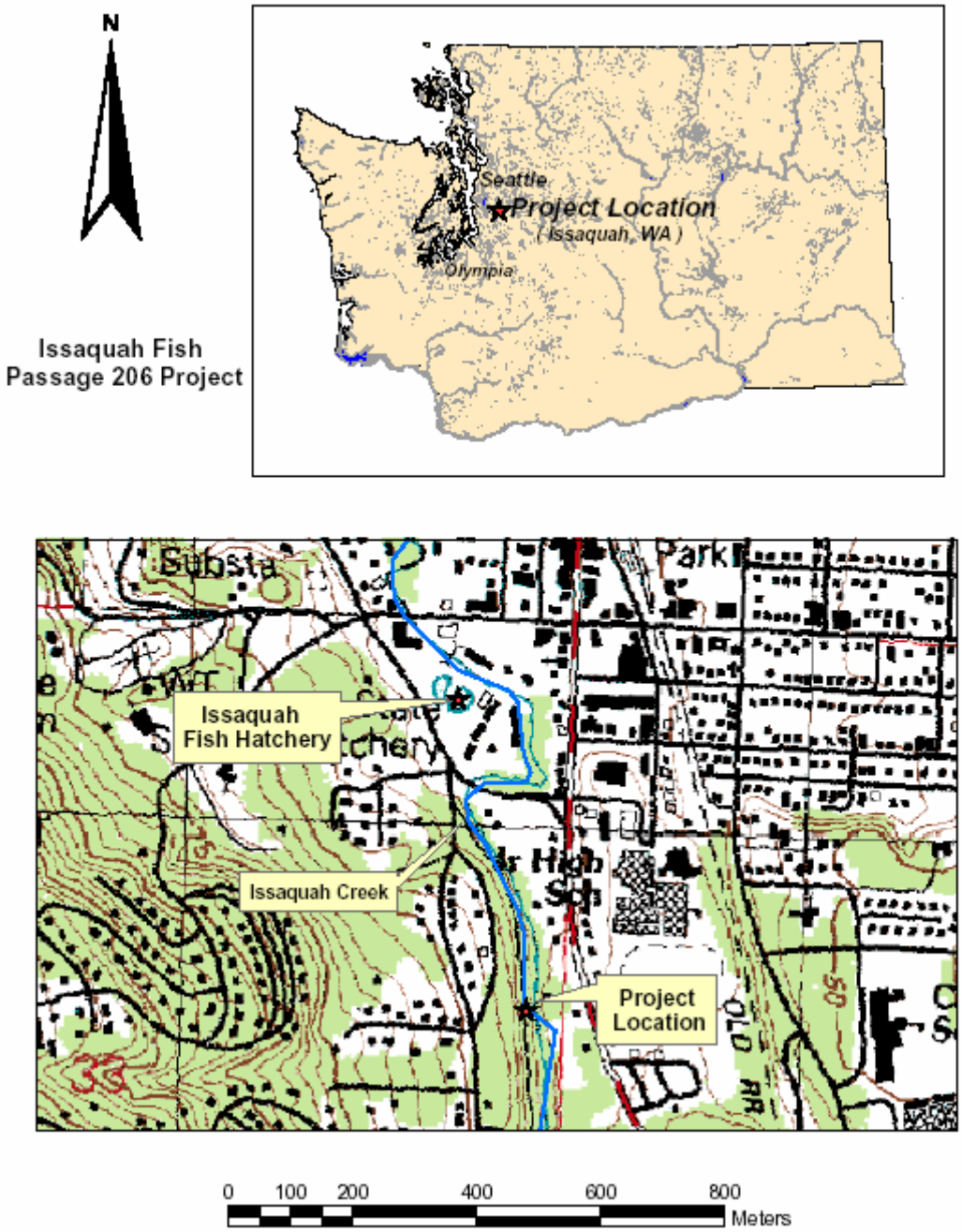

Figure 1. Project Location

1.4 RESOURCE PROBLEMS

The degraded project area is really only a small part of an otherwise healthy watershed. But under the existing without project condition the dam is a bottleneck that restricts use of the watershed by some of the Northwest's most important species. Four species of anadromous salmonids (coho, Chinook, sockeye salmon, and steelhead) inhabit the creek. In addition, numerous cutthroat trout inhabit the entire watershed, kokanee historically inhabited the creek, and some anecdotal information suggests that native char have inhabited the creek in the past.

The intake dam and its associated fish ladder currently present a challenge to migrating juvenile and adult salmonids, marginalizing access to at least 10 miles of spawning and rearing habitat upstream of the dam. The numerous passage problems associated with the project vary in degree of magnitude depending on the stream flow that is passing the project.

The fish ladder has many problems such as inadequate flow, velocity, slope, attraction velocities, and perhaps entrance pool depth. The existing gravity intake screen structure for the hatchery water supply is detrimental to downstream juvenile fish passage as it was originally designed primarily for flushing the screen box of sediment and debris. For example, during low flow when little water is bypassed, the intake chamber can trap juvenile fish. The intake structure poses other problems for migrating juveniles such as screening not meeting current standards and routing fish through hardware and then discharging fish from a height of 6-8 ft onto rocks during higher flows.

The spillway and the accompanying concrete apron produce problems for both adult and juvenile salmonids at this facility also. During high flow events, the elevated size and quantity of bedload being moved can plug the pools of the fish ladder, significantly reducing the ability to pass fish upstream. In addition, high flow attracts the adult fish to the apron below the spillway where they are unable to pass the structure during times of low flow. The concrete apron below the spillway also causes stranding of adult fish. The spillway on this dam consists of timbers angled at about 60° from the crest of the dam to the concrete apron. Most of these timbers are missing and the majority of fish passing the project fall from the crest of the dam about 4 ft to the concrete apron. Even the fish that happen to pass the project in an area with the timbers still present, encounter a rapid descent and abrupt impact with the concrete apron.

No detailed survival studies of juvenile salmon and trout passing the project have been completed to date. Based on current passage criteria and observations by WDFW and Corps biologists, the project is clearly resulting in unnecessary mortality to juvenile salmonids and substantially restricting adult passage. In October through December of 2002, the Corps conducted an adult passage rate study at the site. The results indicated that 115 Chinook passed the fishway and diversion dam and although coho salmon were observed in the pool below the

diversion dam and attempting to migrate upstream through the fishway, no coho salmon were observed successfully passing upstream of the diversion dam.

Downstream of the dam, the City of Issaquah surrounds this portion of the creek, which has been extensively altered by both natural processes and human activity. Hardened banks dominate this reach and riparian habitat is often sparse varying from native vegetation to bare riprap. However, all salmonid species that inhabit the Issaquah Creek basin have been observed spawning in this reach. Upstream of the dam, over ten miles of quality habitat features are available which have high potential value for biological use. Special habitat features including snags, down logs, and open water contributes to high habitat values. The side channels associated with many of the tributaries provide winter rearing habitat for juvenile fish and refuge from seasonal high flows following large storm events. The limited amount of instream large woody debris recruited from riparian areas also provides excellent habitat. Without the proposed restoration the high value habitat areas would continue to be under-utilized by key anadromous fish species.

1.5 RESOURCE SIGNIFICANCE

Northwest salmonid stocks have been declining for decades, and many are now reaching critically low levels. Puget Sound Chinook salmon have been listed as threatened under the Endangered Species Act and coho and coastal cutthroat trout are candidate species for listing.

Issaquah Creek, with its many tributaries having excellent substrate and excellent pool to riffle ratios, is especially suitable spawning and rearing habitat for Chinook salmon. It is one of the few streams in the Lake Washington Watershed that provides excellent fish habitat.

Providing upstream passage of spawning anadromous fish also provides a critical link in aquatic food webs in the Pacific Northwest. Pacific salmon are considered a “keystone” species upon which producers and consumers from the bottom to the top of the food chain depend (Wilson and Halupka 1995). Rearing in the rich-ocean environment, adult salmon return to nutrient poor streams with a wealth of ocean nutrients, enriching the food web from primary producers to top carnivores. At least 22 species of wildlife, including black bear, mink, river otter, and bald eagle, feed on salmon carcasses (Cederholm *et al*. 1989). At the base of the food web, salmon carcasses provide a significant amount of nitrogen to streamside vegetation as well as large amounts of carbon and nitrogen to aquatic insects and other macroinvertebrates (Bilby *et al.* 1996). Juvenile salmon also utilize spawned-out salmon carcasses directly as a food source. Bilby *et al.* (1998) witnessed increased densities, increased body weight, and improved condition factor of juvenile coho and steelhead in stream reaches supplemented by the addition of salmon carcasses from a nearby hatchery. Sixty to 96 percent of the food material in the stomachs of juvenile steelhead and coho consisted of carcass flesh and eggs.

1.6 PRIOR STUDIES AND REPORTS

Prior to Corps involvement, a number of engineering and biological studies and reports had been completed in the area related to fish passage improvements for the diversion dam. These studies are summarized below.

- Sverdrup Civil, Inc. (June 1996), *Issaquah Hatchery Facilities Master Plan.* Prepared for Washington Department of Fish and Wildlife. The report recommends improvements to the hatchery facility including the diversion dam.

- WRIA 8 Steering Committee (2002), *Near Term Action Agenda for Salmon Habitat Conservation.* The report lists factors for the decline for salmonids in the WRIA 8 and provides recommendations for action to rehabilitate various areas. The top project listed for the Issaquah Creek Watershed is to improve fish passage at the Issaquah Hatchery Intake Dam.

1.7 EXPECTED SUCCESS OF RESTORATION

Guided by a committed team of professionals from numerous stakeholders, this project enjoys high levels of support because of the potential for successful restoration. Restoration issues on Issaquah Creek are not terribly complex: the present fish blockage is a major limiting factor for migratory fish use of this stream. Because the quantity of available upstream habitat, additional factors limiting restoration success are minimal. Specifically, the project as proposed has great potential for successful restoration for the following two main reasons: migrating salmon and resident fish will have a significantly higher probability of ascending and descending through the project reach.

2.0 DESCRIPTION OF PROPOSED PROJECT

The proposed project (Figure 2) will correct the current problems of upstream adult and juvenile salmon migration and downstream juvenile passage at the upper water intake of the Issaquah Salmon Hatchery on Issaquah Creek. The design guidelines include a 50-year project life, no effect on 100-year flood levels, and fish passage for flows ranging from 5% (16 cfs)-95% (320 cfs) of the daily averaged values.

The project will replace the existing dam and fish ladder with new configurations, modify the existing intake structure and replace the intake screens, provide a juvenile fish bypass return and alarm system, and install seven downstream grade control weirs (see Appendix A for project drawings). Specifics include:

1. The spillway will be moved downstream coincident with the entrance of the fishway to prevent fish from being attracted beyond the fishway entrance by spill flows. The right abutment will also be extended at least 17 feet downstream to the crest of the new spillway.

2. The spillway will be founded on the existing apron, removing it as a potential location for stranding of adults at lower tailwater levels.

3. A new ten-foot apron will be placed below the new spillway to prevent scour, and two feet below the minimum water elevation.

4. A new fish ladder consisting of five pool and chute weirs will provide upstream and downstream fish passage past the dam. The four pools will each be twenty feet wide, ten feet long, and three feet deep from crest to floor. The weirs will each have a low flow notch and sloping sides. A sluice opening will be provided on each side of each fishway weir to allow flushing of accumulated sediment and debris. Fish ladder design flow range will be from 16 cfs-320 cfs.

5. Seven grade control weirs spaced at 25 foot intervals with .8 foot drops will be constructed downstream of the dam. The weir spans range from 70 to 120 feet in length.

6. Streambed and bank protection will be placed for each weir to prevent scour and weir failure. Riprap will be placed at the depth of expected scour and covered with gravel having a range of sizes that replicate exiting substrate. Bank armoring will require a total of 80 cubic yards per weir, resulting in a total of 560 cubic yards. Between each weir 170 cubic yards of riprap will be used as instream scour protection. This instream scour protection riprap will be covered with 1000 cubic yards of pool mix (having a range of sizes that replicate exiting substrate) substrate. In addition, a 75 ft. section on the right bank will need to be elevated 2 ft

to maintain the current channel configuration due to the weir installation. This bank elevation will be accomplished by placing approximately 500 cubic yards of riprap and soil.

7. The inlet and trashrack of the screen will be extended upstream, approximately 10 feet, so that debris will sweep past the trashrack and continue down the fishway rather than accumulate in front of the intake. The extension of the structure will require fill along the left bank and excavation along the right bank.

8. The intake structure will be modified into a V-shaped configuration to meet the screen sweeping and approaching velocity criterion.

9. A collection trough and outfall conduit will transport juvenile fish from the intake structure to below the fishway.

10. The existing sluiceway and walls will remain but be extended upstream parallel to the intake and fishway.

11. The bank will be planted with native plant species following construction.

12. An alarm system, using water level sensors, will be installed to alert the hatchery when the intake system needs to be cleaned.

For additional details, please see the attached design drawings in Appendix A.

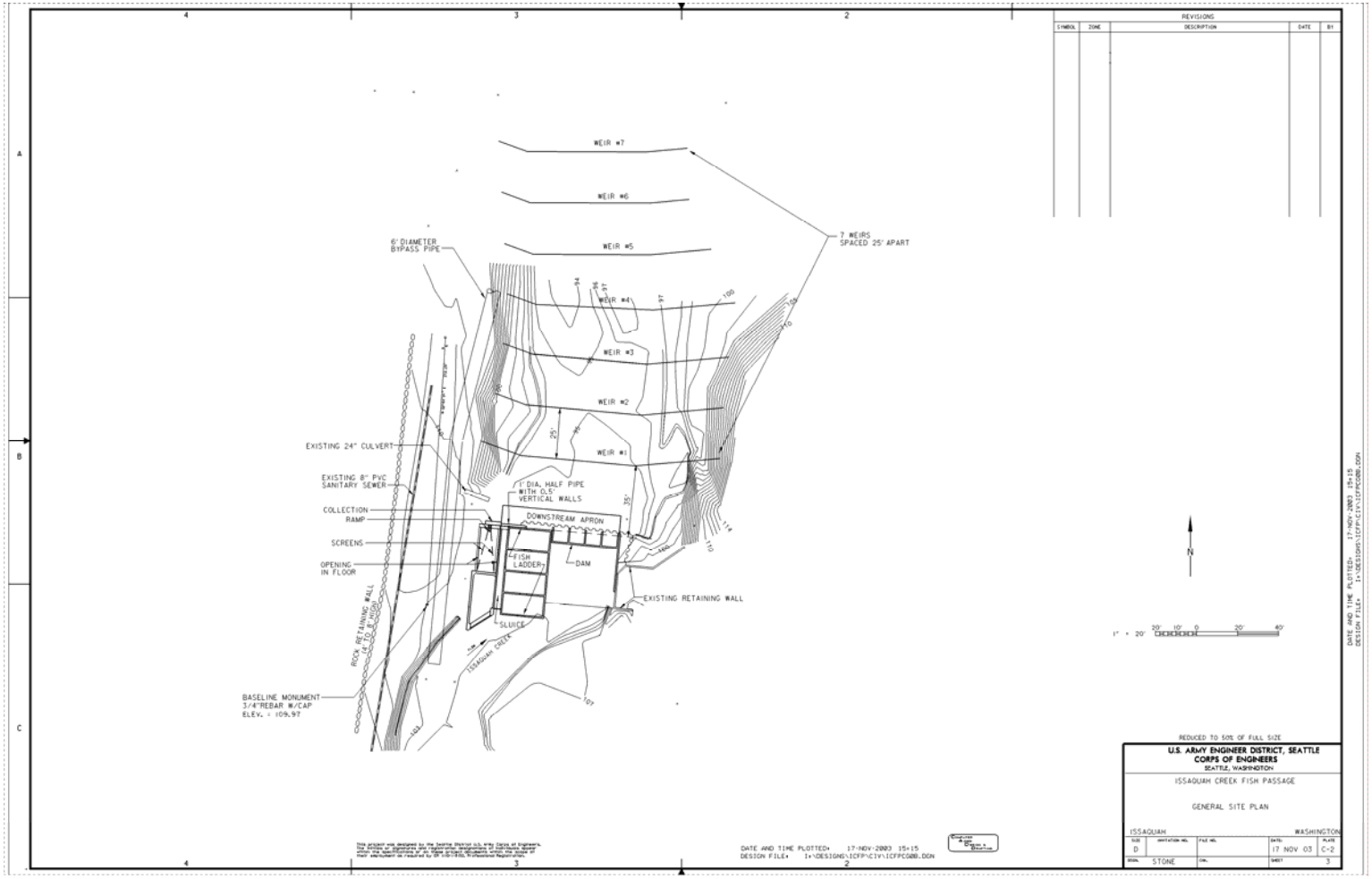

Figure 2. Proposed Project

3.0 NON-SELECTED ALTERNATIVES

3.1 NO ACTION

This alternative contains no directed restoration activities at the project site. The fish ladder would continue to present a challenge to migrating adults due to many factors including but not limited to insufficient attraction flows, insufficient pool size, plugging with sediment and debris, and substandard entrance pool configuration. The gravity intake screen structure would continue to injure juvenile salmonids by stranding fish at low flows, or discharging them onto rocks at higher flows. The apron would continue to strand adult salmon and injure juvenile salmon.

3.2 ALTERNATIVES NOT CONSIDERED IN DETAIL

During the planning process, various alternatives were initially considered. As an initial screen for these planning alternatives, the Corps performed an analysis of environmental benefits to fish and wildlife habitat in relation to project cost performed. Following more detailed design work, technical review of alternative feasibility was performed on the remaining alternatives. The alternatives described below were considered at various stages during the planning process, but, for the reasons stated below, will not be carried forward for further evaluation because the environmental benefits were not sufficient to justify the costs, or they entailed unacceptable environmental impacts.

3.3 POOL AND WEIR FISHWAY

Under this alternative, the fish ladder design flow range would be 5 to 40 cfs. At 320 cfs Creek flow there would be 280 cfs spillway flow. Ladder step increases would be 0.8 ft. The dam crest would be moved downstream eliminating the adult stranding issue, reducing/eliminating false attraction, and reducing injury to fish moving downstream. The intake screen would be modified to improve sweeping and bypass flows, reducing the stranding and injury of juvenile salmonids at all flows. This alternative was determined to have lower environmental benefits associated with adult passage (primarily attraction flow) so it was eliminated from further analysis.

3.4 POOL AND WEIR/CHUTE COMBINATION ON LEFT BANK WITH TURNING POOL

Under this alternative, the fish ladder would operate at a wide range of creek flows (5–320 cfs). The fishway would be an "L" shaped configuration. The upper segment would be a pool and weir. This would empty into a turn pool where a pool and chute would then be used for the lower segment. Auxiliary water from the intake would be introduced at the turn pool to increase the attraction flow resulting from the pool and chute discharge jet. Ladder step increases would be 0.8 ft. The dam crest would be moved downstream eliminating the adult stranding issue, reducing/eliminating false attraction, and reduce injury to fish moving downstream. The intake screen would be modified reducing the stranding of juvenile salmonids at low flow, and the addition of a chute or other modification would reduce injury caused by the intake at high flows. This alternative was determined to have lower environmental benefits associated with adult passage (primarily attraction flow) so it was eliminated from further analysis. In addition, it was determined that this alternative was more likely to require more maintenance than other alternatives.

3.5 POOL AND WEIR WRAP AROUND BACK TO DAM CREST.

Under this alternative, the fish ladder design flow range would be 5 to 40 cfs. At 320 cfs Creek flow there would be 280 cfs spillway flow. Ladder step increases would be 0.8 ft. The dam crest would not be moved downstream but a plunge pool along with one weir downstream of the structure would be created eliminating the adult stranding issue, reducing/eliminating false attraction, and reducing injury to fish moving downstream. The intake screen would be modified reducing the stranding of juvenile salmonids at low flow, and the addition of a chute or other modification would reduce injury caused by the intake at high flows. This alternative was determined to have lower environmental benefits associated with adult passage (primarily attraction flow) so it was eliminated from further analysis. In addition, it was determined that this alternative was more likely to require more maintenance than other alternatives.

3.6 CUT AND FILL-RELOCATE INTAKE

Under this alternative, the existing dam would be demolished, and a new intake structure would be constructed upstream of the existing dam. The configuration of this intake was not determined, nor was the routing of the supply pipeline. Eight grade control weirs with 1.0 ft elevation drops would be installed spaced 50 ft apart. The gradient through the reach would be 2%. Each of the weirs would have a low flow notch, roughly a 45 ft bottom width, and 3:1 side slopes. The weirs would extend to the existing bank with a slope of approximately 15:1. This design is essentially a fish way, which uses the entire width of the stream as steps for the ascent

and descent of fish. In addition, these weirs would provide a grade control to eliminate head cutting. This alternative would allow the placement of large woody debris and bank vegetation. This alternative would include the excavation of 4500 cu. yds. of sediment upstream of the existing structure and the placement of 2500 cu. yds. of sediment downstream of the existing structure along with the installation of a 450 ft long 12-18 inch sediment bypass pipe. The addition of approximately 2000 yds of 9-inch riprap/bank protection would be necessary. This alternative was discarded because the costs would be excessively high.

3.7 LARGE SPACING, CONCRETE OR BOULDER WEIRS 50 FT SPACING

Under this alternative, the existing dam would be demolished but the hatchery intake structure location would remain. A series of weirs with 1.0 ft elevation drops would be constructed beginning at the intake structure and moving downstream of the dam spaced fifty feet apart. This 50 ft spacing of weirs results in a total of 13 weirs. The gradient through the reach would be 2%. Each of the weirs would have a low flow notch, roughly a 45 ft bottom width, and 3:1 side slopes. The weirs would extend to the existing bank with a slope of approximately 15:1. This design is essentially a fish way, which uses the entire width of the stream as steps for the ascent and descent of fish. In addition, these weirs would provide a grade control to eliminate head cutting. This alternative would allow the placement of large woody debris and bank vegetation. This alternative would also include the placement/grading of 8000 cu. yds. of imported gravels/cobbles. The addition of approximately 3300 cu. yds. of 9-inch riprap/bank protection would be necessary, along with installing a 650 ft long 12-18 inch sediment bypass pipe. This alternative was quickly discarded because the costs were would be excessively high.

3.8 CONCENTRATED DROPS, CONCRETE OR BOULDER WEIRS 15 FT SPACING

Under this alternative, the existing dam would be demolished but the hatchery intake structure location would remain. A series of weirs with 0.8 ft elevation drops would be constructed beginning at the intake structure and moving downstream of the dam spaced 15 feet apart. This 15 ft spacing of weirs results in a total of 12 weirs. The gradient through the reach would be 10%. Each of the weirs would have a low flow notch, roughly a 45 ft bottom width, and 3:1 side slopes. The weirs would extend to the existing bank with a slope of approximately 15:1. This design is essentially a fish way, which uses the entire width of the stream as steps for the ascent and descent of fish. In addition, these weirs would provide a grade control to eliminate head cutting. This alternative would also include the grading of 1000 cu. yds. of channel sediments. The addition of approximately 1700 cu. yds. of 2.5-inch riprap/bank protection would be necessary, along with installing a 100-ft-long 12-18 inch sediment bypass pipe. The 15 ft spacing of the weirs would reduce the project length, however it may reduce the ability to successfully pass fish through the steepened reach. This alternative was quickly discarded

because the costs would be excessively high. In addition, the 15 ft spacing would not meet fish passage criteria.

3.9 ENLARGED CHANNEL POOL AND CHUTE FISHWAY

Under this alternative, the fish ladder would span the majority of the width of the channel, and it would operate at a wide range of flows. Pool and chute fishways have been shown to be more self-cleaning compared to more traditional style fishways. The dam crest would be moved downstream eliminating the adult stranding issue, reducing /eliminating false attraction, and reducing injury to fish moving downstream. Several weirs with 0.8 ft elevation drops would be installed downstream of the dam functioning essentially as ladder steps and grade control. This would allow the ladder to be constructed in a linear fashion while still meeting current specifications for ladder pool area and volume with 0.8 step increases. The intake screen would be modified to reduce the stranding of juvenile salmonids at low flow, and the addition of a chute or other modification would reduce injury caused by the intake at high flows. This alternative was eliminated since the project cost was higher than the preferred alternative, however it had almost identical environmental benefits.

4.0 AFFECTED ENVIRONMENT

4.1 GENERAL

The Issaquah Creek basin drains about 61 square miles of King County. Issaquah creek flows from steep headwaters in the southern basin into Lake Sammamish at the northern edge of the basin. The basin elevations range from approximately 3,000 feet at the peak of Tiger Mountain to near sea level at the mouth of Issaquah Creek. More than 80 percent of the basin is forested, with the remainder in wetlands, pastures, urban, and low-density single-family residences.

The Upper sub-basin is largely undeveloped and it represents the most abundant and relatively undamaged salmonid habitat in the Issaquah Creek basin (King County 1996).

The Middle Issaquah Creek Sub-basin is much like the upper basin but also contains farms with pastures, homes, and highway passing through it.

The Lower Issaquah Creek Sub-basin will be defined here as RM 3.5 just downstream of the diversion dam to the confluence with Lake Sammamish. The City of Issaquah surrounds this portion of the creek, which has been extensively altered by both natural processes and human activity. The lowest reach from about RM 0.6 to the mouth winds through Lake Sammamish Park where the stream is large, deep, and slow moving.

4.2 GEOLOGY/SOILS

The soils and land types of the King County Area were formed largely in deposits of glacial drift laid down during the Vashon period of the Fraser glaciation late in the Pleistocene. The major kinds of material left by the glacier are till, recessional outwash, and pro-glacial lacustrine and outwash sediments (Snyder et al. 1973). The action area and project are founded upon the landtype known as “Vashon till” commonly found throughout King County. Vashon till consists of very dense, consolidated lodgment till that ranges in thickness from about 5 feet to nearly 100 feet and has a mantle of ablation till about 3 feet thick. The ablation till is loose, and it is in this material that soils of the Alderwood series formed (Snyder et al. 1973). The till plain is undulating and slopes are mostly between 6 and 15 percent.

4.2.1 Sediments

The forebay immediately upstream of the dam has trapped sediment over the years. Total weight of the sediment has been estimated to be between approximately 63 to 94 tons.

Sediment in the Issaquah Creek basin is produced by soil surface erosion and stream erosion. Finer-grained sediment is carried downstream most of the year, while coarser sediment is moved only during higher flows in most of the subbasins. The coarser sediment accumulates in the bed of the stream and in point and side-channel bars at times of lower flow. Sediment transport and deposition varies throughout the Issaquah Creek Basin as the numerous subbasins have many different characteristics. For example, Fifteenmile Creek has a slope averaging 10 percent resulting in high levels of sediment transport. Carey Creek maintains a balance between water and sediment discharge and the Middle Issaquah Creek Subbasin consists of both flat and steep tributaries resulting in a relatively consistent sediment movement throughout the subbasin. Detailed erosion and deposition information is available in the Current/Future Conditions & Source Identification Report produced by King County Surface Water Management in October 1991.

4.3 WATER/WATER QUALITY

4.3.1 General

The lower Issaquah Creek overflows its banks on a frequent basis, resulting in the flooding of hundreds of homes and businesses. Flooding problems are largely the result of extensive development in floodplains in the lower basin, rather than increases in flood flows due to upstream development (King County, 1996).

Water quality in the basin is generally good. Despite localized pollution from urban sources, roads, and agricultural and forestry activities, the water quality in Issaquah Creek and its tributaries is good, particularly during baseflow conditions (King County, 1996).

4.3.2 Land Use and Potential Pollution Sources

More than 80 percent of the basin is forested, with the remainder in wetlands, pastures, urban, and low-density single-family residences. The current land use surrounding Upper Issaquah Creek and its tributaries is mostly forestry. The forest surrounding Holder Creek is under management of the Washington State Department of Natural Resources and the forest surrounding Carey Creek is primarily in private ownership.

Potential sources of nonpoint pollution in Issaquah basin include agriculture, stormwater runoff, failing onsite septic systems, improper pesticide and fertilizer application, hazardous wastes, underground storage tanks, landfills, resource extraction, forestry operations, and gravel mining.

Point source pollution sources in the basin include Lakeside Sand and Gravel, Consolidated Dairy Products, Washington State Department of Fisheries, and Sunset Quarry.

4.4 HYDRAULICS AND HYDROLOGY

Issaquah Creek is one of the larger creeks in the Lake Washington watershed; with stream flows ranging from several hundred cubic feet per second (cfs) in the winter to summer lows of about 30 cfs. Mean flow is 134 cfs. Drainage area for Issaquah Creek is about 61 square miles. Unit area discharges have been calculated for the basin and range from 0.06 to 0.12 cfs/acre, with a mean flow of 0.099 cfs/acre. This number is relatively large compared to other highly urbanized Lower Puget Sound basins that are typically in the 0.078 cfs/acre range (King County, 1991). The large unit area discharge in the Issaquah Creek basin is the result of greater local precipitation, generally steeper topography, and a local geology dominated by significant amounts of bedrock and till. The 100-year flood discharge is estimated to be 3,160 cfs and the 10-year flood discharge to be 1,960 cfs (King County 1991).

4.5 VEGETATION

Generally the vegetation in the project area is generally comprised of a mixed coniferous forest on the valley slopes and mixed deciduous forest in the valley floor. Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), bigleaf maple (*Acer macrophyllum*), cottonwood (*Populus trichocarpa*), and Oregon ash (*Fraxinus latifolia*) and alder (*Alnus rubra*) dominate the overstory, while Indian plum (*Oemleria cerasiformis*), salal (*Gaultheria shallon*), snowberry (Symphoricarpos albus), elderberry (*Sambucus racemosa*), swordfern (*Polystichum munitum*), and oregon grape (*Berberis aquifolium*) are common understory species. The riparian area of the Upper Issaquah Creek Sub-basin is in excellent condition, primarily vegetated with deciduous species along with conifers. The riparian area through the middle Issaquah reach is in very good condition and is dominated by deciduous species. The riparian zone varies from a width of 30-50 feet per bank to over 200 feet per bank, interrupted by pastures, highways, and homes. The City of Issaquah surrounds the lower portion of the creek, which has been extensively altered by both natural processes and human activity.

4.6 WETLANDS

King County conducted a wetland inventory where they inventoried 38 wetlands totaling 324.8 acres (King County 1991). These 324.8 acres of wetlands are less than 1 percent of the total land in the basin of about 40,000 acres. However, riparian wetlands (those that are developed on floodplains along streams) were largely omitted in the original inventory process (King County 1981) and have not been evaluated at this time. It has been estimated that 200 to 400 acres of riparian wetlands remain to be mapped with large portions of this along the Issaquah Creek main stem and along Carey Creek. By including the unmapped riparian wetlands, a more accurate estimate of the total wetland acreage in the basin is approximately 600-700 acres, or about 1.5 percent of the basin area.

The Corps conducted a wetland delineation for the immediate project area. This delineation determined that a small wetland is located on the right bank downstream of the existing diversion dam in a sandy pocket between the base of the creek bank and the waterline. Vegetation includes Japanese knotweed (*Polygonum cuspidatum*, FACU), black cottonwood (*Populus balsamifera*, FAC), vine maple (*Acer circinatum*, FAC-), and buttercup (*Ranuniclus repens*, FACW). The soil characteristics, including soil saturation, meet wetland criteria. The approximate size of wetland is 16- by 16-feet, for an area of 256 square feet.

4.7 FISH AND WILDLIFE

Anadromous fish found in Issaquah Creek include Chinook, coho, sockeye, and steelhead. In recent years large numbers of Chinook, coho, and sockeye have returned to Issaquah Creek but only a small percentage of these salmonids have been documented upstream of the intake dam. Resident fish in the creek include sculpin, and large numbers of cutthroat trout. There was an observation of a native char in the creek in the early 1990's (Personal Communication Goetz 2004) and a population of kokanee apparently inhabited the creek at one time but sampling by WDFW in 2001 and 2002 did not capture a single char or kokanee. Further information is described below.

4.7.1 Stream Habitat

The Issaquah Creek Basin includes Issaquah Creek and many of its tributaries such as Holder, Carey, Fifteenmile, and McDonald Creeks. The basin also includes the North and East Forks of Issaquah Creek. The North and East Forks of Issaquah Creek are located below the diversion dam. The middle and upper Issaquah Creek Basin has exceptional fish habitat primarily provided from Carey and Holder Creeks (WRIA 8 2002).

The Middle Issaquah Creek Sub-basin is defined here as RM 3.5 to RM 11.4 with Fifteenmile Creek entering the mainstem at RM 6.9 and McDonald Creek entering at RM 7.45 both of which are utilized by anadromous and resident fish. The gradient throughout this long reach is less that 1 percent, and many channel braids are present providing excellent summer rearing habitat and refuge during high flow events. The gravels are free of fines, providing excellent spawning conditions and the pool to riffle ratio is slightly uneven with riffles being more frequent.

The riparian area through Middle Issaquah Creek is in very good condition and is dominated by deciduous species. The riparian zone varies from a width of 30-50 feet per bank to over 200 feet per bank, interrupted by pastures, highways, and homes. The canopy vegetation consists primarily of alder, cottonwood, and Oregon ash, and the understory consists of salmonberry, snowberry, elderberry, Indian plum, swordfern, and Oregon grape.

The Upper Issaquah Creek Sub-basin is formed by the drainages of Holder and Carey creeks. Holder Creek begins on the southeastern slopes of Tiger Mountain and flows approximately 6-7 miles to its confluence with Carey Creek. Large cobble and boulders dominate Holder Creek, and the gradient is typically greater than 3.0 percent. In addition, the habitat is generally low in complexity; lacking large woody debris, this creek provides little salmonid habitat. Carey Creek begins on the southeastern slopes of South Taylor Mountain and flows 7 miles to the confluence with Holder Creek, which forms the upstream end of the mainstem Issaquah Creek. Unlike Holder Creek, Carey Creek is an ideal salmon stream. It has a very low gradient, extensive pool and riffle complexes, and abundant large woody debris. Gravel beds are numerous, and the gravels are typically free of fines. Coho salmon, steelhead, and both sea run and resident cutthroat trout utilize the river for both spawning and rearing. Unfortunately, the stream appears to be underutilized by anadromous salmonids given the quality and abundance of habitat (King County 1991). At RM 5.2 a series of cascades provides an anadromous barrier and resident cutthroat inhabit this section to the Carey Creek headwaters.

The riparian area of the Upper Issaquah Creek Sub-basin is in excellent condition, primarily vegetated with deciduous species along with conifers. The current land use surrounding both tributaries is mostly forestry uses. The forest surrounding Holder Creek is under management of the Washington State Department of Natural Resources and the forest surrounding Carey Creek is primarily in private ownership. This sub-basin is largely undeveloped and it represents the most abundant and relatively undamaged salmonid habitat in the Issaquah Creek basin (King County 1996).

In Lower Issaquah Creek the mean stream width is over 30 feet, and pools can exceed six feet in depth, with the substrate consisting of fine sand and silt. This section of the stream is utilized for spawning by bass, perch, and suckers, and provides rearing habitat for salmonids. From RM 0.6 to about RM 1.2 the gradient increases, and gravels become present along with some pools and riffles. In addition some very old large woody debris is present along with some smaller woody debris. This area provides excellent spawning substrate, as evidenced by the large

number of redds observed in the area, but survival of these redds is unknown. From about RM 1.2 to the hatchery diversion dam at RM 3.5 hardened banks dominate and riparian habitat is often sparse varying from native vegetation to bare riprap. However, all salmonid species that inhabit the Issaquah Creek basin have been observed spawning in this reach.

4.7.1.2 Biota

The City of Issaquah (2001) performed a Benthic Index of Biotic Integrity (B-IBI) in 1999. This index evaluates general stream health in comparison to similar lowland streams in Puget Sound. Three sites were sampled, two sites were located below the diversion dam, and one site was above the diversion dam. All of the sites are located within 2 miles of the proposed project. The downstream site closest to the proposed project was rated as “poor’ and the site farther downstream was rated as “fair”. The benthic macroinvertebrate sample site above the proposed project was rated as “fair”. The fair score is similar to other streams in newly urbanizing areas such as Bear Creek, which was sampled in 1999 (Morley 2000).

4.7.2 Anadromous Fish

4.7.2.1 Chinook Salmon

Three stocks of Chinook are present in Lake Washington: (1) the Issaquah Creek stock, a composite population (utilizing Green River stock) that is at least partially sustained by production from the Issaquah hatchery; (2) the Cedar River stock, classified as native/wild; and (3) the north Lake Washington tributary stock also classified as native/wild. Lake Washington Chinook represent approximately 12% of the natural escapement occurring in the Puget Sound Evolutionary Significant Unit (ESU). Recent trends in abundance of Lake Washington Chinook have declined since 1991. The Lake Washington Chinook stock is now considered to be depressed (City of Seattle 1998).

Issaquah Creek is one of the three major Chinook spawning streams in the Lake Washington basin. It has been estimated that Issaquah Creek produced approximately 33% of all wild Chinook smolts entering the Lake Washington basin in 2000. The Issaquah Creek Hatchery and the accompanying weir are located about .5 miles downstream of the diversion dam. The Chinook return to Issaquah Creek from July through October, with the peak in late August through September. The collection of adult coho and Chinook for egg propagation takes place during the months of September, October, and at least part of November. Approximately 2,400 coho and 1,200 Chinook are required to meet the egg take goals of 3.3 million coho and 2.425 million Chinook. During the collection period, essentially all salmonids other than Chinook and coho are sorted out manually and released back into Issaquah Creek upstream of the weir. During the rest of the year, approximately December through August, upstream-bound fish are allowed to pass over the hatchery weir on their own volition. Therefore, if any Chinook were to return before

or after the collection period they would be able to move upstream of the hatchery and spawn naturally.

As stated previously, the hatchery's production goals require approximately 1,200 adult Chinook for egg production and the escapement goal is 500 Chinook. However, the escapement was not met from 1990 to 1996. In fact, some years the 1,200 spawners needed for egg-take was not achieved. As a result there has been some discussion regarding the priority of allowing some Chinook to spawn naturally upstream of the hatchery regardless if the 1,200 fish needed for production is achieved. Presently this has not been an issue due to the recent increase in adult returns. From 1997 to present, the escapement (upstream of the hatchery) has ranged from approximately 1,100 fish in 1999, to 7000 adult Chinook in 2001 (Table 1).

TABLE 1. ISSAQUAH HATCHERY ADULT CHINOOK RETURNS 1994-2001 BROOD YEARS (ISSAQUAH HATCHERY, 2001)

	Fish Trapped		Fish Released Upstream	
Brood Year	**Adults**	**Jacks**	**Adults**	**Jacks**
2001	10,451	287	7,014	146
2000	3,776	458	1,321	49
1999	3,529	434	1,113	59
1998	4,867	24	3,820	20
1997	3,815	125	1,700	116
1996	1,246	2	150	0
1995	1,910	270	0	0
1994	3,703	43	0	0

As stated previously, Issaquah Creek is one of the three major Chinook spawning streams in the Lake Washington basin, but it differs from the Cedar River and Bear Creek, in that the majority of the "wild" production is believed to be progeny of hatchery fish. The majority of spawning occurs in the East Fork Issaquah Creek and in the mainstem below the hatchery. The WDFW installed and operated a screw trap on the lower mainstem in the spring of 2000 primarily to measure the production of naturally produced Chinook along with obtaining other biological data. The preliminary results of this study estimated that from 14 March through 3 July, 29,196 Chinook migrants passed the screw trap. It is likely that many juvenile Chinook may have migrated out of Issaquah Creek prior to or after the period of trap operation due to the typical migrational characteristics of the Lake Washington Chinook. The Chinook in Issaquah creek and other local streams and rivers migrate downstream as fry from January through March and later in the year from May through early July as smolts. Based on migration timing curves generated in

2000 for the Cedar River, Soos Creek, and Bear Creek, it is believed that the sample period may have missed 30% to 50% of total Chinook migrants leaving the system (Dave Sieler personal comm). The vast majority of Chinook that the sampling missed would have been the fry that migrate out of the creek prior to the sampling that began 14 March. By incorporating the estimate of the early migrants along with the estimate of Chinook passing the trap during the sample period, the estimated production from Issaquah Creek in 2000 ranges from about 39,000 to 45,000 Chinook.

4.7.2.2 Coho Salmon

Coho salmon, like Chinook, are raised at the Issaquah hatchery so there is a hatchery component and a wild component to the Issaquah Creek coho. As stated previously in the Chinook salmon section, coho returning to Issaquah Creek are collected during the months of September, October and part of November. Generally the procedure has been to collect approximately 2,400 coho for egg propagation and allow 1,300 to 2,400 coho above the rack to spawn naturally. The coho escapement goals for Issaquah Creek and other Puget Sound streams have been determined by various methods through the years resulting in varying escapement goals depending on the methods used. King County Surface Water Management has suggested that enough usable habitat is available in Issaquah Creek and its tributaries upstream of the hatchery to justify allowing 6,000 to 10,000 adult coho to pass upstream of the hatchery every year. In addition, if nutrients are limiting production, allowing larger numbers of fish upstream of the hatchery may increase the capacity of the stream as the decaying carcasses provide needed nutrients.

Adult coho return and migrate upstream from early September through late December and juvenile coho migrate downstream in mid March through May in Issaquah Creek. Trapping was conducted in the spring of 2000 from March 14 through July 3 to estimate the wild coho production of Issaquah Creek. In 2000, WDFW estimated a production of 18,232 wild coho (Seiler 2002).

4.7.2.3 Sockeye

It has been estimated that 80% of the Lake Washington sockeye spawn in the lower Cedar River, with the remaining 20% spawning primarily in Bear Creek and Issaquah Creek. The 1992 Washington State Salmon and Steelhead Inventory (SASSI 1994) identified three distinct sockeye stocks in Lake Washington, with the Issaquah Creek sockeye as a part of the Sammamish Tributary Stock. Historic run sizes (1972-1990) for Issaquah Creek in particular are not available but the median size of the entire Lake population is 246,913 adults, ranging from 122,964 in 1990 to 531,062 in 1988. From 1988 to 1995 the population continually declined with the lowest run on record in 1995, with 23,997 adults returning. However, in 1996, 2000, and 2004 large numbers of sockeye returned, allowing sport and Tribal fisheries suggesting that the long-term negative escapement trend is reversing.

Adult sockeye return to Issaquah Creek from August to November with peak returns in September and October. Juvenile sockeye migrate downstream from January through April.

4.7.2.4 Kokanee

Native kokanee were historically widespread throughout Lake Washington and its tributaries (Bean 1891). From 1978 to 1998, the native early run timing kokanee stock was found largely in Issaquah Creek and is believed to be the only remaining native stock of kokanee present in the Lake Washington Basin (Pfeifer 1995). Historically, this stock was present in at least Swamp and Bear Creeks. During the 1930's and 1040's, Washington Department of Game took up to 10 million eggs from kokanee that were trapped in Bear Creek. This suggests that an egg take of this size would have required the trapping of in excess of 10,000 adults and possibly as many as 25,000. However, the annual escapement rates into Issaquah Creek were reported to vary between one and three thousand individual spawners during the early 1970's (Berggren 1974). From 1980 through 1982, estimated kokanee escapement into Issaquah Creek ranged from approximately 400 and 1,000 fish (Pfeifer 1992). In 1983, only 10 early run kokanee were observed in Issaquah Creek. Kokanee escapement counts conducted from 1992 through 1998 showed a continual low escapement. In 2000, the WDFW conducted trapping on Issaquah Creek from March 14 through July 3, and 0 kokanee were caught. The decline of the Issaquah Creek kokanee is most likely due to their spawning timing. These fish spawn in July and August subjecting there redds to the typical low flow period that is accompanied by warm water temperatures. In addition, sockeye, Chinook, and coho would potentially construct their redds in the same locations as the kokanee redds that were constructed just a few weeks earlier.

4.7.2.4 Steelhead

Steelhead, displaying perhaps the most diverse life history pattern of all Pacific salmonids, reside in most Puget Sound streams. Their historic native distribution extended from northern Mexico to the Alaska Peninsula. Presently, spawning steelhead are found as far south as Malibu Creek, California (Busby *et al.* 1996). Two different genetic groups (coastal and inland) of steelhead are recognized in North America (Busby *et al.* 1996). British Columbia, Washington, and Oregon, have both coastal and inland steelhead, while Idaho has only the inland form and California steelhead stocks are all of the coastal variety (Busby *et al.* 1996). Within these groups, steelhead trout are further divided based on the state of sexual maturity when they enter freshwater. Stream-maturing steelhead (also called summer steelhead) enter freshwater in an immature life stage, while ocean-maturing (or winter steelhead) enter freshwater with well developed sexual organs (Busby *et al.* 1996). Lake Washington Basin steelhead have been placed into the Puget Sound ESU, along with 53 other steelhead stocks, by the National Marine Fisheries Service (Busby *et al.* 1996). Total run size for the major stocks of this ESU was estimated at 45,000, and natural escapement of approximately 22,000 steelhead (Busby *et al.* 1996).

The Lake Washington Basin does not have a summer steelhead stock and winter steelhead adults spawn from February through May. Juvenile steelhead migrate in April and May.

Much like Chinook and coho, the steelhead population is composed of hatchery and wild fish. In 1998 fry were planted in the upper river and the Issaquah hatchery also raises steelhead that are released as fingerlings. In recent years only a couple of adult steelhead return to Issaquah Creek each spring. In 2000, the juvenile sampling estimated that a total of 1,146 wild steelhead smolts migrated past the trap. However, no attempts were made to adjust this number to represent the total basin production.

4.7.2.5 Coastal Cutthroat Trout

Coastal, or anadromous cutthroat trout, are distributed on the Pacific Coast from Prince William Sound in southern Alaska to the Eel River in northern California, rarely penetrating more than 100 miles inland (Johnston 1982; Behnke 1992). Considerable information exists for Puget Sound cutthroat trout, though little of that has been collected in a standardized manner and over a long enough time period to establish trends in populations (Leider 1997). Coastal cutthroat trout exhibit early life history characteristics similar to coho and steelhead whereby juveniles spend time rearing in freshwater before outmigrating as smolts (Leider 1997). While little information exists on Issaquah Creek cutthroat, Puget Sound cutthroat emigrate to estuaries at a younger age (age II) and smaller size (6 inches TL) than cutthroat that are exposed to rough coastal waters (age III to V, 8-10 inches TL) (Johnston 1982). Puget Sound cutthroat trout will feed and migrate along beaches, often in waters less than 10 feet deep (Johnston 1982). Many stocks are thought to stay within estuarine habitats for their entire marine life (Leider 1997). Most cutthroat return to freshwater the same year they migrate to sea. Little information is available on the status of coastal cutthroat trout in Issaquah Creek. It is known that the adult cutthroat return to Issaquah creek in February through April, and the juveniles migrate downstream in February through June. The Lake Washington cutthroat spawn in tributaries and appear to spend their entire life in Lake Washington rather than migrating into the Puget Sound. This theory is based on 4 years of purse-seining in Lake Union and the Large Lock where thousands of sockeye, coho, and Chinook have been sampled and only a few cutthroat have ever been captured. As mentioned previously several times, trapping was conducted in the spring of 2000 from March 14 through July 3 to estimate the wild coho production of Issaquah Creek. In addition to obtaining coho production, information on cutthroat trout was obtained. It was estimated that 14,803 cutthroat migrated past the trap during the sample period. However, no attempts were made to adjust this number to represent the total basin production.

4.7.3 Resident Fish

4.7.3.1 General

Little information about resident fish is available for Issaquah Creek other than the cutthroat discussed previously. The lowest half-mile of the stream provides spawning areas for bass, perch, and suckers from Lake Sammamish. It can be reasonably assumed that various

sculpins (*Cottus* species), and threespine stickleback (*Gasterosteus aculeatus*) would be present upstream of the creek mouth.

4.7.3.2 Bull Trout

In the past 10 years, only two "native char" have been reported in Issaquah Creek and none have been reported in the Sammamish River (64 FR 16397; 1999; WDFW 1998). The USFWS is not certain that the latter subpopulation is "viable." There is no known spawning subpopulation resident in Lake Washington or Lake Sammamish, however, bull trout have been observed in the fish ladder viewing pool at the Locks as recently as 1997 (F. Goetz, USACE, *pers. comm.*) and isolated reports of bull trout captures in or around Lake Washington occur every few years. A larger juvenile bull trout (~250 mm, 3 year old) was caught in the lower Cedar River in July of 1998 (M. Martz, USACE, *pers. comm.*).

The only likely viable bull trout subpopulation in the Lake Washington watershed is the Chester Morse Reservoir subpopulation. However, the Chester Morse Reservoir subpopulation is above an anadromous barrier and is a glacial relic population (WDFW 1998). The population exhibits an adfluvial life history strategy, although residents could exist in the upper watershed (WDFW 1998). Because all life history strategies can arise from the same population, it is possible that some fish emigrate from the Chester Morse Reservoir to exhibit anadromy or to reside in Lake Washington. Water temperatures in the lower Cedar River may be too high to support a fluvial population (WDFW 1998).

The Washington Resources Inventory Area (WRIA) 8 has recommended an investigation for char (bull trout and/or Dolly Varden) to be completed throughout the watershed, especially in areas of the watershed above 1,000 feet and in cool water. Preliminary surveys were scheduled for summer 2000. The study findings recommended a three to five year investigation to determine the likelihood of needing future studies to determine char life history strategies in the basin. The preliminary results of the WDFW sampling conducted in the spring of 2000 from 14 March through 3 July did not catch any char out of more than 6,500 fish sampled. The sample collected at the trap consisted of Chinook, coho, steelhead, and cutthroat trout.

4.7.4 Fish Passage

The intake dam and its associated fish ladder currently present a challenge to migrating juvenile and adult salmonids and it restricts access to at least 10 miles of spawning and rearing habitat. The existing dam has passage problems with the ladder, the water supply intake, the spillway, and the accompanying apron. The numerous passage problems associated with the project vary in degree of magnitude depending on the stream flow that is passing the project.

The fish ladder has many problems such as inadequate flow, velocity, slope, attraction velocities, and perhaps entrance pool depth. Another problem occurs during high flow events,

when the sediment that has built up around the intake erodes plugging the ladder with sediment and rendered it unusable. The existing gravity intake screen structure is detrimental to juvenile fish passage as it was originally designed for flushing the screen box of sediment and debris. For example, during low flow when little water is bypassed, the intake chamber can trap juvenile fish. The intake structure poses other problems for migrating juveniles such as screening not meeting current standards and routing fish through hardware and then discharging fish from a height of 6-8 ft onto rocks during higher flows. The spillway and the accompanying concrete apron produce problems for both adult and juvenile salmonids at this facility also. During high flows, the apron below the spillway attracts the adult fish to an area where they are unable to pass the project (false attraction). During these high flows the fish attempt to ascend the spillway until they become exhausted and they then locate the ladder entrance only because they are looking for a refuge from the high velocity flows below the spillway. The concrete apron below the spillway attracts adult fish during times of low flow also. The problem with this is that once fish jump on to the apron they can become stranded. Another passage issue for the spillway is that the spillway consists of timbers angled at about 60° from the crest of the dam to the concrete apron. Most of these timbers are missing and the majority of fish passing the project fall from the crest of the dam about 4 ft to the concrete apron. Even the fish that happen to pass the project in an area with the timbers still present, encounter a rapid descent and abrupt impact with the concrete apron.

No detailed survival studies of juvenile salmon and trout passing the project have been completed to date, but based on current passage criteria, and the previously listed observations, the project is clearly resulting in unnecessary mortality to juvenile salmonids and substantially restricting adult passage. Although no detailed passage or survival studies have been conducted at the intake dam, spawning surveys have been conducted upstream and downstream of the project. The results of the 2001 surveys identified 14 Chinook, 197 coho, 88 sockeye, and 28 unidentified fish at RM 3.3 below the diversion dam. The results of the RM 5.8 surveys identified 9 Chinook, 42 coho, 43 sockeye and 8 unidentified fish above the diversion dam. This data shows that out of the total numbers of fish identified at the 2 sites, 39% of the Chinook, 21% of the coho, 33% of the sockeye, and 22% of the unidentified fish were identified above the diversion dam at RM 5.8. Combined with the knowledge that salmonids have been identified spawning up to 11 miles upstream of the diversion dam and that there is approximately 11 miles of quality spawning and rearing habitat upstream of the dam, this data provides further evidence of a passage problem at the project site.

4.7.5 Wildlife

Wildlife in the basin include over 100 species of birds, including bald eagles (*Haliaeetus leucocephalus*), barred owls (*Strix varia*), northern saw-whet owls (*Aegolius acaducus*), red-tailed hawks (*Buteo jamaicensus*), pileated woodpeckers (*Dryocopus pileatus*), and blue grouse (*Dendragapus obscurus*). Round lake provides excellent nesting habitat for a variety of waterfowl including eared grebes (*Podiceps nigricollis*) and bufflehead (*Bucephala albeola*). In addition, dippers (*Cinclus mexicanus*) and belted kingfishers (*Ceryle alcyon*) have been observed

throughout the basin. Several species of amphibians and reptiles are found in the area including the rubber boa (*Charina bottae*) and the pacific giant salamander (*Dicamptodon ensatus*). Large mammals in the basin include elk (*Cervus elephus*), black-tailed deer (*Odocoileus hemionus columbianus*), black bear (*Ursus americanus*), bobcat (*Felis rufus*), and beaver (*Castor Canadensis*). Historically cougar (*Felis concolor*) were common in the area but presently they are known only to inhabit the upper Carey Creek basin and area of Tiger Mountain (King County 1991).

4.8 THREATENED AND ENDANGERED SPECIES

The Puget Sound Chinook salmon Evolutionary Significant Unit (ESU), including the populations in the Lake Washington Basin, were proposed for listing as threatened under the federal Endangered Species Act on 9 March 1998 (63 FR 11482). Cedar River Chinook salmon, along with 28 other stocks, have been placed into the Puget Sound ESU by NMFS (Myers *et al.* 1998). The Puget Sound ESU encompasses all Chinook populations from the Elwha River on the Olympic Peninsula to the Nooksack River in North Puget Sound and south to the Nisqually River. The five-year mean natural escapement (1992-1996) for the Puget Sound ESU is approximately 27,000 spawners; recent total escapement (natural and hatchery fish) has averaged 71,000 spawners (Myers *et al.* 1998).

The Coastal/Puget Sound bull trout population segment was listed as a threatened species under the Endangered Species Act of 1973, as amended, in October 1999. A 1998 WDFW study reported 80 bull trout/Dolly Varden populations in Washington: 14 (18%) were healthy; two (3%) were in poor condition; six (8%) were critical; and the status of 58 (72%) was unknown. Bull trout are estimated to have occupied approximately 60% of the Columbia River Basin and presently occur in only 45% of the estimated historical range (Quigley and Arbelbide 1997).

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed and proposed threatened or endangered species. Several species listed as either threatened or endangered are potentially found in the Issaquah Creek Basin, and are listed in Table 2.

TABLE 2. ENDANGERED SPECIES IN THE PROJECT VICINITY

Scientific Name	Common Name	Status
Haliaeetus leucocephalus	Bald Eagle	Threatened
Salvelinus confluentus	Coastal/Puget Sound Population Segment Bull Trout	Threatened
Oncorhynchus tshawytscha	Puget Sound ESU Chinook Salmon	Threatened
Oncorhynchus kisutch	Puget Sound/Straight of Georgia ESU Coho Salmon	Candidate

Information on known occurrences of endangered and threatened species in the project vicinity, and the impacts of the proposed project on these species will be addressed in a separate biological evaluation.

4.9 CULTURAL RESOURCES

The small diversion dam was constructed circa 1937-1940, to supply water downstream through a long pipe to the Issaquah Salmon Hatchery. The hatchery supplemental water supply pipe that carried water from the dam to the hatchery was placed in a trench dug into an old railroad grade that extends along the left or south bank of Issaquah Creek for a distance downstream of the project area. The railroad grade has been altered and now serves as an access road to the dam. The railroad grade dates to circa 1910 and was part of the former Issaquah and Superior Coal Company (later, Pacific Coast Coal Company) railroad loop.

4.10 AIR QUALITY

Air quality in the Puget Sound Basin is generally good. However, urban areas experience moderately degraded air quality during certain times of the year. Motor vehicles are the largest source of air pollutants in King County, although wood-burning stoves also contribute. Particulates, sulfur dioxide, ozone, and carbon monoxide are the pollutants of concern. High concentrations of these pollutants generally occur during the dry, late summer months when minimal wind conditions persist for long periods of time or during mid-winter thermal inversions.

Carbon monoxide, a product of incomplete combustion, is generated by automobiles and other fuel burning activities (e.g. residential heating with wood). The highest ambient concentrations of carbon monoxide tend to occur in localized areas such as major roadways and

intersections during periods of low temperatures, light winds, and stable atmospheric conditions. Ozone is a highly reactive form of oxygen created by sunlight-activated chemical reactions of nitrogen oxides and volatile organic compounds. Unlike high carbon monoxide concentrations, which tend to occur close to emission sources, ozone problems tend to be regional since ozone precursors can be transported far from their sources. Ozone precursors are primarily generated by motor vehicle engines.

4.11 RECREATION

Recreational uses of Issaquah Creek at the project site are seasonal and moderate. They include but are not limited to sightseeing, wildlife observation, , photography, hiking, fishing, and boating.

5.0 EFFECTS OF THE PROPOSED ACTION

5.1 GENERAL

Potential effects of the proposed project are evaluated compared to the no-action alternative. For all parameters, the no-action alternative would result in no changes to the existing conditions.

5.2 GEOLOGY/SOILS

Preferred Alternative

Construction activities associated with the proposed project will result in soil being disturbed and compacted from heavy machinery throughout the construction area. Streambed and bank protection will be placed for each weir to prevent scour and weir failure. Riprap will be placed at the depth of expected scour and covered with gravel having a range of sizes that replicate exiting substrate. Bank armoring will require a total of 80 cubic yards per weir, resulting in a total of 560 cubic yards. Between each weir 170 cubic yards of riprap will be used as instream scour protection. This instream scour protection riprap will be covered with 1000 cubic yards of pool mix (having a range of sizes that replicate exiting substrate) substrate. In addition, a 75 ft. section on the right bank will need to be elevated to height of 2 ft to maintain the current channel configuration due to the weir installation. This bank elevation will be accomplished by placing approximately 500 cubic yds of riprap and soil.

No Action Alternative

No effects anticipated as a result of the No Action Alernative.

5.1.1 Sediments

Preferred Alternative

The proposed project's dam face will be built approximately 10 ft downstream of the existing dam face. Following the river diversion removal, and consequential rerouting of the river

through the creek channel, the sediment that has accumulated in the forebay will be mobilized a short distance to the new dam face. After a few high flow events the sediment will accumulate in the new forebay and continue to pass the project as it has been doing for decades. The sedimentation and erosion control plan addresses water quality impacts associated with the proposed project.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.3 WATER/WATER QUALITY

5.3.1 General

Preferred Alternative

Water quality and flow in Issaquah Creek are expected to change little. Because the project area is in a relatively small area in comparison to the remainder of the watershed, flow stability will not be altered. The stream will continue to transport fine sediment throughout its length, through Issaquah into Lake Sammamish.

Potential point and non-point sources of water pollution will not be affected by this project. Some canopy cover in the project area will be lost during project construction. Though replanting will occur, it may take several years for the canopy to return to pre-project conditions. This minor loss is not expected to result in any temperature increases even during warm temperature and low flow conditions within the project reach.

There will be some construction impacts on water quality at several stages during the construction process. Large pulses of sedimentation following diversion of the stream back into the restored stream bed will result in short term turbidity until the water slows sufficiently to allow settlement, potentially lowering dissolved oxygen concentrations for short durations. Localized shifting of sediments will continue sporadically as the stream heals and adjusts to the new diversion dam. Floods during the winter and spring following construction will continue to mobilize sediments in the project area, potentially contributing to small increases in turbidity over that normally seen during flood events. Sedimentation impacts will be controlled through best management and conservation practices during construction. They should be temporary and of short duration. Water quality will be monitored in the project area and downstream during construction to detect any unacceptably high water quality impacts.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.3.2 Land Use and Potential Pollution Sources

Preferred Alternative

The proposed project will not alter land use or pollution sources except for the temporary water quality issues discussed in the previous paragraph.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.4 HYDRAULICS AND HYDROLOGY

Preferred Alternative

The hydraulic impacts of any of the proposed alternatives were viewed from the perspective of changes from the existing condition. The intent of the hydraulic evaluation was to ascertain any changed conditions in water surface profiles.

There are three potential areas of concern related to the performance of the recommended plan; sedimentation, flood conveyance, and erosion. Substantial efforts have been made to reduce any possibility of impacts outside of the project area. Hydraulic analysis has determined that the proposed project will pass sediment very similar to the existing project. However, the design will allow a minor increase in sediment transport as a result of the pool and chute design. The flood conveyance through the project reach is equal to the existing condition. By maintaining existing channel cross-section widths, with appropriate side-slopes and tying into high ground ensures flood flows will be contained. Finally, the potential for any increased erosion, through changes in channel depth or velocity, has been minimized in the project design. Increased velocities are expected through the project reach, however the hydraulic model indicates that the water surface profile of the preferred plan matches the existing condition profile downstream of the last weir groups, indicating that the weir groups are able to dissipate sufficient energy so that the existing channel controls flow conditions. In other words, implementing the preferred plan should not alter hydraulic conditions below the last element of the project. As such it is not expected that the project as designed will exacerbate existing instabilities downstream of the project reach. Also, due in part to the increases in velocity in the project reach, bank protection is required intermittently through the project footprint to reduce erosion potential. Bank protection is also required to ensure the integrity of the grade control features.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.5 VEGETATION

Preferred Alternative

Riparian impacts are not expected upstream of the project reach. However, the installation of grade control weirs between the downstream end of the project reach and the dam site will result in the riparian areas being impacted due to construction activities. Riparian impacts downstream of the project area will be non-existent in some areas and moderate in others, depending on construction access needs, siting, and practices. New vegetation will be planted along the disturbed riparian zone following construction. This new vegetation will take several years to replace the shading and detrital functions provided by existing vegetation within the construction area. Riparian and upland vegetation will not need to be removed for access roads and staging areas during construction as an access road presently exists. The installation of the weirs and the 75 ft. section of the right bank that needs to be elevated will be the primary part of the project area that will be 'disturbed' during construction. The section of the right bank that will require elevation will result in a 75 ft. long by 12 ft. wide area that will require vegetation removal.

No Action Alternative

The several areas on both the left bank and right bank will not have vegetation removed.

5.6 WETLANDS

Preferred Alternative

The proposed project includes the installation of seven grade control weirs. Through the installation of these weirs and the substrate to be placed between them the 256 sq.ft. wetland along the right bank will be filled. Preliminary consultation with the Washington Department of Ecology has indicated that this impact to the wetland can be mitigated by planting riparian vegetation in the project area or by increasing the type and number of habitat features included in the project design. The project will not alter the hydrology of any other wetlands in the area.

No Action Alternative

No wetlands would be affected by the No Action Alternative.

5.7 FISH AND WILDLIFE

Preferred Alternative

5.7.1 Habitat

The weir construction will provide alternating pool and riffle sections mimicking a natural stream gradient. The potential incorporation of habitat enhancement features such as, riparian plantings, deflector logs, and gravel bars, together with large woody debris included in the stream bands, will provide improvements in the rearing and refuge habitat for young salmonids and resident fish in the downstream (weir) section of the project.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.7.2 Anadromous Fish

Preferred Alternative

Populations of salmon in the Pacific Northwest have declined precipitously over the past several decades (Nehlsen *et al.* 1991). Small streams like Issaquah Creek have the capacity to buffer the declines in larger systems and support the efforts of the federal and state agencies to preserve and recover wild salmonid stocks.

The proposed project will remove the Issaquah Creek Dam, the primary bottleneck to salmonid rearing and spawning habitats in the upper watershed. This habitat is particularly limited in northern Puget Sound and the condition of Issaquah Creek is better than most other streams in the area. Downstream passage for juvenile and resident fish through the proposed project will also improve. Specifically, the intake structure and ladder currently present a challenge to migrating juvenile and adult salmonids. At least 10 miles of prime spawning and rearing habitat experience limited use due to the difficulty of adult upstream migration past the dam. During low flows downstream migrating juvenile fish also experience difficulty as they can be trapped in the intake area or are passed onto a concrete apron. The proposed project will include the following attributes:

Dam:

1) Adult fish will be attracted to the fish passage structure where they can move upstream,

2) Juvenile fish will pass downstream without injury as a plunge pool with sufficient depth will be constructed,

3) The new dam will provide stabilization to all abutments, and

4) The fish ladder and spillway design will be very resistant to clogging with sediment and debris.

Fish Ladder:

1) Ladder step heights will meet current guidelines,

2) Ladder step volumes will meet volume guidelines for energy dissipation,

3) Sediment will not accumulates in the pools after high flow events, and

4) Attraction flow will meet current guidelines.

Intake Structure:

1) Screen openings will meet current guidelines,

2) Juvenile fish will be able to bypass the screens,

3) The sweeping components of velocities along screens will meet current guidelines, and

4) The velocity gradient at the screen entrance will meet current guidelines.

All of these design features detailed above will addressed and will result in more efficient fish passage and higher survival for adult and juvenile salmonids during both upstream and downstream migrations.

No Action Alternative

The existing dam will continue to create a bottleneck to salmonid passage and reduce access to 10 miles of habitat.

5.7.3 Resident Fish

Preferred Alternative

Considering the small size of the project reach, there will be little impact to the resident fish population during construction. After diversion of the stream flow into the bypass pipe, as many fish as possible will be collected in the dewatered section. Fish could be trapped in the few pools in this section. Resident fish will be placed upstream a minimum of one mile to avoid the project area and downstream sedimentation.

A significant increase in anadromous fish above the dam could affect the current population of resident trout. The upper watershed has always had some level of salmonid use, including natural spawning and some hatchery supplementation using steelhead fry. The proposed project would result in an incremental increase of primarily Chinook, coho, and sockeye fry above the dam.

An increase in cutthroat trout smolt numbers in western Washington streams coincided with declines in coho salmon abundance (Dave Sieler, personal communication). There has also been some evidence that cutthroat trout are relegated to riffles by the more dominant coho salmon (Glova 1986), although other authors have found that cutthroat trout select the shallower and faster waters in riffles even though coho salmon are not present (Sabo and Pauley 1999). When coho salmon fry are present they can dominate cutthroat trout fry because juvenile coho salmon emerge from redds earlier and are larger in size (Laufle *et al.* 1986). Yet, adult cutthroat trout will readily prey on coho salmon fry or other small fish.

Anadromous salmonids currently and historically occurred in the upper watershed. Additional nutrients and elevated primary productivity levels resulting from increased adult carcass densities will partially offset the detrimental effects to resident fisheries associated with the increased abundance of juvenile anadromous salmonids.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.7.4 Fish Passage

Preferred Alternative

This project will improve fish passage for all species that inhabit the creek or have inhabited the creek historically. The existing dam has passage problems associated with the dam face, fish ladder, and the intake structure that were listed in section 4.7.4. The stranding issue associated with the apron below the dam face will be resolved as this apron will always be at least 2 ft below the water surface; this will also address the problems encountered by juvenile fish passing over the dam crest. The passage problems associated with the fish ladder will be addressed as the proposed project will meet or exceed current guidelines for ladder step heights, and pool volumes. The sediment and attraction problems will be alleviated by the pool and chute design that utilizes the majority of stream flow through the fish passage structure, increasing attraction flows and passing sediment more efficiently than the present structure. The intake issues will be resolved by meeting current passage criteria for screen opening size, screen configuration, and screen velocities. In addition, a juvenile bypass will be installed to return fish to the river.

No Action Alternative

Fish passage will continue to be limited and cause mortality to both juvenile and adult salmonids.

5.7.4.1 Short Term Impacts (Construction)

Preferred Alternative

Project construction will require approximately two to four months, depending upon the construction schedule, to complete. During this period, the creek will be diverted into a pipe for the length of the project area, and will provide little or no fish habitat along the length of the diversion.

The construction period will follow the spring high-flow period, so it will avoid impacts to the juvenile salmon migrating downstream during the spring. Most of the construction (all in-water work) will occur prior to the adults arriving in the fall. There is the potential that upstream migrants, particularly early Chinook and sockeye, will arrive in Issaquah Creek prior to completion of the stream restoration. However, in recent years water temperatures in Issaquah Creek have been extremely high creating a barrier for passage until mid to late September when water temperatures recede.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.7.4.2 Construction Contingency Plan (Stream Bypass)

5.7.4.2.1. Adult salmon Collection and Trucking Upstream

Preferred Alternative

To avoid the most direct adverse construction impacts to salmonids, ideally the temporary stream bypass by pipe should only occur between June 15 and July 31, for a construction window of approximately 6 weeks. The downstream migration of smolts is largely completed by June 15 and the adult return of Chinook and sockeye salmon for spawning can begin as early as early August. However, the Chinook often do not show up in large numbers until mid September. The Corps and WDFW are determining if a more appropriate in-water work window of June 15- September 15 would be more accurate, and will continue to coordinate with NMFS. Preliminary consultation with NMFS indicates that the in water work window extending into September may be acceptable. However, if weather conditions in August and early September were cold and wet, the adult migration would likely begin earlier than in recent years. If this occurred a trap and haul operation would likely be necessary. All reasonable effort will be made to require the contractor(s) to include a concentrated and intensive work schedule to complete instream work that requires flow bypass by September 15.

After diversion of the stream flow into the bypass pipe, a concerted effort will be made to collect as many fish as possible in the dewatered section. Salmonid smolts will be placed downstream to allow them to continue their outmigration and resident fish will be placed at least a mile upstream to remove them from any effects of construction and sedimentation.

If the project in-water work and temporary bypass by pipe cannot be completed in the preferred time frame, even with a concentrated and intensive work schedule, then it would preferable to initiate the work prior to June 15 rather than extend the work into September. During plans and specifications the project construction schedule will be revisited. If it appears likely that the in-water construction period required exceeds approximately 10 weeks, coordination will occur among all the project stakeholders to determine the best course of action. The options may include delaying construction one year so that the work could begin earlier the following spring, or continuing construction into late September, in which case a trap and haul facility would be necessary.

If construction (in water work) is initiated prior to 15 June, the diversion structure would need to accommodate passage of outmigrating fish. No detailed evaluations have been completed as part of the feasibility phase to determine the design requirements that would need to be incorporated into the diversion structure to allow for safe passage of outmigrating fish.

It must be understood that even if the stream diversion is planned to be completed by July 31, unplanned delays may make this schedule impossible. A contingency plan will be developed to mitigate this potential problem. Work progress will be carefully monitored throughout the construction period to determine if the schedule is being met. The decision to initiate collection

and trucking procedures will be made by July 15 to allow sufficient time for implementation. WDFW has the capability to accomplish this contingency plan very rapidly as the hatchery collection weir and holding facilities are located about ½ mile downstream of the project. Regardless of when construction occurs, a contingency plan will need to be in place prior to initiating construction.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.7.4.3 Long Term Impacts

Preferred Alternative

This project is proposed as a means to remove the existing adverse impact the dam has on anadromous fish passage in Issaquah Creek. The proposed project goal is to improve the spawning success of salmonids and reduce the mortality of juvenile and adult fish in Issaquah Creek. Providing more efficient and effective fish passage at the Issaquah Creek barrier dam is the primary objective of the proposed project.

The proposed project will eliminate the existing problems associated with the dam, fish ladder, and intake structure, that has been an impediment to upstream and downstream passage of salmonids. The dam has apparently impeded the movement of Chinook salmon, coho salmon, sockeye salmon, steelhead, cutthroat, and possibly kokanee and native char to productive areas of Issaquah Creek upstream from the dam. Since most of the potential spawning and rearing habitat (about 10 miles) of Issaquah Creek exists upstream of the dam, eliminating this passage impediment has the potential to substantially increase the salmonid production from Issaquah Creek.

No Action Alternative

Fish passage problems will continue as a result of the No Action Alternative.

5.7.5 Wildlife

Preferred Alternative

Effects to wildlife, if any, will be temporary and occur primarily during construction. The riparian plantings and potential addition of woody material added to the site will increase some habitat values. In addition, the increase in fish passage success will provide more adult fish upstream benefiting numerous species. Overall effects to wildlife, both adverse and favorable, will be insignificant.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.8 THREATENED AND ENDANGERED SPECIES

Preferred Alternative

Potential impacts of the proposed project on sensitive, threatened and endangered species are summarized below and were addressed in detail in a separate BE (Appendix G). The effects discussed below were further considered through consultation with the USFWS and NOAA Fisheries in accordance with Section 7(a)(2) of the Endangered Species Act (see Section 8.2) and concurrence with the Corps determination of may effect, not likely to adversely effect were received in April 2004.

No bald eagle nests occur within one mile of the project or disposal site (Washington Priority Habitat and Species List Database, July 2003). Bald eagles likely use or occur near the project area only sporadically. Bald eagles are more active and abundant in areas closer to Lake Sammamish, more than three miles from the project site. Bald eagle use of the site is most likely during the winter in association with the salmon spawning period. Construction at the site will occur during the summer and fall months, minimizing the chance of impacts to bald eagles. After construction, the habitat will provide similar eagle habitat to that which currently exists. Accordingly, the proposed project is not likely to adversely affect bald eagles.

Effects on fish, including salmonids, are discussed in detail in Section 5.7.2, 5.7.3 and 5.7.4. Construction will be planned and managed to minimize potential impacts to salmonids and other aquatic species. Bull trout are unlikely to occur in Issaquah Creek at any time of the year, and particularly not during the summer and fall due to high water temperatures. The proposed construction window avoids peak abundance of Chinook and coho salmon adults and juveniles. Considering the magnitude, timing, and management of construction of the project, the likelihood of impacts to bull trout and Chinook salmon during construction are insignificant and discountable. After construction, habitat for salmonids, including Chinook salmon, coho salmon, and bull trout, will be readily accessible. Accordingly, the project is not likely to adversely affect Puget Sound/Coastal bull trout or Puget Sound Chinook salmon. Under ESA, effect determinations are not appropriate for candidate species such as Puget Sound/Strait of Georgia coho salmon.

No Action Alternative

Fish passage problems will continue as a result of the No Action Alternative. No effects to terrestrial species are anticipated as a result of the No Action Alternative.

5.9 CULTURAL RESOURCES

Preferred Alternative

The proposed Corps defined Area of Potential Effects (APE) was submitted to the Washington State Historic Preservation Officer (SHPO), who concurred with the Corps' APE. A cultural resource investigation was completed for the APE that included a professional field survey, archival and other background research, coordination with concerned parties, and submission of a report to SHPO that was copied to the Muckleshoot Tribe. The records search indicated that there were no historic properties listed in the National Register of Historic Places (NRHP) or the Washington Office of Archaeology and Historic Preservation (OAHP) electronic historic site database within the APE. A Corps architectural historian recorded a small diversion dam and a railroad grade within the APE and determined that they were eligible for nomination to the NRHP. The architectural historian also examined the nearby Issaquah Fish Hatchery, conducted research at the Issaquah Historical Society and Museum, and consulted with the Society staff concerning the significance of the two properties. The railroad grade has been previously disturbed and the Corps will return to its same appearance at the end of the project. Consequently, the Corps determined that there would be no historic properties adversely affected related to disturbance of the railroad grade and SHPO concurred.

The Corps determined that removal of the dam would adversely affect an historic property and the SHPO concurred. Subsequently, the proposed mitigation measures addressing the adverse effect to the dam were formulated in a memorandum of agreement (MOA) with the SHPO, the Washington Department of Fish and Wildlife, and the City of Issaquah. The King County Historic Preservation Officer signed the MOA on behalf of the City of Issaquah. The SHPO concurred with mitigation measures for removal of the dam are to fully document the structure in a Historic American Buildings Survey/Historic American Engineering Record report (HABS/HAER) in medium format. Submittal to the SHPO and acceptance by the OAHP of the HABS/HAER report will complete the Section 106 process.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.10 AIR QUALITY

Preferred Alternative

During construction, there would be temporary and localized reduction in air quality due to emissions from heavy machinery operating during construction. These emissions would not exceed EPA's de minimis threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone) or affect the implementation of Washington's Clean Air Act implementation plan. Therefore, impacts would not be significant.

Ambient noise levels will increase slightly during project construction. However, these effects will be temporary and localized, and every effort will be made to so that construction will occur only during daylight working hours. Given that the project is located in a City of 15,000 residents, the temporary elevations in noise level will not be significant.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

5.11 RECREATION

Preferred Alternative

Effects to recreation values are insignificant because the site will remain as a WDFW diversion dam owned, maintained, and patrolled by WDFW. Recreational resource and value uses are not changed.

No Action Alternative

No effects anticipated as a result of the No Action Alternative.

6.0 CUMULATIVE EFFECTS

The NEPA defines cumulative effects as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions in the project vicinity, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7). According to Washington State Environmental Policy Act Register (http://www.ecy.wa.gov/apps/sepa/) and Corps records, a number of projects are ongoing or planned to occur along Issaquah Creek.

Three projects (Issaquah Creek Bank Stabilization/Habitat Enhancement Project, Gilman Area Channel Improvement Project, and the Squak Valley Restoration Project) are located within a few miles of the Issaquah Creek Diversion Dam Project. The Issaquah Creek Bank Stabilization/Habitat Enhancement Project, and the Gilman Area Channel Improvement Project are planned to plant willows and place large woody debris along the shoreline. The Squak Valley projects will create off-channel rearing and refuge habitat for salmon and trout. In addition, this project will include riparian plantings that will benefit local wildlife by improving habitat value along the riparian corridor of Issaquah Creek. Another streambank restoration project (the Lasley Streambank Restoration Project) is planned to occur approximately 4 stream miles upstream of the diversion dam. These projects will enhance the riparian zone of Issaquah Creek and will complement the proposed diversion dam project.

Construction work by the Washington Department of Transportation (WDOT) is ongoing on a new Sunset Way interchange on I-90 adjacent to the East Fork of Issaquah Creek on the east side of the city. This work included authorization to fill wetlands and restore and enhance the creek corridor. In the summer of 2002, routine inspections by Corps Regulatory staff determined that additional unauthorized work had occurred. The unauthorized work included placement of riprap bank protection along the creek and additional wetland fill. To resolve the permit violation, the Corps is working with WDOT to restore the creek and perform additional compensatory mitigation. Together with the above mentioned Squak Valley project, restoration and mitigation work that will likely be performed in conjunction with the Sunset Way interchange will help restore lost ecosystem functions and values.

In summary, the cumulative impact of the Issaquah Creek Diversion Dam project will be to incrementally enhance ecological functions and values, particularly with regard to salmonid passage and habitat utilization.

7.0 TREATY RIGHTS

In the mid-1850's, the United States entered into treaties with a number of Native American tribes in Washington. These treaties guaranteed the signatory tribes the right to "take fish at usual and accustomed grounds and stations . . . in common with all citizens of the territory" [*U.S. v. Washington*, 384 F.Supp. 312 at 332 (WDWA 1974)]. In *U.S. v. Washington*, 384 F.Supp. 312 at 343 - 344, the court also found that the Treaty tribes had the right to take up to 50 percent of the harvestable anadromous fish runs passing through those grounds, as needed to provide them with a moderate standard of living (Fair Share). Over the years, the courts have held that this right comprehends certain subsidiary rights, such as access to their "usual and accustomed" fishing grounds. More than *de minimis* impacts to access to usual and accustomed fishing area violates this treaty right [*Northwest Sea Farms v. Wynn*, F.Supp. 931 F.Supp. 1515 at 1522 (WDWA 1996)]. In *U.S. v. Washington*, 759 F.2d 1353 (9th Cir 1985) the court indicated that the obligation to prevent degradation of the fish habitat would be determined on a case-by-case basis. The Ninth Circuit has held that this right also encompasses the right to take shellfish [*U.S. v. Washington*, 135 F.3d 618 (9th Cir 1998)]. Native Americans do harvest salmonids from the Lake Washington-Sammamish system, including those that originate from the Issaquah Creek basin.

The proposed project has been analyzed with respect to its effects on the treaty rights described above. We anticipate that:

(1) The work will not interfere with access to usual and accustomed fishing grounds or with fishing activities or shellfish harvesting;

(2) The work will not cause the degradation of fish runs and habitat; and

(3) The work will not impair the Treaty tribes' ability to meet moderate living needs.

(4)

8.0 ENVIRONMENTAL COMPLIANCE

8.1 NATIONAL ENVIRONMENTAL POLICY ACT

Section 1500.1(c) and 1508.9(1) of the National Environmental Policy Act of 1969 (as amended) requires federal agencies to “provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact” on actions authorized, funded, or carried out by the federal government to insure such actions adequately address “environmental consequences, and take actions that protect, restore, and enhance the environment". This assessment evaluates environmental consequences from the proposed habitat restoration project at the Issaquah Creek diversion dam in Issaquah, Washington.

8.2 ENDANGERED SPECIES ACT

In accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. The potential effects of the project and conservation measures taken to reduce those effects are summarized in Paragraph 5.6.4 and will be addressed in more detail in the BE for the project. The Corps has fulfilled its responsibilities under the ESA. The Corps received Endangered Species Act Section 7 Informal Consultation concurrence letters from the National Marine Fisheries Service and U.S. Fish and Wildlife Service dated 24 August 2004 and 30 April 2004, respectively.

8.3 CLEAN WATER ACT COMPLIANCE

Section 404 of the Clean Water Act (CWA) requires federal agencies to protect waters of the United States and disallows the placement of dredged or fill material into waters (and excavation) unless it can be demonstrated there are no reasonable alternatives. The Corps has prepared a Section 404(b)(1) evaluation that documents the project is consistent with Section 404 of the CWA.

Section 401 of the CWA requires federal agencies to comply with state water quality standards. The Corps received a Section 401 Water Quality Certification from the Washington State Department of Ecology on April 20, 2004.

8.4 FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act (FWCA, 16 USC 470) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. As discussed in this EA, the Corps has designed the project to restore and enhance fish and wildlife habitat in the immediate project area and the Issaquah Creek basin.

8.5 ESSENTIAL FISH HABITAT

In accordance with the Essential Fish Habitat (EFH) requirements of the Magnuson-Stevens Fishery Conservation and Management Act, the Corps has determined that the proposed work would impact approximately 180 linear feet of Issaquah Creek streambank, areas which are classified as EFH utilized by Pacific salmon. We have determined that the proposed action would not adversely affect EFH for federally managed fisheries in Washington waters. The project's BE provides supporting documentation for our determination. The Corps received an EFH concurrence letter from the National Marine Fisheries Service, dated 24 August 2004.

8.6 NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the National Historic Preservation Act of 1966, as amended through 2003, requires that Federal agencies identify and assess the effects of Federally assisted undertakings on historic properties and to consult with others to find acceptable ways to resolve adverse effects. Properties protected under Section 106 are those that are listed in or eligible for listing in the National Register of Historic Places. Eligible properties must generally be at least 50 years old, possess integrity of physical characteristics, and meet at least one of four criteria for significance. Regulations implementing Section 106 (36 CFR Part 800) encourage maximum coordination with the environmental review process required by the National Environmental Policy Act and with other statutes. The Washington State Archaeological Sites and Resources Act (RCW 27.53) and the Indian Graves and Records Act (RCW 27.44) may also apply.

8.7 CLEAN AIR ACT

The proposed project has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. The proposed activities would not exceed *de minimis* levels of direct emissions of a criteria pollutant or its precursors and are exempted by 40 CFR Part 93.153. Any later indirect emissions are generally not within the Corps continuing program responsibility and generally cannot be practicably controlled by the Corps. For these reasons, a conformity determination is not required for this project.

8.8 ENVIRONMENTAL JUSTICE

Executive Order 12898 directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations. No tribal resources would be harmed. No adverse effects to minority or low-income populations would result from the implementation of the proposed project.

8.9 COASTAL ZONE MANAGEMENT ACT

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner, which is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management (CZM) Program. The Shoreline Management Act of 1972 (RCW 90.58) is the core of authority of Washington's CZM Program. Primary responsibility for the implementation of the SMA is assigned to local government. The City of Issaquah, in which the project is located, fulfilled this mandate with their Shoreline Master Program.

The Corps conducted a review of the City of Issaquah Shoreline Master Program. Based on that review, the Corps has determined that the proposed action complies with the policies, general conditions, and activities as specified in the City of Issaquah Shoreline Management Program approved by the Director of the Washington Department of Ecology. The proposed action is thus considered to be consistent to the maximum extent practicable with the State of Washington Shoreline Management Program and policies and standards of the City of Issaquah Shoreline Master Program.

In a letter dated 20 April 2004, the Washington State Department of Ecology concurred with the Corps' Coastal Zone Consistency Determination.

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APPENDIX A

Project Drawings

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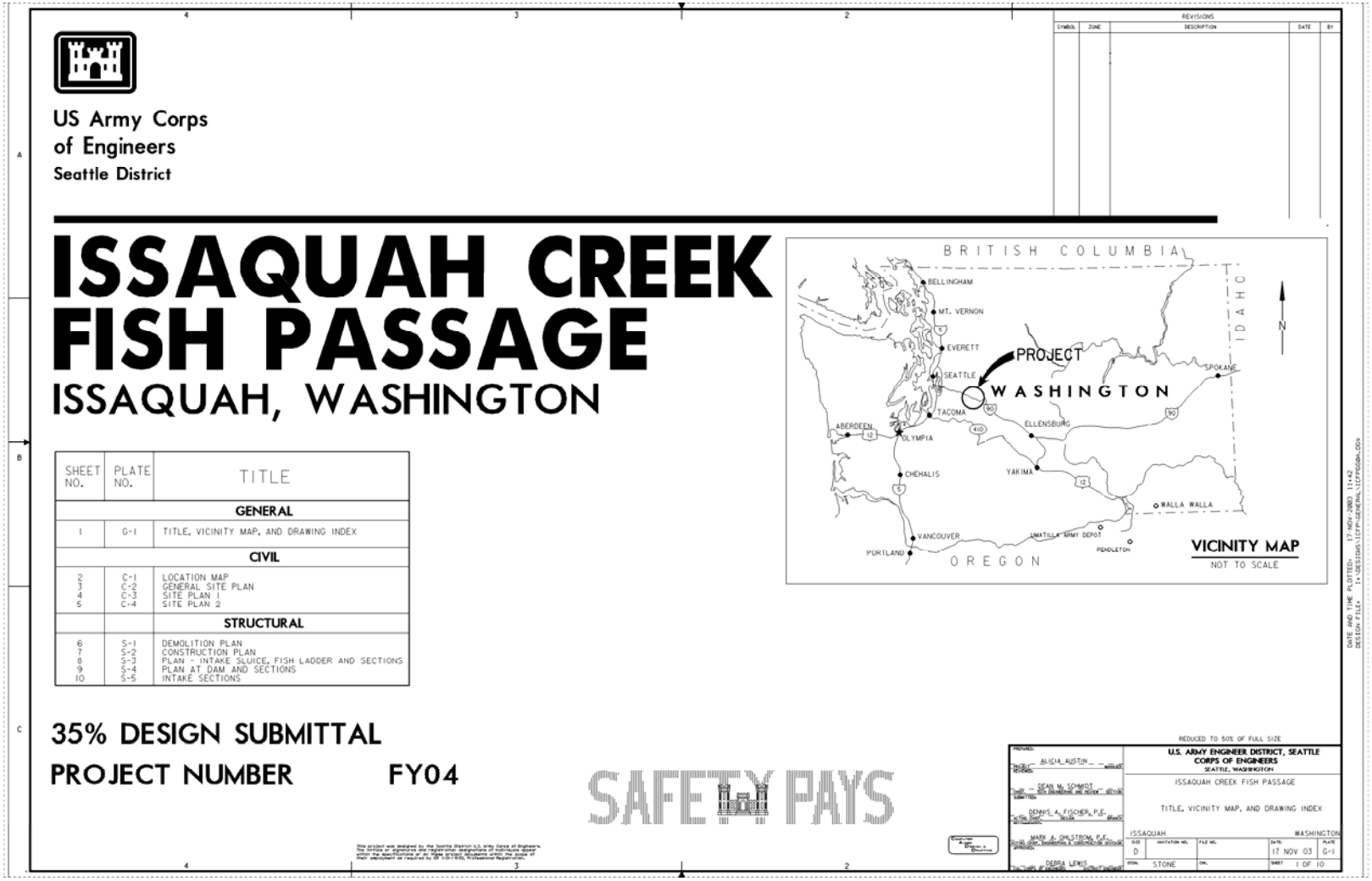

Figure A-1. Vicinity Map

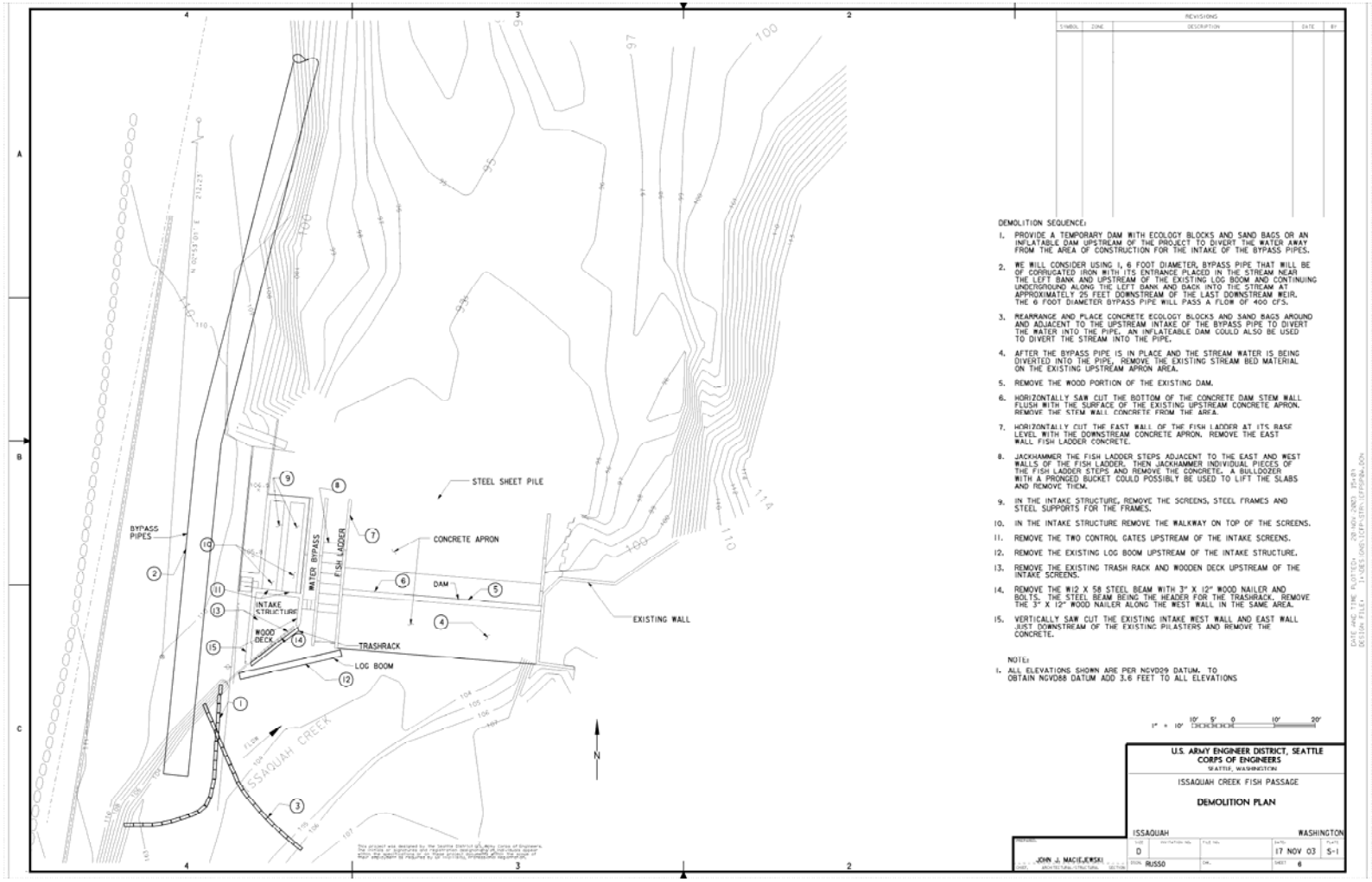

Figure A-2. Proposed Demolition Plan

Figure A-3. Proposed Construction Plan

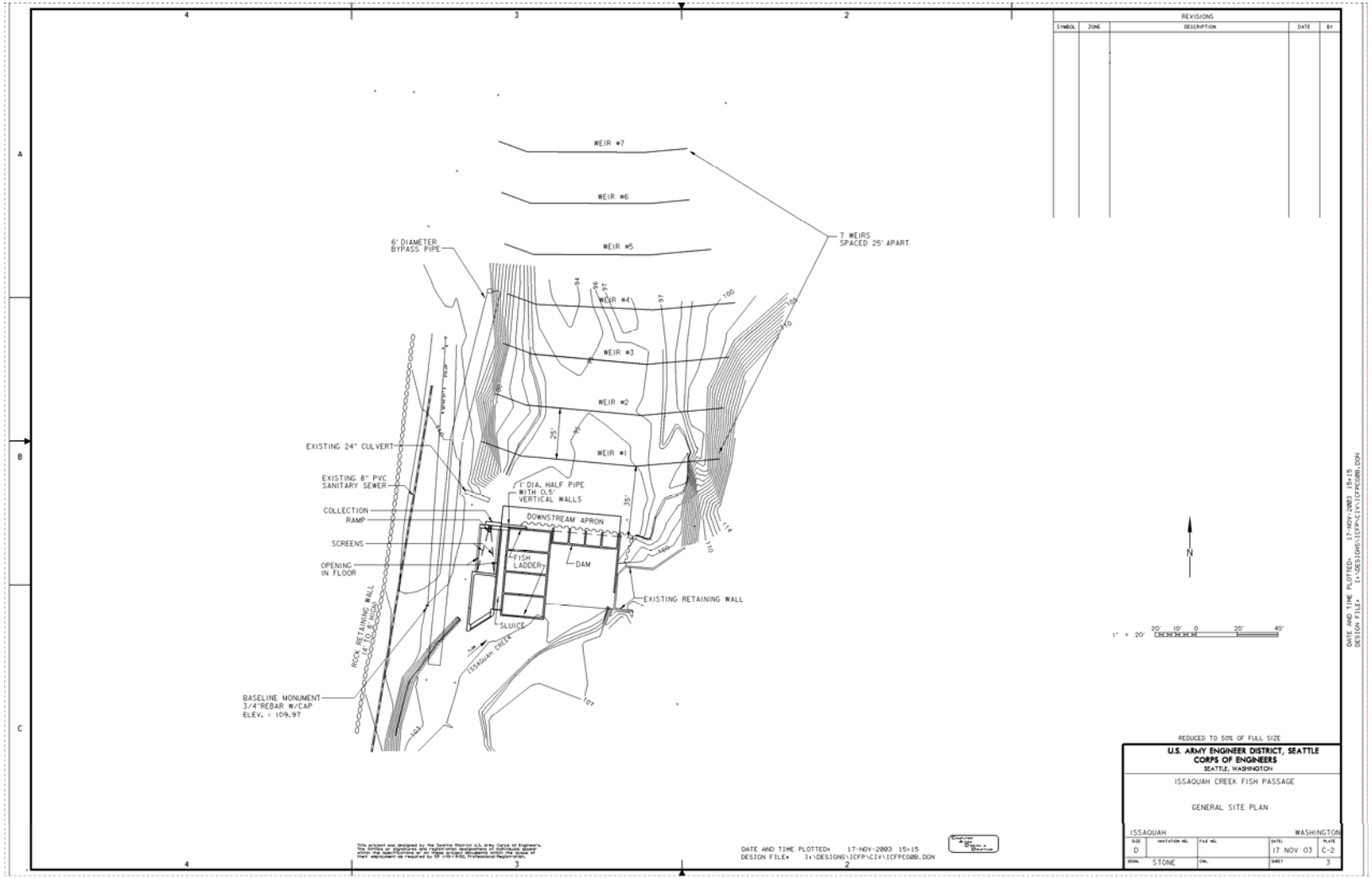

Figure A-4. Entire Site Plan

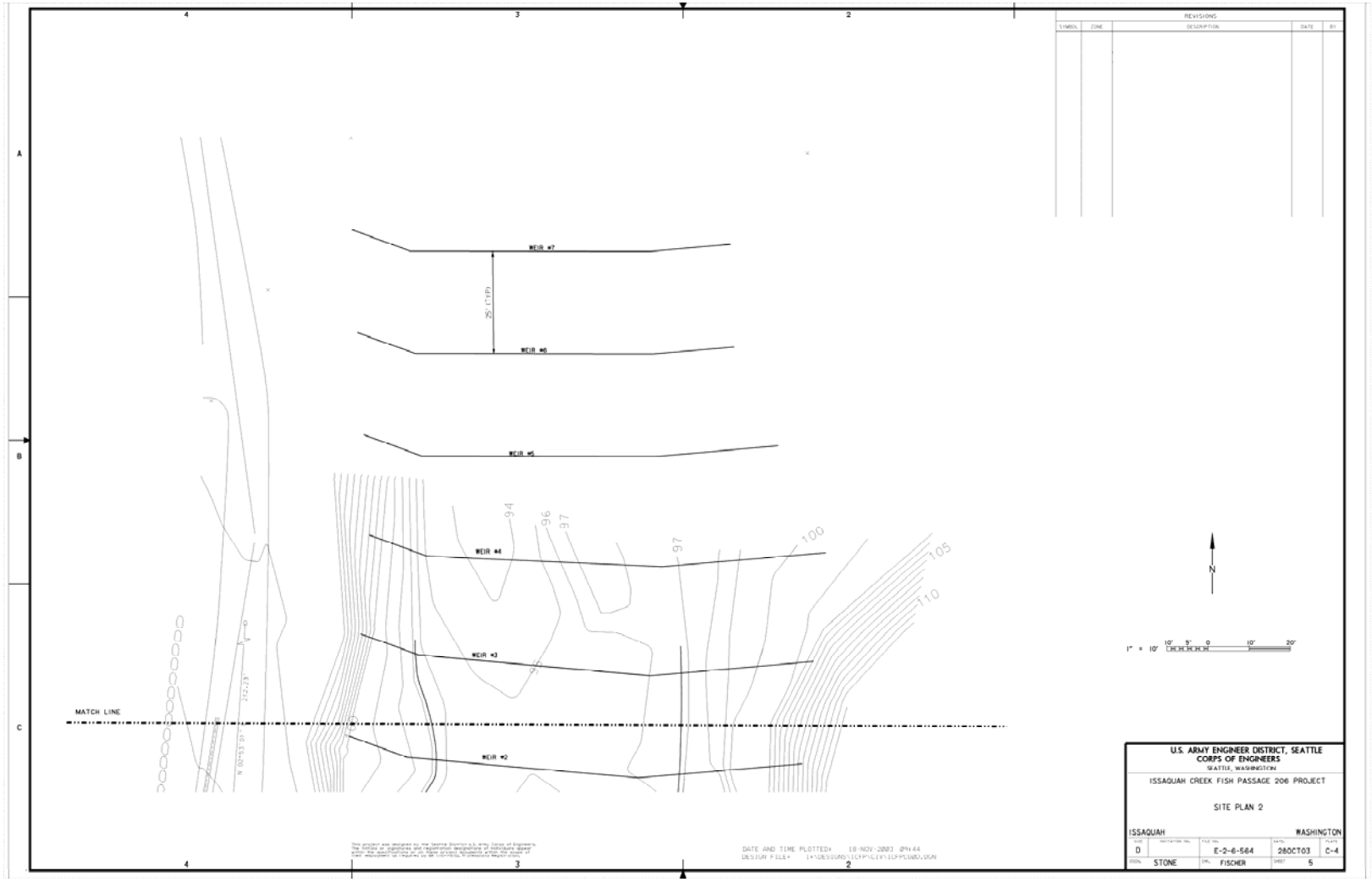

Figure A-5. Site Plan Downstream

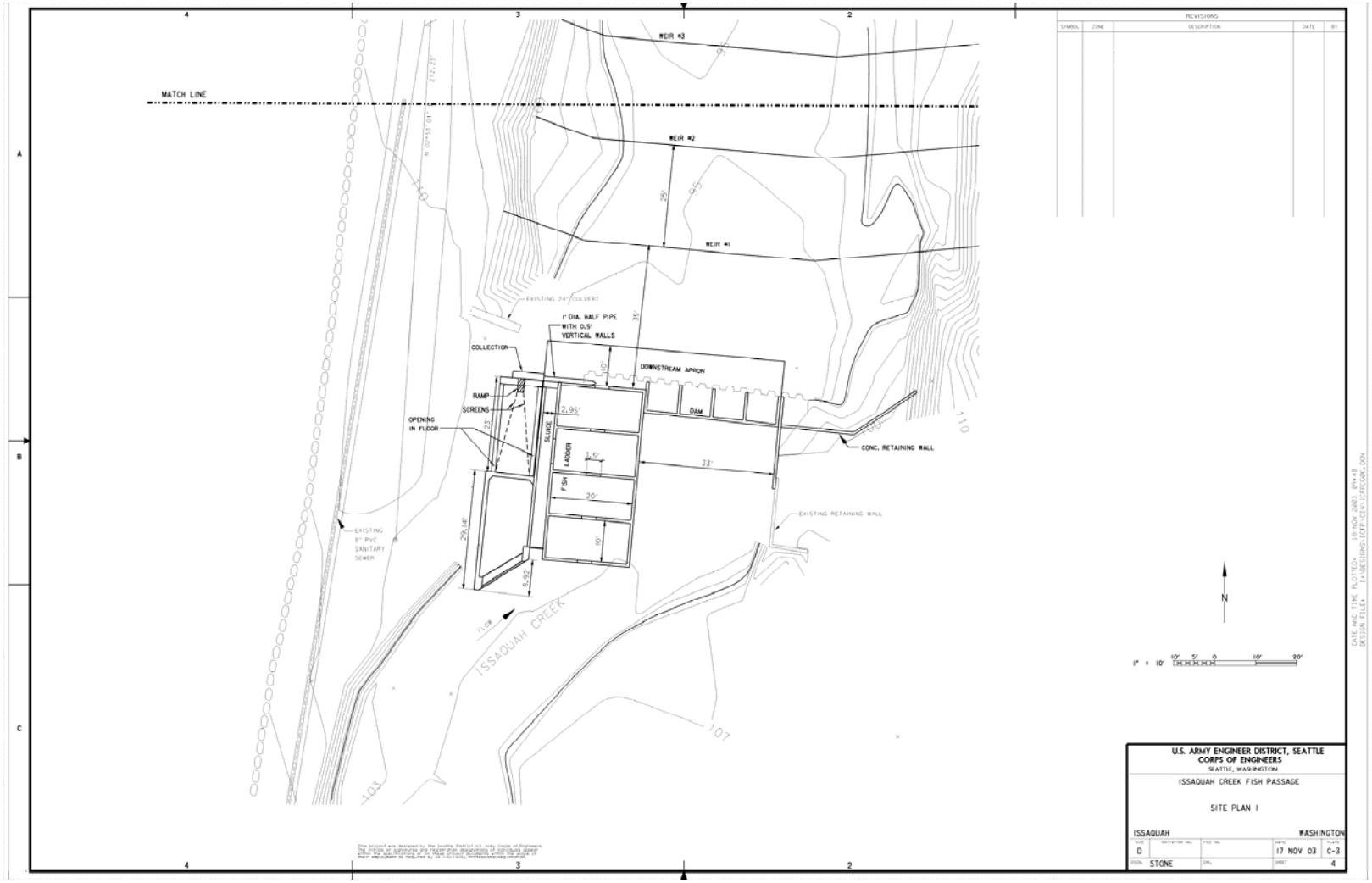

Figure A-6. Site Plan Upstream

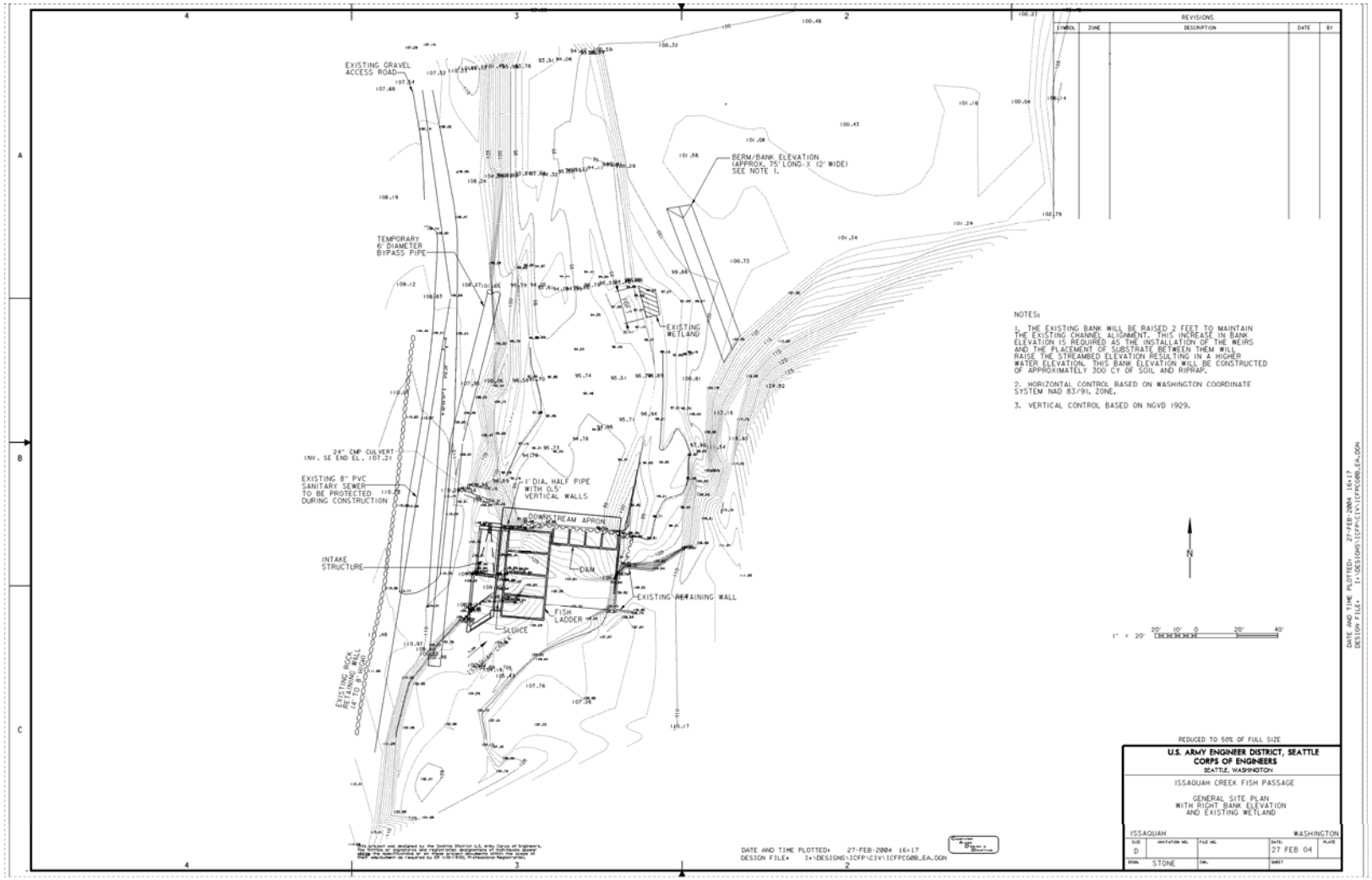

Figure A-7. General Site Plan With Right Bank Elevation and Existing Wetland

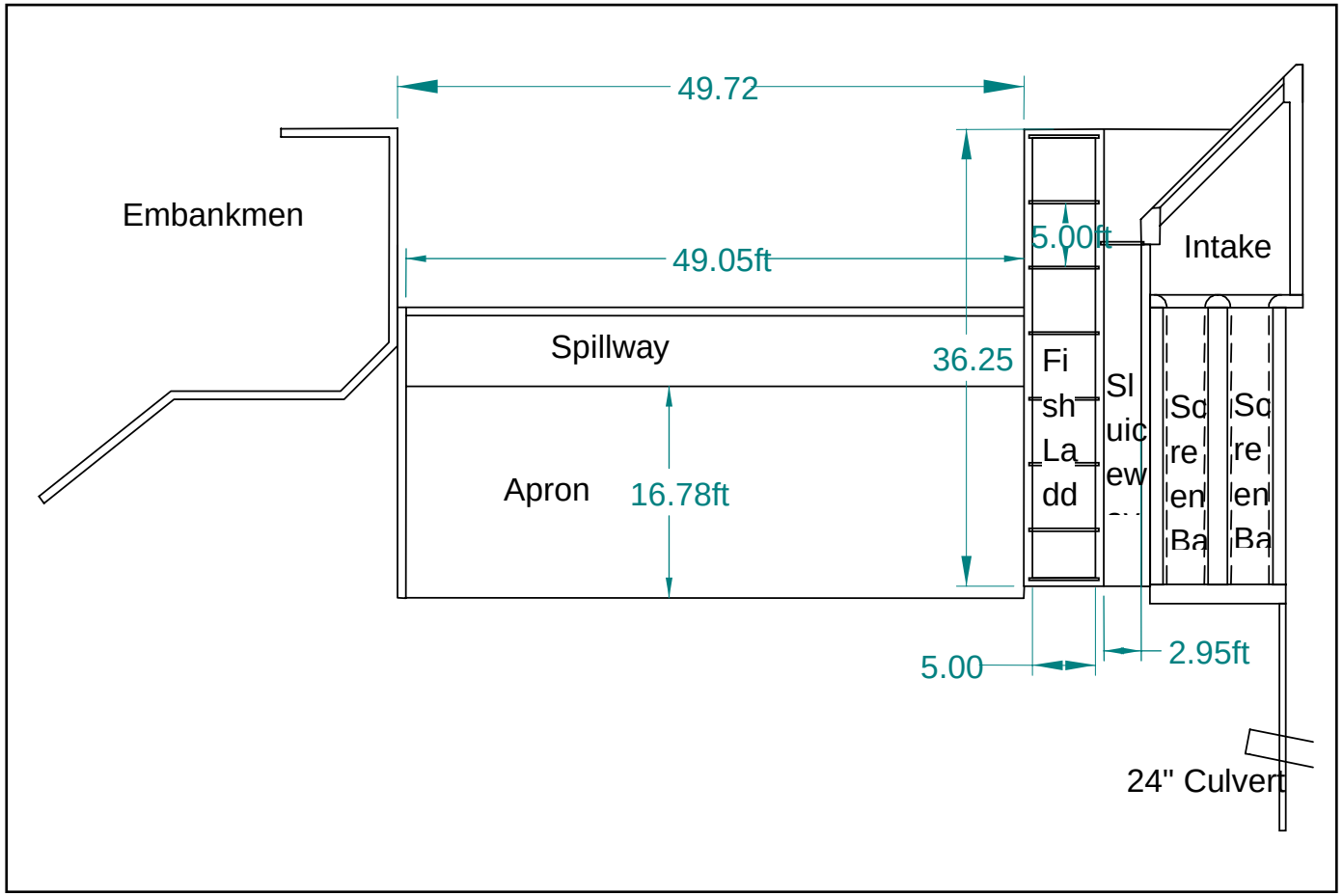

Figure A-8. Existing Structure (Plan View)

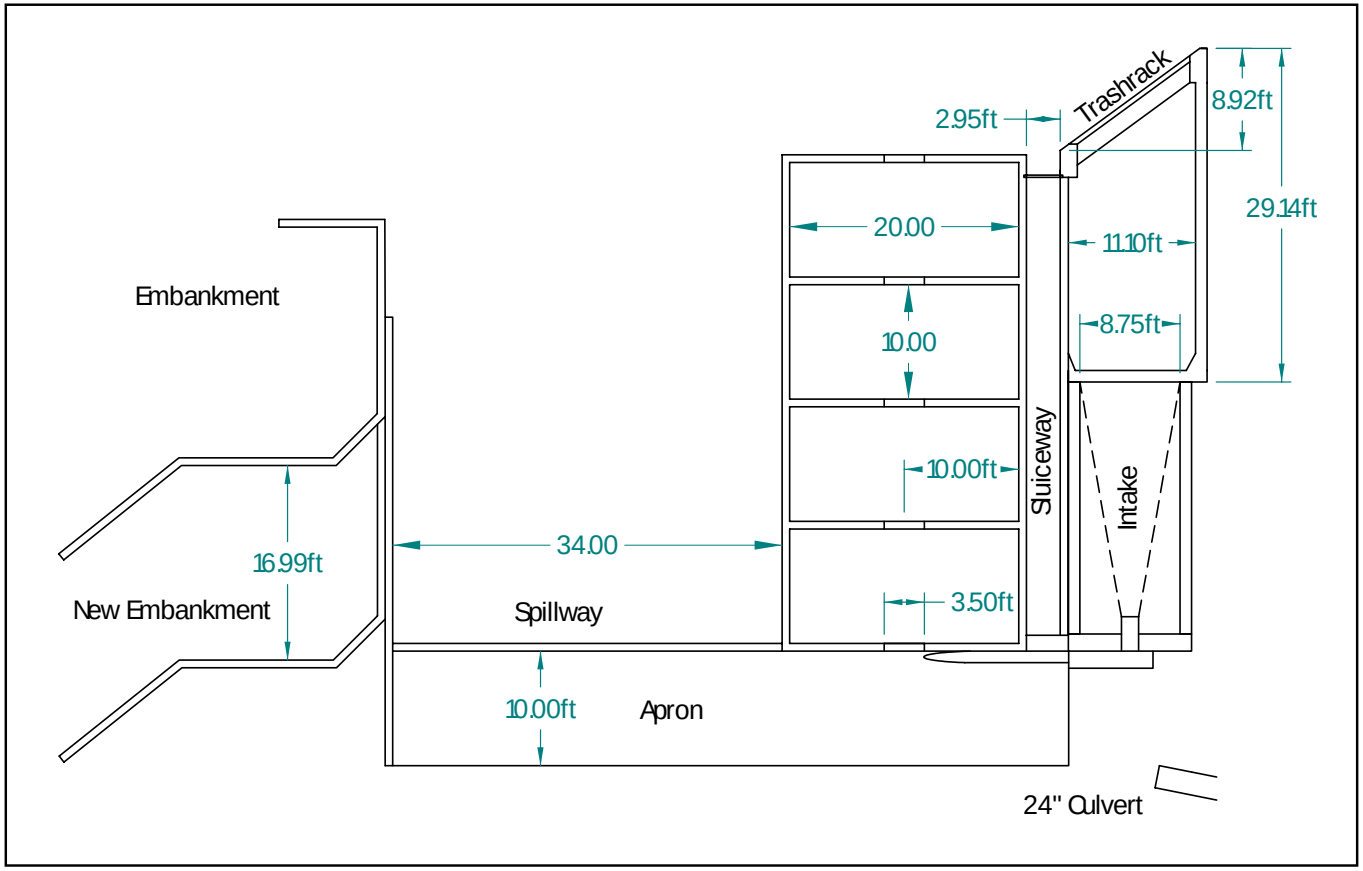

Figure A-9. Proposed Project (Plan View)

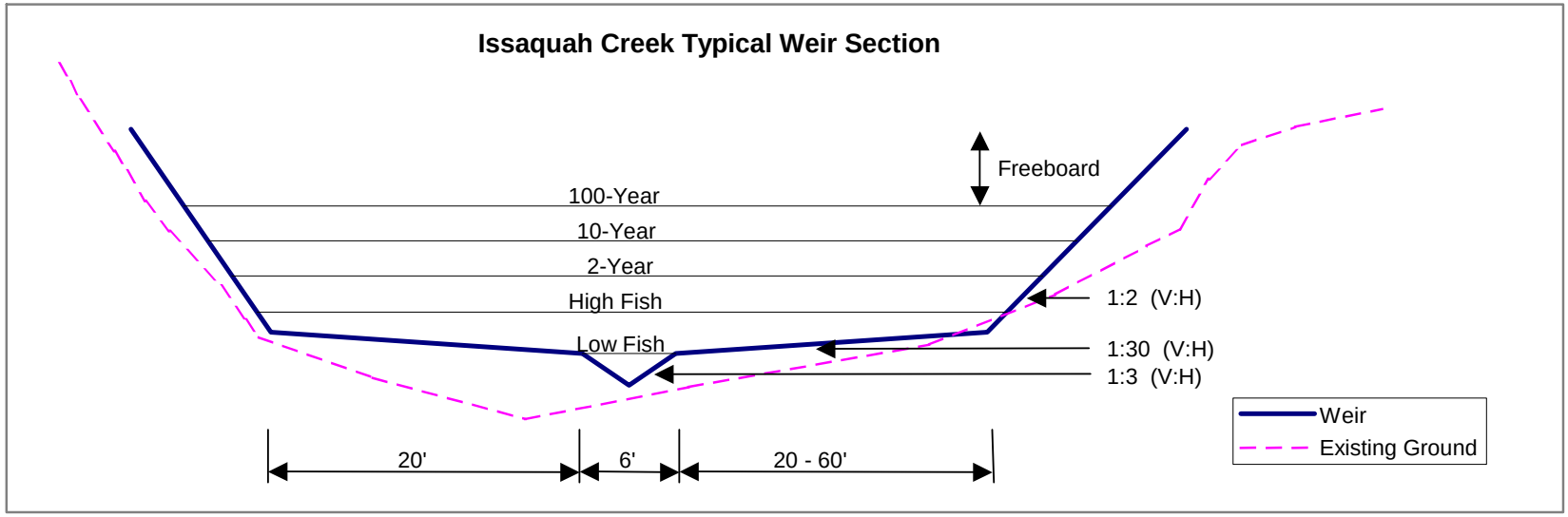

Figure A-10. Cross-section view of a typical pool and chute weir.

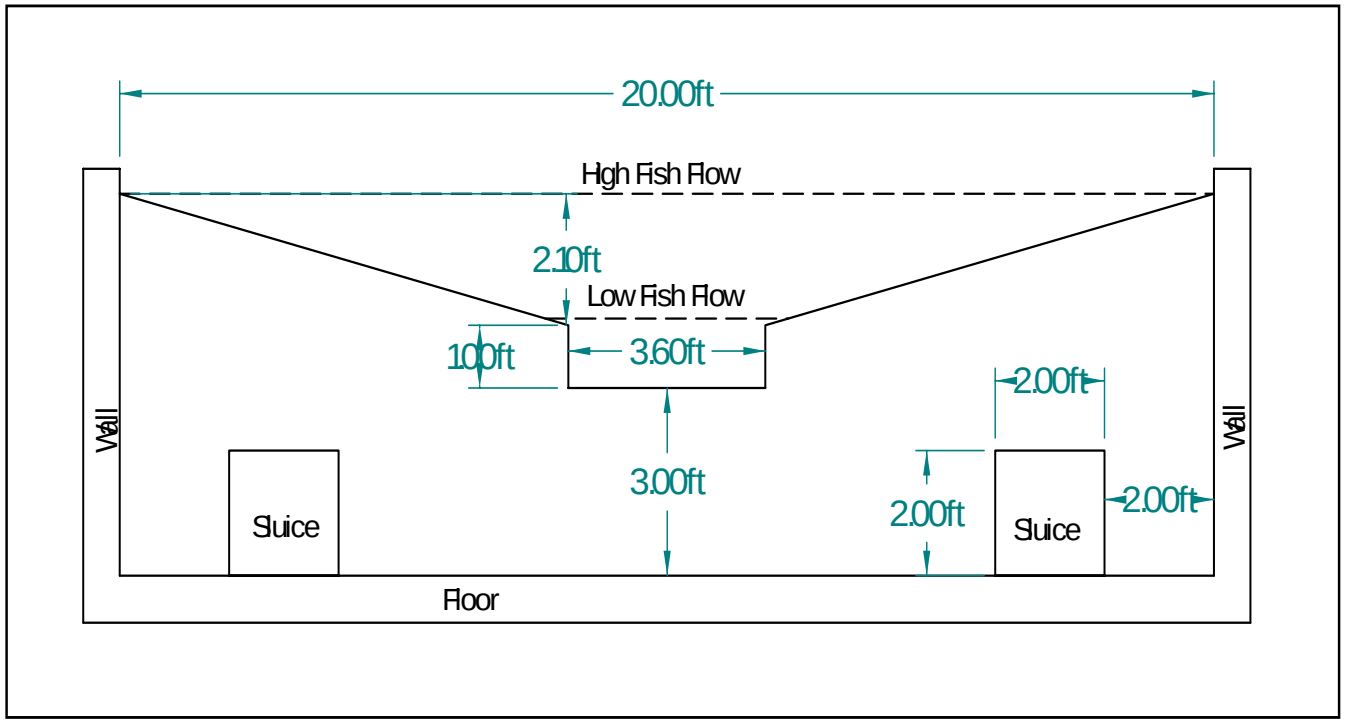

Figure A-11. Typical cross-section view of one of seven grade control weirs.

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APPENDIX B

Public Notice

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Public Notice

US Army Corps of Engineers
Seattle District

Planning Branch
P.O. Box 3755
Seattle, WA 98124-3755
ATTN: Alicia Austin (PM-PL)

Public Notice Date: December 1, 2003
Expiration Date: December 30, 2003
Reference: CENWS-PL-04-03
Name: Issaquah Creek Section 206 Restoration

30-DAY PUBLIC NOTICE

Interested parties are hereby notified that the U.S. Army Corps of Engineers, Seattle District (Corps) plans to replace a diversion dam that severely restricts fish passage with a structure that meets or exceeds current fish passage criteria in Issaquah, Washington. The Washington Department of Fish and Wildlife (WDFW) is the non-Federal sponsor for the Corps project. The proposed project is described below and shown on the enclosed drawings. The purpose of this Public Notice is to solicit comments from interested persons, groups, and agencies.

LOCATION

The project area is located at river mile (RM) 3.5 on Issaquah Creek about ½ mile upstream of the Issaquah Fish Hatchery in Section 33, T24 N, R6E, City of Issaquah, King County, Washington.

PROJECT BACKGROUND

In 1936, in response to growing demands of fish resources and diminishing returns, the Washington State Department of Fish and Wildlife (WDFW) began supplementing salmon production through operation of the Issaquah creek Fish Hatchery as a salmon production facility in the City of Issaquah. Two dams were constructed to support the hatchery, the lower dam or “barrier dam” located at the hatchery site and an upper dam, “diversion dam”. This project focuses on the upper dam and its associated fish passage problems.

The intake structure or diversion dam located ½ mile upstream of the hatchery has supplied water to the hatchery since 1960 through diverting creek flow and creating the elevation head necessary to deliver a gravity flow water supply. In 1972 the gravity intake was reconstructed, the walls at the intake were raised one foot, two additional pools were added to the fish ladder, and a new screen structure incorporated. Since then, the hatchery has become a historical and cultural feature as well as a fish production facility.

The existing dam has passage problems with the ladder, the water supply intake, the spillway, and the accompanying apron. At present, adult fish passage is only possible at a narrow range of flows and the projects causes unacceptable mortality to both adult and juvenile salmonids.

PURPOSE AND PROJECT OBJECTIVE

The proposed project will provide low mortality passage at least 90% of the time for both upstream and downsteam passage including juvenile upstream passage, while maintaining an existing water supply to the Issaquah Hatchery.

AUTHORITY

The proposed project is submitted under Section 206 authority of the Water Resources Development Act of 1996, P.L. 104-303. This authority authorizes the Secretary of the Army to carry out aquatic ecosystem restoration and protection projects if the Secretary determines that the project will improve the quality of the environment, is in the public interest, and is cost-effective.

PROPOSED PROJECT

The proposed project will correct the current problems of upstream adult and juvenile salmon migration and downstream juvenile passage at the upper water intake of the Issaquah Salmon Hatchery on Issaquah Creek. The design guidelines include a 50-year project life, 100-year flood levels, and fish passage for flows ranging from 5-95% of the daily averaged values, 16cfs-320cfs.

The project will replace the existing dam and fish ladder with new configurations, modify the existing intake structure and replace the intake screens, provide a juvenile fish bypass return and alarm system, and install 7 downstream grade control weirs. Specifics include:

- The spillway will be moved downstream coincident with the entrance of the fishway to prevent fish from being attracted beyond the fishway entrance by spill flows. The right abutment will also be extended at least 17 feet downstream to the crest of the new spillway.
- The spillway will be founded on the existing apron, removing it as a potential location for stranding of adults at lower tailwater levels
- A new ten-foot apron will be placed below the new spillway to prevent scour, and two feet below the minimum water elevation.
- A new fish ladder consisting of five pool and chute weirs will provide upstream and downstream fish passage past the dam. The four pools will each be twenty feet wide, ten feet long, and three feet deep from crest to floor. The weirs will each have a low flow notch and sloping sides. A sluice opening will be provided on each side of each fishway weir to allow flushing of accumulated sediment and debris.
- Seven grade control weirs spaced at 25 foot intervals with .8 foot drops will be constructed downstream of the dam. The weir spans range from 70 to 120 feet in length
- Streambed and bank protection will be placed for each weir to prevent scour and weir failure. Riprap will be placed at the depth of expected scour and covered with gravel having a range of sizes that replicate exiting substrate
- The inlet and trashrack of the screen will be extended upstream, approximately 10 feet, so that debris will sweep past the trashrack and continue down the fishway rather than accumulate in front of the intake. The extension of the structure will require fill along the left bank and excavation along the right bank.

- The intake structure will be modified into a V-shaped configuration to meet the screen sweeping and approaching velocity criterion
- A collection trough and outfall conduit will transport juvenile fish from the intake structure to below the fishway
- The existing sluiceway and walls will remain but be extended upstream parallel to the intake and fishway
- The bank will be planted with native plant species following construction
- An alarm system, using water level sensors, will be installed to alert the hatchery when the intake system needs to be cleaned.

MITIGATION

The project is considered self-mitigating.

ENDANGERED SPECIES

The Endangered Species Act of 1973, as amended, requires assessment of potential impacts to listed and proposed species. Listed and proposed species that may occur in the project vicinity include:
Bald Eagle (Haliaeetus leucocephalus)—threatened;
Coastal/Puget Sound Bull Trout (Salvelinus confluentus)—threatened;
Puget Sound Chinook Salmon (Oncorhynchus tshawytscha)—threatened;

The Corps will prepare a biological evaluation to discuss potential impacts to listed and proposed species and initiate consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, according to Section 7 of the ESA, for species under jurisdiction of each respective agency.

CULTURAL AND HISTORIC RESOURCES

The District Engineer has reviewed the latest published version of the National Register of Historic Places, lists of properties determined eligible, and other sources of information. The following is current knowledge of the presence or absence of historic properties and the effects of the undertaking upon these properties:
Section 106 compliance studies completed to date include an examination of the electronic database containing the archaeological and historic site records of the Washington State Office of Archaeology and Historic Preservation (OAHP) and other background research. The records search indicated that no properties listed on the National Register of Historic Places (NRHP) and no sites or structures listed on the state inventory are located within the proposed project area. During the next phase of studies a professional cultural resources reconnaissance survey will be being conducted for the proposed project by a Corps archaeologist.

The District Engineer invites responses to this Public Notice from Federal, State and local agencies, historical and archeological societies, Indian tribes and other parties likely to have knowledge of or concerns with historic properties in the area.

PUBLIC HEARING

Any person may request, in writing and within the comment period specified in this notice, that a public hearing be held to consider this proposal. Requests for public hearings shall state, with particularity, the reason for holding a public hearing.

EVALUATION

The decision whether to perform the proposed work will be based on an evaluation of the probable impact, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits that reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people.

The U.S. Army Corps of Engineers, Seattle District is soliciting comments from the public; Federal, State, and local agencies and officials; Indian tribes; and other interested parties in order to consider and evaluate the impacts of this activity. Any comments received will be considered by the Corps of Engineers to determine whether to modify, condition, or not proceed with the proposed work. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the activity.

The evaluation of the activity on the public interest will include application of the guidelines promulgated by the Administrator, Environmental Protection Agency, under authority of Section 404(b) of the Clean Water Act. This evaluation will include an alternatives analysis.

ADDITIONAL EVALUATION

The State of Washington will review this work for consistency with the approved Washington Coastal Zone Management Program. A coastal zone consistency statement will be prepared and submitted to the Department of Ecology. A preliminary determination has been made that the proposed maintenance work is consistent to the maximum extent practicable with the enforceable policies of the City of Issaquah Shoreline Management Program.

A Section 401 water quality certification is requested from the State of Washington.

Pursuant to the National Environmental Policy Act, a final Environmental Assessment will be prepared based on responses to this Public Notice. Once complete, the Environment Assessment (EA) will be posted and available on the Seattle District web site at:
<http://www.nws.usace.army.mil/ers/envirdocs.html>. A preliminary determination has been made that the proposed maintenance work will not significantly affect the quality of the human environment and, therefore, an Environmental Impact Statement is not required.

COMMENT AND REVIEW PERIOD

Comments on these factors will be accepted, made part of the record, and will be considered in determining whether it would be in the best public interest to proceed with the proposed project. Comments should reach this office, Attn: Planning Branch, not later than the expiration date of this public notice to ensure consideration.

Requests for additional information should be directed to Alicia Austin, Project Manager, at (206) 764-5522 or Chuck Ebel, Environmental Coordinator, at (206) 764-3626.

Encl
Drawings (4)

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Notice of Application for
Water Quality Certification
and for
Certification of Consistency with the
Washington Coastal Zone Management Program

Date: December 1,2003

Notice is herby given that a request has been filed with the Department of Ecology, pursuant to the requirements of Section 401 of the federal Clean Water Act of 1977 (PL 95-217), to certify that the project described in the U.S. Army Corps of Engineers Public Notice No.04-03 will comply with the Sections 301, 302, 303, 306, and 307 of the Act, and with applicable provisions of State and Federal water pollution control laws.

Notice is herby given that a request has been filed with the Department of Ecology, pursuant to the requirements of Section 307© of the Federal Coastal Zone Management Act of 1972 (16 U.S.C. 1451), to certify that the above referenced project will comply with the Washington State Coastal Zone Management Program and that the project will be conducted in a manner consistent with that program.

Any person desiring to present views on the project pertaining to the project on either or both (1) compliance with water pollution control laws or (2) the project's compliance or consistency with the Washington State Coastal Zone Management Program may do so by providing written comments within 30 days of the above publication date to:

Federal Permit Coordinator
Department of Ecology
SEA Program
Post Office Box 47600
Olympia, Washington 98504-7600

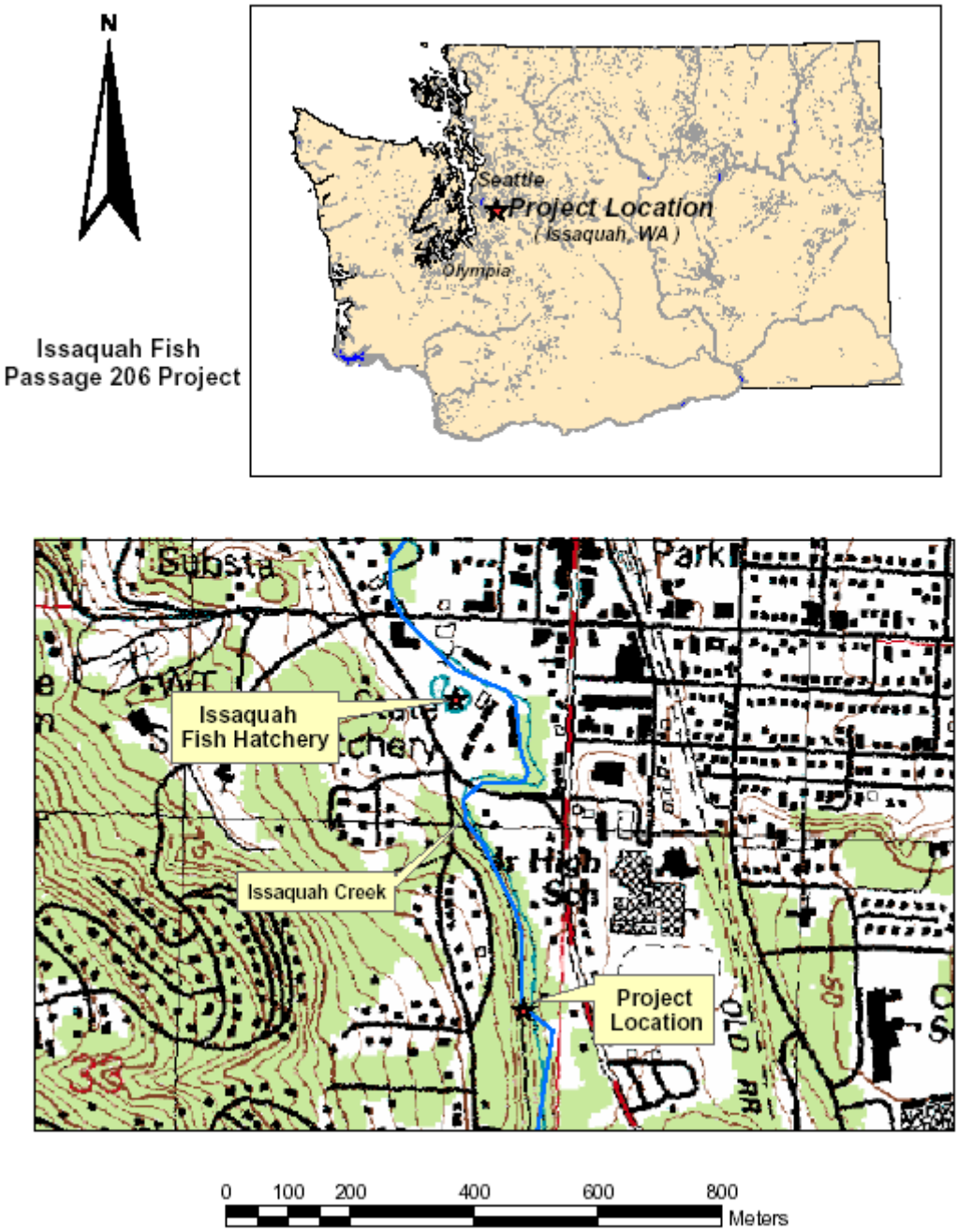

Figure 1. Project Location

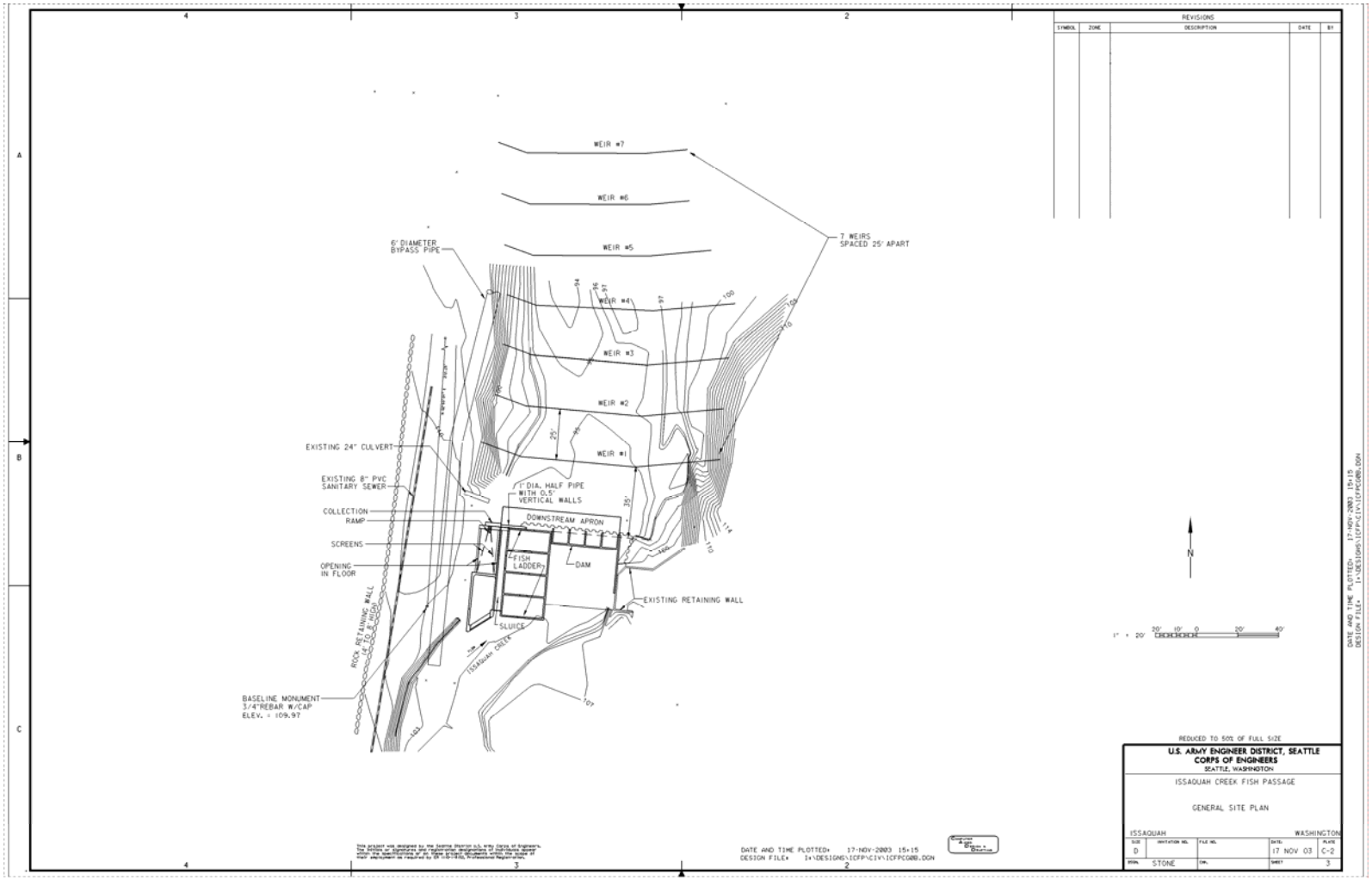

Figure 2. Site Plan

Figure 3. Construction Plan

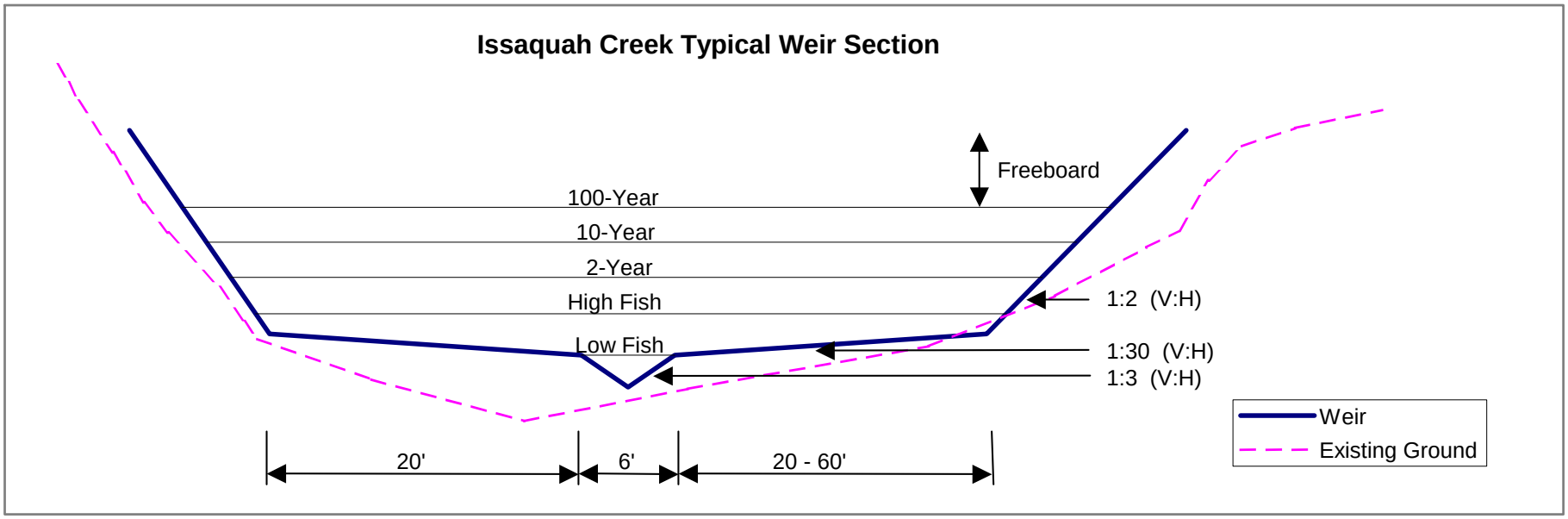

Figure 4. Example Weir Section

APPENDIX C

Section 404 of the Clean Water Act Evaluation

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Issaquah Creek Restoration Section 206

Issaquah, King County, Washington

Substantive Compliance for

Section 404 of the Clean Water Act

1. Introduction. The purpose of this document is to record the Corps' evaluation and findings regarding this project pursuant to Section 404 of the Clean Water Act (CWA).

This document covers the replacement of an existing dam along with the diversion of Issaquah Creek and the placement of cobble and gravel substrate from an upland source on the stream bed of Issaquah Creek in the City of Seattle, King County, Washington.

The information contained in this document reflects the findings of the project record. Specific sources of information included the following:

a. Issaquah Creek Section 206 Restoration Project Environmental Assessment, dated September 2004.

This document addresses the substantive compliance issues of the Clean Water Act 404(b)(1) Guidelines [40 CFR §230.12(a)] and the Regulatory Programs of the Corps of Engineers [33 CFR §320.4(a)].

2. Project Background. The Issaquah Creek Section 206 Restoration Project, located in Issaquah, Washington, is authorized under Section 206 authority of the Water Resources Development Act of 1996, P.L. 104-303.

The existing dam is located at river mile (RM) 3.5 on Issaquah Creek in Section 33, T24 N, R6E, City of Issaquah, King County, Washington. Downstream of the project area, the creek runs through the City of Issaquah into Lake Sammamish State Park and empties into Lake Sammamish. Upstream of the project the creek flows primarily through forested areas, draining approximately 55 square miles of quality habitat.

In 1936, in response to growing demands of fish resources and diminishing returns, the Washington State Department of Fish and Wildlife (WDFW) began supplementing salmon production through operation of the Issaquah Creek Fish Hatchery as a salmon production facility in the City of Issaquah. Two dams were constructed to support the

hatchery, the lower dam or "barrier dam" located at the hatchery site and an upper dam, "diversion dam". This project focuses on the upper dam and its associated fish passage problems.

The intake structure or diversion dam located ½ mile upstream of the hatchery has supplied water to the hatchery since 1960 through diverting creek flow and creating the elevation head necessary to deliver a gravity flow water supply. In 1972 the gravity intake was reconstructed, the walls at the intake were raised one foot, two additional pools were added to the fish ladder, and a new screen structure incorporated. Since then, the hatchery has become a historical and cultural feature as well as a fish production facility.

3. Project Purpose and Need. This report addresses the need and justification for implementing a restoration project along Issaquah Creek. The project would consist of replacing an existing dam structure, which is a hindrance to both upstream and downstream fish passage, while maintaining an existing auxiliary water supply to the Issaquah Hatchery. If implemented, the project would allow dwindling salmonid populations to return to one of the last largely unspoiled watersheds in the Lake Washington Basin.

4. Availability Of Less Environmentally Damaging Practicable Alternatives to Meet the Project Purpose. The alternatives evaluated for this project were as follows:

a. Alternative 1 (No Action). This alternative contains no directed restoration activities at the project site. The fish ladder would continue to present a challenge to migrating adults due to many factors including but not limited to insufficient attraction flows, insufficient pool size, plugging with sediment and debris, and entrance pool design. The gravity intake screen structure would continue to impact juvenile salmonids by stranding fish at low flows, or discharging them onto rocks at higher flows. The apron would continue to strand adult salmon and injure juvenile salmon.

b. Alternative 2 (Proposed Action). The proposed project would correct the current problems of upstream adult and juvenile salmon migration and downstream juvenile passage at the upper water intake of the Issaquah Salmon Hatchery on Issaquah Creek. The design guidelines include a 50-year project life, no effect on 100-year flood levels, and fish passage for flows ranging from 5-95% of the daily averaged values, 16cfs-320cfs.

- The project would replace the existing dam and fish ladder with new configurations, modify the existing intake structure and replace the intake screens, provide a juvenile fish bypass return and alarm system, and install 7 downstream grade control weirs. Specifics include:

- The spillway would be moved downstream coincident with the entrance of the fishway to prevent fish from being attracted beyond the fishway entrance by spill flows. The right abutment would also be extended at least 17 feet downstream to the crest of the new spillway.

- The spillway would be founded on the existing apron, removing it as a potential location for stranding of adults at lower tailwater levels

- A new ten-foot apron would be placed below the new spillway to prevent scour, and two feet below the minimum water elevation.

- A new fish ladder consisting of five pool and chute weirs would provide upstream and downstream fish passage past the dam. The four pools would each be twenty feet wide, ten feet long, and three feet deep from crest to floor. The weirs would each have a low flow notch and sloping sides. A sluice opening would be provided on each side of each fishway weir to allow flushing of accumulated sediment and debris.

- Seven grade control weirs spaced at 25 foot intervals with .8 foot drops would be constructed downstream of the dam. The weir spans range from 70 to 120 feet in length.

- Streambed and bank protection would be placed for each weir to prevent scour and weir failure. Riprap would be placed at the depth of expected scour and covered with gravel having a range of sizes that replicate exiting substrate.

- The inlet and trashrack of the screen would be extended upstream, approximately 10 feet, so that debris would sweep past the trashrack and continue down the fishway rather than accumulate in front of the intake. The extension of the structure would require fill along the left bank and excavation along the right bank.

- The intake structure would be modified into a V-shaped configuration to meet the screen sweeping and approaching velocity criterion.

- A collection trough and outfall conduit would transport juvenile fish from the intake structure to below the fishway.

- The existing sluiceway and walls would remain but be extended upstream parallel to the intake and fishway.

- The bank would be planted with native plant species following construction.

- An alarm system, using water level sensors, would be installed to alert the hatchery when the intake system needs to be cleaned.

c. Alternative 3 (POOL AND WEIR FISHWAY).

Under this alternative, the fish ladder design flow range would be 5 to 40 cfs. At 320 cfs Creek flow there would be 280 cfs spillway flow. Ladder step increases would be 0.8 ft. The dam crest would be moved downstream eliminating the adult stranding issue, reducing/eliminating false attraction, and reduce injury to fish moving downstream. The intake screen would be modified to improve sweeping and bypass flows, reducing the stranding and injury of juvenile salmonids at all flows. This alternative was determined to have lower environmental benefits associated with adult passage (primarily attraction flow) and therefore is more environmentally damaging than the proposed action.

d. Alternative 4 (POOL AND WEIR/CHUTE COMBINATION ON LEFT BANK WITH TURNING POOL.)

Under this alternative, the fish ladder would operate at a wide range of creek flows (5–320 cfs). The fishway would be an "L" shaped configuration. The upper segment would be a pool and weir. This would empty into a turn pool where a pool and chute would then be used for the lower segment. Auxiliary water from the intake would be introduced at the turn pool to increase the attraction flow resulting from the pool and chute discharge jet Ladder step increases would be 0.8 ft. The dam crest would be moved downstream eliminating the adult stranding issue, reducing/eliminating false attraction, and reduce injury to fish moving downstream. The intake screen would be modified reducing the stranding of juvenile salmonids at low flow, and the addition of a chute or other modification would reduce injury caused by the intake at high flows. This alternative was determined to have lower environmental benefits associated with adult passage (primarily attraction flow) and therefore is more environmentally damaging than the proposed action. In addition, it was determined that this alternative was more likely to require more maintenance than other alternatives.

e. Alternative 5 (POOL AND WEIR WRAP AROUND BACK TO DAM CREST).

Under this alternative, the fish ladder design flow range would be 5 to 40 cfs. At 320 cfs Creek flow there would be 280 cfs spillway flow. Ladder step increases would be 0.8 ft. The dam crest would not be moved downstream but a plunge pool along with one weir downstream of the structure would be created eliminating the adult stranding issue, reducing/eliminating false attraction, and reducing injury to fish moving downstream. The intake screen would be modified reducing the stranding of juvenile salmonids at low flow, and the addition of a chute or other modification would reduce injury caused by the intake at high

flows. This alternative was determined to have lower environmental benefits associated with adult passage (primarily attraction flow) and therefore is more environmentally damaging than the proposed action. In addition, it was determined that this alternative was more likely to require more maintenance than other alternatives.

f. Alternative 6 (CUT AND FILL-RELOCATE INTAKE).

Under this alternative, the existing dam would be demolished, and a new intake structure would be constructed upstream of the existing dam. The configuration of this intake has not been determined, nor has the routing of the supply pipeline. Eight grade control weirs with 1.0 ft elevation drops would be installed spaced 50 ft apart. The gradient through the reach would be 2%. Each of the weirs would have a low flow notch, roughly a 45 ft bottom width, and 3:1 side slopes. The weirs would extend to the existing bank with a slope of approximately 15:1. This design is essentially a fish way, which uses the entire width of the stream as steps for the ascent and decent of fish. In addition, these weirs would provide a grade control to eliminate head cutting. This alternative would allow the placement of large woody debris and bank vegetation. This alternative would include the excavation of 4500 cu. yds. of sediment upstream of the existing structure and the placement of 2500 cu. yds. of sediment downstream of the existing structure along with the installation of a 450 ft long 12-18 inch sediment bypass pipe. The addition of approximately 2000 yds of 9-inch riprap/bank protection would be necessary. This alternative was determined not to be practicable because the costs were deemed too high.

g. Alternative 7 (LARGE SPACING, CONCRETE OR BOULDER WEIRS 50 FT SPACING).

Under this alternative, the existing dam would be demolished but the hatchery intake structure location would remain. A series of weirs with 1.0 ft elevation drops would be constructed beginning at the intake structure and moving downstream of the dam spaced fifty feet apart. This 50 ft spacing of weirs results in a total of 13 weirs. The gradient through the reach would be 2%. Each of the weirs would have a low flow notch, roughly a 45 ft bottom width, and 3:1 side slopes. The weirs would extend to the existing bank with a slope of approximately 15:1. This design is essentially a fish way, which uses the entire width of the stream as steps for the ascent and decent of fish. In addition, these weirs would provide a grade control to eliminate head cutting. This alternative would allow the placement of large woody debris and bank vegetation. This alternative would also include the placement/grading of 8000 cu. yds. of imported gravels/cobbles. The addition of approximately 3300 cu. yds. of 9-inch riprap/bank protection would be necessary, along with installing a 650 ft long 12-

18 inch sediment bypass pipe. This alternative was determined not to be practicable because the costs were deemed too high.

h. Alternative 8 (CONCENTRATED DROPS, CONCRETE OR BOULDER WEIRS 15 FT SPACING).

Under this alternative, the existing dam would be demolished but the hatchery intake structure location would remain. A series of weirs with 0.8 ft elevation drops would be constructed beginning at the intake structure and moving downstream of the dam spaced 15 feet apart. This 15 ft spacing of weirs results in a total of 12 weirs. The gradient through the reach would be 10%. Each of the weirs would have a low flow notch, roughly a 45 ft bottom width, and 3:1 side slopes. The weirs would extent to the existing bank with a slope of approximately 15:1. This design is essentially a fish way, which uses the entire width of the stream as steps for the ascent and decent of fish. In addition, these weirs would provide a grade control to eliminate head cutting. This alternative would also include the grading of 1000 cu. yds. of channel sediments. The addition of approximately 1700 cu. yds. of 2.5-inch riprap/bank protection would be necessary, along with installing a 100 ft long 12-18 inch sediment bypass pipe. The 15 ft spacing of the weirs would reduce the project length, however it may reduce the ability to successfully pass fish through the steepened reach. This alternative was determined not to be practicable because the costs were deemed too high. In addition, the 15 ft spacing would not meet fish passage criteria.

i. Alternative 9 (ENLARGED CHANNEL POOL AND CHUTE FISHWAY).

Under this alternative, the fish ladder would span the majority of the width of the channel, and it would operate at a wide range of flows. Pool and chute fishways have been shown to be more self-cleaning compared to more traditional style fishways. The dam crest would be moved downstream eliminating the adult stranding issue, reducing /eliminating false attraction, and reducing injury to fish moving downstream. Several weirs with 0.8 ft elevation drops would be installed downstream of the dam functioning essentially as ladder steps and grade control. This allows the ladder to be constructed in a linear fashion while still meeting current specifications for ladder pool area and volume with 0.8 step increases. The intake screen would be modified reducing the stranding of juvenile salmonids at low flow, and the addition of a chute or other modification would reduce injury caused by the intake at high flows. This alternative was determined not to be practicable as project cost was higher than the preferred alternative, however it had almost identical environmental benefits.

Findings. The Corps rejected Alternatives 1, and 3-9 because they would either not meet the authorized project objectives, were not practicable, or they were more environmentally damaging alternative when compared to the proposed action.

5. Significant Degradation, Either Individually or Cumulatively, To the Aquatic Environment

a. Impacts on Ecosystem Function. Riparian habitat in the project area will be disturbed by the downstream grade control weir construction. Some bank hardening will be required above and below each weir and along the right bank immediately below the dam. The creek will be temporarily bypassed from above the dam to approximately 180 ft downstream. The Corps has assessed potential impacts from the construction and determined that they will generally be highly localized in nature, short in duration, and minor in scope. Impacts of the construction on salmonids, and other fish communities will be reduced and/or avoided through implementation of timing restrictions. Due to these measures, impacts to these important resources should not be significant either individually or cumulatively.

b. Impacts on Recreational, Aesthetic and Economic Values. Construction vehicles may temporarily disrupt recreational use of a hiking trail in the vicinity of the project area. However, no significant adverse effects on recreation, aesthetics, or the economy are anticipated (see the Issaquah Creek Section 206 Restoration Project Environmental Assessment, dated November 2003).

c. Findings. The Corps has determined that there would be no significant adverse impacts to aquatic ecosystem functions and values or recreational, aesthetic, and economic values.

6. Appropriate and Practicable Measures To Minimize Potential Harm to the Aquatic Ecosystem

a. Impact Avoidance Measures. Project design has avoided sensitive areas, whever possible. Potential impacts of the proposed work on salmonids will be avoided through the implementation of timing restrictions. For the protection of migrating adult salmonids and, outmigrating juvenile salmonids, work will occur during an approved in-water work window of June 15 through September 15. To avoid impacts to water quality, the creek will be diverted though a culvert during construction.

b. **Impact Minimization Measures.** Keeping the project footprint to the smallest size possible will minimize potential impacts of the proposed work on the aquatic ecosystem. In addition, construction vehicles will access the site on an existing access road and equipment will access the creek through one or two points limiting the effects to the existing riparian vegetation. Constructing the project during the appropriate in water work window will minimize potential impacts to salmonids. If adult salmonids were to return to the site early due to an unusually cold summer the effects will be minimized through a trap and haul operation around the construction site. Impacts to resident fish and the possible late outmigrant will be reduced as all fish will be collected and placed back into the creek. Resident fish will be placed approximately one mile upstream of the project, and salmonids will be placed downstream of the project to allow them to continue their outmigration.

c. **Compensatory Mitigation Measures**. Although some riparian habitat will be lost during construction, the area will be replanted with native species mitigating habitat loss. All fish impacts will be mitigated with the completion of the project. At present, adult fish passage is only possible at a narrow range of flows and the projects causes unacceptable mortality to both adult and juvenile salmonids. The proposed project will provide both upstream and downsteam passage at least 90% of the time, including juvenile upstream passage.

Findings. The Corps has determined that all appropriate and practicable measures have been taken to avoid and minimize potential harm.

7. Other Factors In the Public Interest.

a. **Fish and Wildlife**. The Corps has coordinated with State and Federal agencies to assure careful consideration of fish and wildlife resources. WDFW, the sponsor, will be obtaining an advisory Hydraulic Project Approval from the Washington Department of Fish and Wildlife. The Corps prepared a Biological Evaluation in accordance with Section 7 of the Endangered Species Act. As a result, the Corps received concurrence letters from the National Marine Fisheries Service for the Endangered Species Act Section 7 Informal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation, dated 24 August 2004, as well as from U.S. Fish and Wildlife Service: Endangered Species Act Section 7 Informal Consultation, dated 30 April 2004.

b. **Water Quality.** The Corps submitted an application for a Section 401 Water Quality Certification from the Washington Department of Ecology (Ecology). The Corps received the State-issued Water Quality Certification on April 20, 2004.

c. **Historic and Cultural Resources.** The proposed Corps defined Area of Potential Effects (APE) was submitted to the Washington State Historic Preservation Officer (SHPO), who concurred with the Corps' APE. A cultural resource investigation was completed for the APE that included a professional field survey, archival and other background research, coordination with concerned parties, and submission of a report to SHPO and copied to the Muckleshoot Tribe. The records search indicated that there were no historic properties listed in the National Register of Historic Places (NRHP) or the Washington Office of Archaeology and Historic Preservation (OAHP) electronic historic site database within the APE. A field investigation and additional record searches produced documentation that the existing fish hatchery related diversion dam and coal mining associated railroad grade located within the APE are eligible for the NRHP and that the project had the potential to adversely affect both properties. The railroad grade has been previously disturbed and the Corps will return it to its same appearance at the end of the project. Consequently, the Corps determined that there would be no historic properties adversely affected related to disturbance of the railroad grade and the SHPO concurred. The Corps determined that removal of the dam would adversely affect an historic property and the SHPO concurred. Subsequently, the proposed mitigation measures addressing the adverse effect to the dam were formulated in a memorandum of agreement (MOA) with the SHPO, the Washington Department of Fish and Wildlife, and the City of Issaquah. The King County Historic Preservation Officer signed the MOA on behalf of the City of Issaquah. Mitigation measures for removal of the dam are to fully document the structure in a Historic American Buildings Survey/Historic American Engineering Record report (HABS/HAER) in medium format prior to demolition. Submittal to and acceptance by the SHPO of the HABS/HAER report will complete the Section 106 process.

d. **Activities Effecting Coastal Zones.** The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner, which is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management Program.

The City of Issaquah implemented the SMA through the adoption of goals and policies in the City of Issaquah Shoreline Master Program. This coastal zone consistency determination is based on review of applicable policies and standards of the City of Issaquah Shoreline Master Program (SMP). Applicable portions of the shoreline environment guidelines are presented below, with the Corps' consistency indicated in ***bold italics***.

The proposed project footprint is located in an area designated as *Urban Riparian* on the left bank and *Urban Residential* on the right bank.

II. Master Program Elements: Goals & Policies, Conservation Element, A. Goals: 1. Preserve, protect and restore unique, fragile and scenic elements and non-

renewable natural resources, and assure the continued sustained yield management of renewable resources for the benefit of existing and future generations.

The goal of the proposed project is to restore/improve fish passage on Issaquah Creek, which is consistent with the SMP.

II. Master Program Elements: Goals & Policies, Conservation Element, A. Goals: 2. Identify and inventory wetlands for inclusion in the Shorelines plan.

The Corps conducted a wetland delineation for the immediate project area. This delineation determined that a small wetland is located on the right bank downstream of the existing diversion dam in a sandy pocket between the base of the creek bank and the waterline. Vegetation includes Japanese knotweed (Polygonum cuspidatum, FACU), black cottonwood (Populus balsamifera, FAC), vine maple (Acer circinatum, FAC-), and buttercup (Ranuniclus repens, FACW). The soil characteristics, including soil saturation, meet wetland criteria. The approximate size of wetland is 16- by 16-feet, for an area of 256 square feet. Consultation with the Washington Department of Ecology has indicated that this impact to the wetland can be mitigated by planting riparian vegetation in the project area or by increasing the type and number of habitat features included in the project design. The project will not alter the inundation patterns of any other wetlands in the area. The Corps has identified and inventoried wetlands in the project area and in surrounding areas, thus the project is consistent with the SMP.

II. Master Program Elements: Goals & Policies, Conservation Element, B. General Policies: 5. The diversity of aquatic life, and wildlife, and habitat within the shoreline should be enhanced.

The proposed project will enhance the diversity of aquatic life by improving fish passage to over 10 miles of underutilized salmonid habitat, therefore the project is consistent with the SMP.

II. Master Program Elements: Goals & Policies, Conservation Element, D. Clearing and Grading Policies: 2. Cleared and disturbed sites remaining after completion of construction should be promptly replanted with native vegetation or in certain circumstances with other species contained in the City's approved plant list.

If any clearing is required to allow access for equipment it will be promptly replanted with native vegetation.

IV. Shoreline Standards and Uses, B. Standards for All Environment Designations and Shoreline Use Activities, 1.General Standards: c. A plan indicating methods for erosion control during and after construction is required for all development proposals within the shoreline area.

An erosion and sedimentation control plan has been developed and will be required as a condition of the Section 401 Water Quality Certification.

IV. Shoreline Standards and Uses, B. Standards for All Environment Designations and Shoreline Use Activities, 1.General Standards: d. All Federal and State water quality and effluent standards shall be met.

Based on the analyses presented in project NEPA documents, as well as a 404(b)(1) Evaluation and General Policies for the Evaluation of Permit Applications analysis, the Corps finds that this project complies with the substantive elements of Section 404 of the Clean Water Act. In addition, the proposed project was coordinated with the State of Washington Department of Ecology and the Corps received the State-issued Water Quality Certification on April 20, 2004.

IV. Shoreline Standards and Uses, B. Standards for All Environment Designations and Shoreline Use Activities, 1.General Standards: g. Riparian vegetation in proposed developments shall be preserved, or shoreline setback areas shall be replanted and enhanced with vegetation from the City's recommended plant list, which is advantageous to the shoreline environment designations. Enhancement improves existing wildlife and salmonoid habitat and may include improvements to streambeds, the riparian zone, and wetlands.

Native riparian vegetation will be planted in areas that require existing vegetation to be removed for construction; therefore, the project is consistent with the SMP.

IV. Shoreline Standards and Uses, B. Standards for All Environment Designations and Shoreline Use Activities, 1.General Standards: h. Fish spawning grounds shall be preserved and protected from any adverse impacts.

The placement of the downstream grade control weirs will temporarily disturb approximately 200 feet of streambed. Presently this area consists of one pool and tailout where all species of anadromous fish in Issaquah Creek repeatedly spawn throughout the multiple species spawning periods. The construction of the weirs will provide numerous pools and tailouts that can be utilized for spawning.

IV. Shoreline Standards and Uses, B. Standards for All Environment Designations and Shoreline Use Activities, 1.General Standards: j. Restoration: Restoration may be permitted or required when the natural riparian habitat within the setback has been adversely altered by construction, flooding, or other natural disasters.

1. Stream Channel: Restoration shall be conducted at times, which cause minimum interference with wildlife and salmonoids and in accordance with applicable agency regulations. Appropriate materials shall be used to recreate or enhance streambed morphology.

2. Streambank: Apply bio-engineering principles to recontour streambanks, emphasizing natural materials.

3. Revegetation: Revegetate using riparian plants from the City of Issaquah's approved plant list.

The restoration project will be constructed during an extended in water work window coordinated with NOAA Fisheries and WDFW.

Streambanks will not be recontoured.

Riparian vegetation planted will be from the City of Issaquah's approved plant list.

IV. Shoreline Standards and Uses, B. Standards for All Environment Designations and Shoreline Use Activities, 6. Wetlands: a. Wetlands shall not be developed unless all of the following conditions are met:

1. All alternative upland sites, solutions, and designs in the same ownership have been demonstrated to be infeasible.

2. The proposal will result in no net loss of wetland functions, characteristics, types, and values.

3. The proposal will be in the public interest and will result in an overall environmental benefit.

There are no alternative sites that are feasible for the proposed project. With the proposed riparian plantings and improvement of function and habitat of the stream, the project will not result in net loss of wetland functions, characteristics, types, or values.

There are no alternative sites that are feasible for the proposed project. With the proposed riparian plantings and improvement of function and habitat of the stream, the project will not result in net loss of wetland functions, characteristics, types, or values. The proposed project will be in the public interest and will result in an overall environmental benefit, thus the project is consistent with the SMP.

IV. Shoreline Standards and Uses, B. Standards for All Environment Designations and Shoreline Use Activities, 8. Archaeological/Cultural/Historical: a. All shoreline permits shall contain provisions which require developers to stop work immediately and notify the City if any items of archaeological interest are uncovered during excavations. In such case, the developer shall be required to allow site inspection and evaluation by a professional archaeologist to ensure that all possible valuable archaeological data are properly salvaged.

The Corps is coordinating with the State Historic Preservation Office (SHPO) addressing all Cultural Resource issues including those listed above.

IV. Shoreline Standards and Uses, C. Shoreline Use Activities, 2. Aquaculture: Aquaculture activities of statewide interest, such as the existing fish hatchery, shall coordinate with the City to protect the aesthetic quality of shorelines.

The Corps and the non-federal sponsor WDFW are coordinating with the City of Issaquah.

IV. Shoreline Standards and Uses, C. Shoreline Use Activities, 8. Marine Structures: a. Piers, floats, marinas, boat ramps, boat launches and manmade channels shall be prohibited in the following areas:

- Fish spawning areas

- Within 100 (100) feet of a public swimming beach, unless the Structure is publicly owned; and

- All shorelines except for Lake Sammamish.

The proposed project will be constructed in a fish spawning area. The placement of the downstream grade control weirs will temporarily disturb approximately 200 feet of streambed. Presently this area consists of one pool and tailout where all species of anadromous fish in Issaquah Creek repeatedly spawn throughout the multiple species spawning periods. The construction of the weirs will temporarily disrupt this area but after construction it will provide numerous pools and tailouts that can be utilized for spawning. In addition, the primary goal of this project is to provide unrestricted access to 10 miles of salmonid habitat including spawning habitat. Therefore the Corps has determined that we are still consistent to the maximum extent practicable with the City of Issaquah SMP.

IV. Shoreline Standards and Uses, C. Shoreline Use Activities, 10. Clearing, Grading, Filling, and Excavating: a. All clearing and grading, fill and excavating activities shall be limited to the minimum necessary for the intended development.

Bank armoring will require a total of 80 cubic yards per weir, resulting in a total of 560 cubic yards. Between each weir 170 cubic yards of riprap will be used as instream scour protection. This instream scour protection riprap will be covered with 1000 cubic yards of pool mix (having a range of sizes that replicate exiting substrate) substrate. In addition, a 75 ft. section on the right bank will need to be elevated to height of 2 ft to maintain the current channel configuration due to the weir installation. This bank elevation will be accomplished by placing approximately 500 cubic yds of riprap and soil.

IV. Shoreline Standards and Uses, C. Shoreline Use Activities, 11. Bank Stabilization and Bulkheads:

a. Structural bank-stabilization measures shall be used only if streambank stability cannot be preserved through the use of vegetation.

Hydraulic analysis will be conducted to determine if vegetation will be sufficient or if rock armoring will be required for bank stabilization. The Corps will utilize vegetation where appropriate.

IV. Shoreline Standards and Uses, C. Shoreline Use Activities, 11. Bank Stabilization and Bulkheads:

b. Stream Channel direction, modification, realignment, and straightening shall not be permitted except as a means of last resort for bank stabilization and flood protection.

Armoring of the bank at each weir location will be limited to the only the amount required to keep the channel from scouring around the weir and potentially resulting in flood damages.

IV. Shoreline Standards and Uses, C. Shoreline Use Activities, 11. Bank Stabilization and Bulkheads:

e. Where applicable, the State Department of Fisheries and Game permits and standards for hydraulics approval or exemption shall apply.

The local sponsor WDFW will be obtaining a HPA.

IV. Shoreline Standards and Uses, C. Shoreline Use Activities, 11. Bank Stabilization and Bulkheads:

f. Stabilization and protection works shall be permitted only for:

1. Protection of public works, including roads, bridges, and utility systems.

2. Protection of existing residential, commercial and industrial developments or valuable natural features.

3. Enhancement of in-stream values and aquatic values and aquatic resources, including fisheries management.

The bank stabilization measures that will be required for this project are necessary to provide long-term unrestricted fish passage to benefit aquatic resources.

Based on the above evaluation, the Corps has determined that the proposed action complies with the policies, general conditions, and activities as specified in the City of

Issaquah Shoreline Management Program approved by the Director of the Washington Department of Ecology. The proposed action is thus considered to be consistent to the maximum extent practicable with the State of Washington Shoreline Management Program and policies and standards of the City of Issaquah Shoreline Master Program.

e. **Environmental Benefits.** At present adult fish passage is only possible at a narrow range of flows and the project causes unacceptable mortality to both adult and juvenile salmonids. The proposed project will provide low mortality passage at least 90% of the time for both upstream and downsteam passage including juvenile upstream passage. Through the incorporation of large woody debris, and native vegetation plantings, the temporary effects of construction will be minimized.

Findings. The Corps has determined that this project is within the public interest.

8. Conclusions. Based on the analyses presented in project NEPA documents, as well as the following 404(b)(1) Evaluation and General Policies for the Evaluation of Permit Applications analysis, the Corps finds that this project complies with the substantive elements of Section 404 of the Clean Water Act.

404(b)(1) Evaluation [40 CFR §230]

Potential Impacts on Physical and Chemical Characteristics (Subpart C)

1. **Substrate [230.20].** The existing stream channel substrate consists of cobble, small gravel, and coarse sand. The substrate to be placed between the weirs will consist of large armor rock covered with "pool mix". The size of the new material (pool mix) will closely mimic that which is already present limiting impacts to the area. To ensure that Issaquah Creek continues to flow through its existing channel after project completion, a 75 ft. section of the right bank below the dam will need to be elevated 2 ft. This will result in approximately 500 cubic yards of soil and rock to be placed in this area. In addition, it is likely that it will be determined that the banks will need to be armored immediately upstream and downstream of each of the seven weirs.

2. **Suspended Particulate/Turbidity [230.21].** Minor increases in turbidity will result from the proposed action during the installation and removal of the creek bypass pipe. In addition, turbidity will increase during the rerouting of water through the newly constructed diversion dam and weir groups. The Corps and WDFW will utilize all sediment control practices practical as the WDFW hatchery will be collecting water from below the proposed project. Any sediment plumes attributable to the project will be temporary, localized, and equivalent to those created by natural sediment transport processes.

3. **Water Quality [230.22].** During the installation of the proposed river bypass pipe minor increases in suspended sediment will occur. No impacts to water temperature, dissolved oxygen, or suspended sediments will occur due to construction while the stream is bypassed. When the river is rerouted from the bypass pipe through the Issaquah Creek channel, a minor increase in suspended sediment may occur, however it will be insignificant and temporary.

4. **Current Patterns and Water Circulation [230.23].** The proposed project will slightly constrict water flow and increase velocities through the project reach however, downstream of the last weir, the conditions will not be affected. This is a result of the existing project dispersing the water over the spillway, fish ladder, and intake. The proposed project will pass the majority of the river through the fish passage structure (fish ladder).

5. **Normal Water Fluctuations [230.24].** No effects to water fluctuations are expected.

6. **Salinity Gradients [230.25].** Not Applicable.

Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)

1. **Threatened and Endangered Species [230.30].** Pursuant with Section 7 of the Endangered Species Act, the Corps prepared a Biological Evaluation (BE) to assess

potential impacts of the proposed work on species protected under the Act. This document concluded that the proposed maintenance work was not likely to adversely affect the bald eagle (*Haliaeetus leucocephalus*), bull trout (*Salvelinus confluentus*), and Chinook salmon (*Oncorhynchus tshawytscha)*. The Corps received concurrence letters from both NOAA Fisheries and USFWS.

2. **Aquatic Food Web [230.31].** The project would provide unrestricted access to spawning/rearing habitat for all salmon and trout species inhabiting Issaquah Creek. The project would have no discernable impact on other fish species utilizing the river or their prey base, including crustaceans and mollusks, due to the relatively small size of the construction area, and adherence to the proposed work window, July 15 to September 1. Any effect of sediment input to Issaquah Creek is likely to be of minor consequence to benthic invertebrates since the biological effect of episodic inputs has been found generally to be temporary. Rapid recovery often results from invertebrate drift from upstream reaches.

3. **Wildlife [230.32].** Noise associated with disposal operations may have an effect on birds and marine mammals in the project vicinity. The impacts of any sound disturbance would likely result in displacement of animals rather than injury. Construction operations are not expected to result in a long-term reduction in the abundance and distribution of any prey items. No breeding or nesting areas will be directly impacted. The work window avoids sensitive nesting and wintering periods for bald eagles.

Potential Impacts to Special Aquatic Sites (Subpart E)

1. **Sanctuaries and Refuges [230.40].** The proposed project will not impact any designated sanctuary or refuge area.

2. **Wetlands [230.41].** On the right bank downstream of the existing diversion dam a small wetland is located in a sandy pocket between the base of the creek bank and the waterline. Vegetation includes Japanese knotweed (*Polygonum cuspidatum*, FACU), black cottonwood (*Populus balsamifera*, FAC), vine maple (*Acer circinatum*, FAC-), and buttercup (FACW). The soil characteristics including soil saturation meets wetland criteria. The approximate size of wetland is 16- by 16-feet, for an area of 256 square feet. The proposed project includes the installation of seven grade control weirs. Through the installation of these weirs and the substrate to be placed between them this wetland will be filled. Preliminary consultation with the Washington Department of Ecology has indicated that this impact to the wetland can be mitigated by planting riparian vegetation in the project area or by increasing the type and number of habitat features included in the project design. The project will not alter the inundation patterns of any other wetlands in the area.

3. **Mudflats [230.42].** Not applicable.

4. **Vegetated Shallows [230.43].** Not applicable.

5. **Coral Reefs [230.44].** Not applicable.

6. **Riffle and Pool Complexes [230.45].** Currently below the existing dam, a pool followed by a riffle, which is then followed by a long glide exists. The proposed project weirs will create 7 pools and 7 riffles, which will terminate downstream into the existing glide in this area. The net result will be to replace one pool and riffle with 7 pools and riffles.

Potential Effects on Human Use Characteristics (Subpart F)

1. **Municipal and Private Water Supplies [230.50].** This project will maintain the Washington Department of Fish and Wildlife (WDFW) existing intake and water supply to the hatchery.

2. **Recreational and Commercial Fisheries [230.51].** There is very little recreational fishery in the project vicinity. However, salmon produced in the river out-migrate to Lake Washington and eventually to Puget Sound where they enter recreational and commercial fisheries. Short-term construction effects will not impact these fisheries. However, the existing intake dam and its associated fish ladder currently present a challenge to migrating juvenile and adult salmonids, marginalizing access to at least 10 miles of spawning and rearing habitat. The proposed project will provide low mortality passage at least 90% of the time for both upstream and downstream passage, including juvenile upstream passage. This project will help produce additional fish, many of which will enter recreational and/or commercial fisheries to an incremental degree.

3. **Water-Related Recreation [230.52].** Not applicable.

4. **Aesthetics [230.53].** Localized, temporary increases in noise and turbidity will occur while construction equipment is operating. It is likely that a few trees will need to be removed for access to the river channel however the project area will be planted with native vegetation that will eventually compensate for the loss. In addition, the seven weirs will degrade the aesthetic value of the area.

5. **Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves [230.54].** Not applicable.

Evaluation and Testing (Subpart G)

1. **General Evaluation of Dredged or Fill Material [230.60].** The fill material to be placed for bank protection immediately above and below each weir will consist of class 3 riprap. The fill material to be placed between the downstream weirs will be composed of washed cobble, and gravel, and other naturally occurring inert material obtained from upland borrow sources for which all state and local permits have been obtained.

2. **Chemical, Biological, and Physical Evaluation and Testing [230.61].** The extraction site is sufficiently removed from sources of pollution to provide reasonable assurance that the proposed discharge material is not a carrier of contaminants.

Therefore, the required determinations pertaining to the presence and effects of contaminants can be made without testing.

Action to Minimize Adverse Effects (Subpart H)

1. **Actions Concerning the Location of the Discharge [230.70].** The downstream grade control weirs will add approximately 200 ft to the existing dam footprint. This area between the weirs will be filled with approximately 1000 yds of "pool mix" which will closely mimic the existing substrate. By utilizing this "pool mix" the area will be suitable for rearing and spawning of salmonids. In addition, this substrate will promote the recolonization of benthic invertebrates.

2. **Actions Concerning the Material to be Discharged [230.71].** The extraction site is sufficiently removed from sources of pollution to provide reasonable assurance that the proposed discharge material is not a carrier of contaminants. Therefore, the required determinations pertaining to the presence and effects of contaminants can be made without testing.

3. **Actions Controlling the Material after Discharge [230.72].** The substrate to be placed between the grade control weirs will be held in place by the weirs.

4. **Actions Affecting the Method of Dispersion [230.73].** Not applicable.

5. **Actions Related to Technology [270.74].** Not applicable.

6. **Actions Affecting Plant and Animal Populations [270.75].** A minor quantity of fill material, including riprap and spawning gravel, will remove limited existing areas of aquatic production, but these materials will be colonized by microscopic and macroscopic aquatic organisms that will become part of the river's food web and part of the fish prey base.

7. **Actions Affecting Human Use [230.76].** Not applicable.

8. **Other Actions [230.77].** Not applicable.

General Policies for the Evaluation of Permit Applications [33 CFR §320.4]

1. **Public Interest Review [320.4(a)].** The Corps finds these actions to be in compliance with the 404(b)(1) guidelines and not contrary to the public interest.

2. **Effects on Wetlands [320.4(b)].** On the right bank downstream of the existing diversion dam a small wetland is located in a sandy pocket between the base of the creek bank and the waterline. The approximate size of this wetland is 16- by 16-feet, for an area of 256 square feet. This wetland will be filled. Consultation with the Washington Department of Ecology has indicated that this impact to the wetland can be mitigated by planting riparian vegetation in the project area or by increasing the type and number of habitat features included in the project design. The project will not alter the inundation patterns of any other wetlands in the area.

3. **Fish and Wildlife [320.4(c)].** U.S. Fish and Wildlife Service and the National Marine Fisheries Service were consulted to ensure that direct and indirect loss and damage to fish and wildlife resources attributable to the proposed maintenance work will be minimized.

4. **Water Quality [320.4(d)].** The Corps will abide by the conditions of the Section 401 Water Quality Certification to ensure compliance with Washington water quality standards.

5. **Historic, Cultural, Scenic, and Recreational Values [320.4(e)].** No wild and scenic rivers, historic properties, National Landmarks, National Rivers, National Wilderness Areas, National Seashores, National Recreation Areas, National Lakeshores, National Parks, National Monuments, estuarine and marine sanctuaries, or archeological resources will be adversely impacted by the proposed maintenance work.

6. **Effects on Limits of the Territorial Sea [320.4(f)].** Not applicable.

7. **Consideration of Property Ownership [320.4(g)].** The Corps has worked with the local landowners and currently has their full support.

8. **Activities Affecting Coastal Zones [320.4(h)].** The proposed work complies with the policies, general conditions, and general activities specified in the City of Issaquah Shoreline Master Program and Washington Administrative Code. The Corps received concurrence with this finding from the Washington Department of Ecology on April 20, 2004..

9. **Activities in Marine Sanctuaries [320.4(i)].** Not applicable.

10. **Other Federal, State, or Local Requirements [320.4(j)]**

    a. National Environmental Policy Act. An Environmental Assessment (EA) has been prepared to satisfy the documentation requirements of NEPA.

    b. Endangered Species Act. In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. A Biological Evaluation (BE) was submitted to USFWS and NMFS on 5 December 2003. Concurrence letters were received from USFWS and NMFS on April 30, 2004, and August 24, 2004 respectively.

    c. Clean Water Act. The Corps must demonstrate compliance with the substantive requirements of the Clean Water Act. This document records the Corps' evaluation and findings regarding this project pursuant to Section 404 of the Act. Public Notice CENWS-PL-04-03 (December 1, 2003) served as an application for a Section 401 Water Quality Certification from the Washington Department of Ecology. The Corps requested certification from the Department of Ecology under Section 401 of the Clean Water Act. The Corps received the State-issued Water Quality Certification on April 20, 2004. The Corps will abide by the conditions of the State-

issued Water Quality Certification to ensure compliance with State water quality standards.

d. Coastal Zone Management Act. The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner, which is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management Program. Pursuant to Section 173-27-040(2)(b) of the Washington Administrative Code, which has been adopted in Section I of the City of Issaquah Shoreline Master Program, the Corps determined that this proposal is consistent to the maximum extent practicable with the State of Washington Shoreline Management Program. The Corps received State concurrence with their Coastal Zone Consistency Determination on April 20, 2004.

e. Rivers and Harbors Act. This document records the Corps' evaluation and findings regarding this project pursuant to the Rivers and Harbors Act.

f. National Historic Preservation Act. The National Historic Preservation Act (16 USC 470) requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the National Register of Historic Places must be identified and evaluated. The proposed Corps defined Area of Potential Effects (APE) was submitted to the Washington State Historic Preservation Officer (SHPO), who concurred with the Corps' APE. A cultural resource investigation was completed for the APE that included a professional field survey, archival and other background research, coordination with concerned parties, and submission of a report to SHPO and copied to the Muckleshoot Tribe. The records search indicated that there were no historic properties listed in the National Register of Historic Places (NRHP) or the Washington Office of Archaeology and Historic Preservation (OAHP) electronic historic site database within the APE. A field investigation and additional record searches produced documentation that the existing fish hatchery related diversion dam and coal mining associated railroad grade located within the APE are eligible for the NRHP and that the project had the potential to adversely affect both properties. The railroad grade has been previously disturbed and the Corps will return it to its same appearance at the end of the project. Consequently, the Corps determined that there would be no historic properties adversely affected related to disturbance of the railroad grade and the SHPO concurred. The Corps determined that removal of the dam would adversely affect an historic property and the SHPO concurred. Subsequently, the proposed mitigation measures addressing the adverse effect to the dam were formulated in a memorandum of agreement (MOA) with the SHPO, the Washington Department of Fish and Wildlife, and the City of Issaquah. The King County Historic Preservation Officer signed the MOA on behalf of the City of Issaquah. Mitigation measures for removal of the dam are to fully document the structure in a Historic American Buildings Survey/Historic American Engineering Record report (HABS/HAER) in medium format prior to demolition. Submittal to and acceptance by the SHPO of the HABS/HAER report will complete the Section 106 process.

11. **Safety of Impoundment Structures [320.4(k)].** The entire project has been designed by qualified engineers and meets Corps dam safety guidelines.

12. **Floodplain Management [320.4(l)].** The proposed maintenance work will not alter any floodplain areas.

13. **Water Supply and Conservation [320.4(m)].** This project will maintain the WDFW existing intake and water supply to the hatchery.

14. **Energy Conservation and Development [320.4(n)].** Not applicable.

15. **Navigation [320.4(o)].** No adverse effects to navigation will occur as a result of the proposed project.

16. **Environmental Benefits [320.4(p)].** At present, adult fish passage is only possible at a narrow range of flow, and the project causes unacceptable mortality to both adult and juvenile salmonids. The proposed project will consist of removing the existing diversion dam and replacing it with a dam and seven weirs that meet or exceed current NOAA Fisheries and Washington Department of Fish and Wildlife (WDFW) passage criteria. The proposed project will provide low mortality passage at least 90% of the time for both upstream and downstream passage, including juvenile upstream passage, while maintaining an existing water supply to the Issaquah Hatchery.

17. **Economics [320.4(q)].** During the feasibility study it was determined that the project is economically justified.

18. **Mitigation [320.49(r)].** The Corps will be planting native vegetation throughout the project area, and will by placing “fish mix” gravel between the weirs, to mitigate for the wetland fill.

APPENDIX D

Draft EA Comments and the Corps Responses

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Muckleshoot Indian Tribe Comments to the Issaquah Creek Section 206 Restoration Project Draft EA (March 3, 2004)

Responses to comments are provided below:

General Comments

1. The EA fails to consider a recently released EA that the Corps issued for the upstream project (Squak Valley Restoration project) to restore Issaquah Creek, also under Section 206. There are discrepancies between the two EAs. This EA identifies the habitat of Issaquah Creek as "pristine" (page 6), while the earlier EA did not. The earlier project is one of the reasons why the upstream project is proposed. The habitat in Issaquah Creek is not pristine compared against a variety of habitat indicators. We recommend that the authors review the WRIA 8 limiting factors analysis by the Washington Conservation Commission and the Issaquah Basin Plan by King County SWM, as well as other relevant documents, before making such statements. Finally, the two proposed Corps projects need to be coordinated before either is constructed.

Response: The Corps agrees that the habitat of Issaquah Creek is not pristine. Note that this statement is was taken directly from the 1991 Current/Future Conditions Report for Issaquah Creek Basin prepared by King County Surface Water Management. The Final EA has been revised to avoid characterization of the available habitat as "pristine". The Corps is coordinating with the proposed upstream project and has already made some changes as a result of this coordination.

2. The presence of this dam, ladder, grade controls, etc. will likely continue to impede the local riparian and channel processes and the routing of streambed material. The preferred alternative to increase the number and extent of hardened structures (i.e. fish ladder, grade control weirs, and bank riprap) will further limit riparian and channel processes.

Response: The focus of the project is fish passage while maintaining the intake for the hatchery. The proposed project accomplishes both project purposes and, although short-term construction impacts are unavoidable, will enhance the creek basin by providing connectivity between the upper and lower creek that is currently lacking.

Project Concerns

1. There are some missing details regarding the fish passage component of the proposed project. For example, the weirs in the fish ladder boxes will have a concave top edge complete with a low flow fish passage notch. It is not clear how these weirs will work having both a low flow notch and deeper openings to pass bedload material. Also, there is no discussion about the different types of fish ladders that could be used. A fish ladder based on a vertical slot denil could pass bedload more naturally.

Response: WDFW: A pool and chute ladder was selected because they have shown to pass bedload better than other styles and still pass juveniles. A vertical slot would not provide passage for juvenile fish. A Denil would get plugged with debris and likely not pass juvenile fish.

2. The V-notched intake screen is not defined well enough to determine whether it is being planned correctly. It may work if designed and constructed correctly; however, the details are lacking.

Response: The V-notch is an improvement from the parallel screens. The V-notch prevents decelerating sweeping velocities. The Corps understands that the screen design is crucial and it will be designed to work correctly.

3. Another missing element is the analysis of downstream outmigrant salmon routing. It is not clear if salmon go down the streambed step weirs or through the fish ladder. If salmon go through the ladder, then they will probably be eaten by the large cutthroat trout that will find these big slow pools as ideal ambush sites. The analysis, assumptions, and details need to be provided.

Response: Most downstream migrants will likely go through the pool and chute fishway and over the channel weirs. The project team has had numerous discussions regarding the potential for creating habitat for large cutthroat and the impacts it may have on juvenile salmonids. We believe that by incorporating LWD and riparian plantings this will provide cover for juveniles and reduce potential predation. In addition, the new project design will greatly improve the survival of downstream migrating salmonids. Presently the majority of the juvenile salmonids pass the diversion dam over the spillway where they are subjected to an abrupt encounter with a concrete apron. The proposed project will provide a plunge pool eliminating this problem.

4. Another concern is that the fish ladder appears to be very wide and long for its depth. The proposal to make the ladder a maximum of three feet deep at the top appears to be insufficient for large salmon to jump. The ladder should enable Chinook, coho, steelhead, kokanee and sea-run cutthroat to meander from one step to the next; however, there are no design drawings to provide the details necessary to check this assumption.

Response: The passage concept with a pool and chute fishway (reference P.Powers draft study) is that a low flow the fishway is a pool and weir and fish jump from one pool to the next (or swim). At high flow the water is streaming down the fishway and passage is along the edges. Fishways of this type so far have proven to provide better passage that traditional styles for both adult and juvenile fish.

Tribe's initial technical recommendation

1. Of the ten potential alternatives (including the proposed action) identified in the EA, the cut and fill relocate intake (Alternative 3.6) may be the best if the weirs and grade controls were done with log weirs and engineered log jams (ELJs). The ELJs, combined with log weirs, could be designed to create a hydraulic head to charge the intake, thus eliminating the need for the ladder and grade control weirs. Furthermore, wood can either pass around or add to the ELJs to provide better continuity with channel processes. The wood structures would undoubtedly provide better habitat than rock or concrete structures, and if engineered correctly, and endure most floods. This stability has been shown in several case studies.

Response: The cut and fill relocate intake alternative was identified as a dam removal option early in project scoping where primary benefit is in more natural fish passage. However, this alternative was eliminated during the ten percent design analysis phase for several reasons. First it did not meet project constraints in maintaining the current intake system. We identified the potential to extend the intake upstream but found this would significantly impact upstream riparian vegetation and hydrology by requiring a minimal 600ft. pipeline extension. Second, our current project footprint must remain within the boundaries of the available real estate. Third, we were unclear how to design a more workable intake structure for the upstream environment; development of this structure would require significant additional design funds. Fourth, this alternative was found to be non-cost effective during the cost effectiveness analysis at ten percent design. The problem is the gradient. The gradient would be too steep to support natural processes. Also, the channel is too wide for log weirs. Rocks sills and ELJ could work but the length of channel for construction would greatly increase.

2. The basis for using wood weirs and ELJ grade controls rather than the replacing the dam and ladder and adding concrete grade controls are outlined below:

   A. Details for the proposed project are lacking and may cause impacts without mitigation. The EA states that the construction will take approximately 2-4 months to complete. This time frame may overlap with some species outmigration, or returning adult salmon. The EA is lacking detail about the hydraulics of the by-pass pipe necessary to determine the potential impacts of pipe water velocities on salmon swimming endurance. There may be a passage issue at some flows with the by-pass pipe. The transport, and estimated mortality are not disclosed. The substrate through the impacted reach is not described, nor are estimates provided on how many fish are expected to be present (based on sampling). Based on similar operations, fish mortality is likely to occur. If a new alternative based on the original cut and fill-relocate option combined with ELJ/logs was implemented, then the channel might not require dewatering, thus decreasing the likelihood of fish mortality. Finally, the potential trap and haul contingency plan lacks details.

Response: The project timing is designed to avoid or minimize potential impacts to salmonids during construction by scheduling the in-water construction period to avoid periods of greatest salmonid vulnerability and highest expected use. In addition, water temperatures will likely be very high during the construction period creating an upstream passage barrier/restriction in the Sammamish River until temperatures decrease in September. For example, water temperatures have been documented

exceeding 22.0 Celsius in late July in the Sammamish River by R2 Resource Consultants Juvenile Salmonid Use of Created Stream Habitat in the Sammamish River, Washington 2001. It is also likely that the temperatures in Issaquah Creek itself will be very high during the construction period encouraging many fish to attempt to find cooler water upstream or downstream of the project. If the trap and haul plan is necessary, WDFW and the Corps have decades of experience in collecting and transporting fish.

B. The dam or the seven concrete weirs for grade control may not adequately pass wood, and there is no consideration of how upstream wood will be passed. We are concerned that if wood becomes lodged in the weirs, then there would be limited opportunity to pass the larger pieces manually without cutting them. All of the current reports on Issaquah Creek note that the stream is lacking large wood. There is no discussion about manually passing wood. If wood were passed manually, then its passage would likely occur after flood flows, which requires future floods to redistribute the wood to downstream reaches. The ELJs and lo weirs, if properly designed, would likely pass wood better than through the impediments of the dam, trash rack, ladder, and grade control.

Response: The required Operations and Maintenance Manual for the completed project will address the procedure for passing wood and will attempt to keep large woody debris intact when it is moved downstream past the structure. Additionally, large woody debris will be placed as part of the project to enhance fish habitat in the project area

C. The proposed mitigation is not adequate. According to the EA, the project is expected to be self-mitigating because it improves current fish passage conditions. However, this assumption fails to consider the potential for the new structures to further impede natural stream and riparian functions. The channel dewatering will likely cause mortality of juvenile fish, based on observations of this type of operation in similar projects (e.g. the Stillaguamish River bridge protection project; the TPU pipeline replacement on the White River). The mitigation for this mortality has not been identified. In addition, any restrictions on channel, stream banks or riparian areas should be considered as an impact to habitat forming processes that will require mitigation. Depending on the extent of impacts associated with loss of riparian vegetation and channel processes, one mitigation measure is to install wood to mitigate for habitat losses and potential improve the salmon productivity of Issaquah Creek.

Response: Due primarily to concerns of the Department of Ecology and the Muckleshoot Tribe the Corps has budgeted for, and is planning on, the incorporation of LWD into the design. Details of the LWD placement will be part of the 65% design.

APPENDIX E

Required State and Federal Agency Responses

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CONTENTS

1. Letter from Washington State Department of Ecology: Water Quality Certification/Coastal Zone Consistency Determination, dated 20 April 2004.

2. Letter from National Marine Fisheries Service: Endangered Species Act Section 7 Informal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation, dated 24 August 2004.

3. Letter from U.S. Fish and Wildlife Service: Endangered Species Act Section 7 Informal Consultation, dated 30 April 2004

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

April 16, 2004

REGISTERED MAIL
RR 359 893 187 US

Alicia Austin Johnson
U.S. Army Corps of Engineers
Environmental Resources Section
PO Box 3755
Seattle, WA 98124-2255

Dear Ms. Johnson:

RE: Order # 1112
U.S. Army Corps of Engineers # **CENWS-PL-04-03**
Water Quality Certification and Coastal Zone Management Consistency Determination to authorize removal and replacement of the Issaquah Creek Diversion Dam, Issaquah, King County, Washington.

The request for certification for proposed work in and adjacent to Issaquah Creek has been reviewed. On behalf of the State of Washington, we certify that the proposed work, as conditioned by the enclosed Order, will comply with applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act, as amended, and other appropriate requirements of State law. This letter also serves as the State response to the Corps of Engineers.

Pursuant to 16 U.S.C. 1456 et. seq. (Section 307(c)(3) of the Coastal Zone Management Act of 1972 as amended), Ecology concurs with the applicant's determination that this work will be consistent with the approved Washington State Coastal Zone Management Program. This concurrence is based upon the applicant's compliance with all applicable enforceable policies of the Coastal Zone Management Program, including Section 401 of the Federal Water Pollution Control Act.

This certification is subject to the conditions contained in the enclosed Order. If you have any questions, please contact Alice Kelly at (425) 649-7145. Written comments can be sent to her at the Department of Ecology, 3190 – 160th Ave. SE, Bellevue, WA 98008. The enclosed Order may be appealed by following the procedures described in the Order.

Sincerely,

Jeannie Summerhays

Jeannie Summerhays
Section Manager
Shorelands and Environmental Assistance Program

JS:AK:rc
Enclosure
cc: Chuck Ebel, Corps
Yvonne Oliva, Ecology
Larry Fisher, WDFW

IN THE MATTER OF GRANTING A WATER QUALITY CERTIFICATION TO U.S. Army Corps of Engineers in accordance with 33 U.S.C. 1341 FWPCA § 401, RCW 90.48.260 and Chapter 173-201A WAC	)))))))	**ORDER # 1112** **Corps Reference No. CENWS-PL-04-03** Replace diversion dam on Issaquah Creek with a structure that meets or exceeds fish passage criteria; located in Section 33, T. 24 N., R. 6 E., Issaquah, King County, Washington.

TO: U.S. Army Corps of Engineers
ATTN: Alicia Austin Johnson
Planning Branch
PO Box 3755
Seattle, WA 98124-3755

On December 1, 2003, a public notice for a proposed water quality certification from the State of Washington was distributed for the above-referenced project pursuant to the provisions of 33 U.S.C. 1341 (FWPCA §401). The proposed project entails replacement of the Issaquah Creek Hatchery Diversion Dam. The existing dam will be removed and replaced, and seven grade control weirs will be constructed just downstream of the dam so that the current NOAA Fisheries and Washington Department of Fish and Wildlife fish passage criteria are met. The proposed project will provide low mortality passage at least 90% of the time for both upstream and downstream passage, including juvenile upstream passage while maintaining an existing water supply to the Issaquah Hatchery.

The project is located at river mile (RM) 3.5 on Issaquah Creek in Section 33, T24 N., R6E, City of Issaquah, King County, Washington. The dam and fish ladder will be reconfigured as follows:

- The spillway will be moved downstream coincident with the entrance of the fishway. The right abutment will be extended at least 17 feet downstream to the crest of the new spillway.
- A new ten-foot apron will be placed below the new spillway to prevent scour.
- A new fish ladder will consist of five pool and chute weirs.
- Seven grade control weirs will be constructed of H-pile with concrete panels and concrete caps.
- 560 cubic yards of riprap will be placed along the weirs at the depth of expected scour.
- 1000 cubic yards of pool mix gravel will cover the area of the grade control weirs.

Issaquah Creek will be diverted around the construction area in a bypass pipe. All riparian areas will be replanted with native vegetation after construction.

AUTHORITIES:

In exercising authority under 33 U.S.C. 1341, 16 U.S.C. 1456, and RCW 90.48.260, Ecology has investigated this application pursuant to the following:

1. Conformance with applicable water quality-based, technology-based, and toxic or pretreatment effluent limitations as provided under 33 U.S.C. Sections 1311, 1312, 1313, 1316, and 1317 (FWPCA Sections 301, 303, 306 and 307);

2. Conformance with the state water quality standards as provided for in Chapter 173-201A WAC authorized by 33 U.S.C. 1313 and by Chapter 90.48 RCW, and with other appropriate requirements of state law; and

3. Conformance with the provision of using all known, available and reasonable methods to prevent and control pollution of state waters as required by RCW 90.48.010.

CONDITIONS OF ORDER # 1112 AND WATER QUALITY CERTIFICATION:

In view of the foregoing and in accordance with 33 U.S.C. 1341, 90.48.260 RCW and Chapter 173-201A WAC, water quality certification is granted to the U.S. Army Corps of Engineers subject to the following conditions:

A. No Impairment of Water Quality:

A1. Issaquah Creek is classified as Class A waters of the state. Certification of this proposal does not authorize the U.S. Army Corps of Engineers to exceed applicable state water quality standards (Chapter 173-201A WAC) or sediment quality standards (Chapter 173-204 WAC). Water quality criteria contained in WAC 173-201A-030(1) and WAC 173-201A-040 shall apply to this project, unless otherwise authorized by Ecology. This Order does not authorize temporary exceedances of water quality standards beyond the limits established in WAC 173-201A-110(3). Furthermore, nothing in this certification shall absolve the U.S. Army Corps of Engineers from liability for contamination and any subsequent cleanup of surface waters or sediments occurring as a result of project construction or operations.

A2. <u>Short-Term Modification to the Water Quality Standards per WAC 173-201A-110</u>: Construction activities waterward of the ordinary high water mark may cause water quality effects that will exceed the state water quality criteria specified in WAC 173-201A. Per WAC 173-201A-110, Ecology may grant a modification to the standards to allow for exceedances of the criteria on a short-term basis when necessary to accommodate essential activities. Issaquah Creek is classified as Class A and the criteria of that class apply except as specifically modified by this Order. Turbidity in Class A waters shall not exceed 5 NTU over background when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

Mixing zones (or zones of disturbance) can be authorized to allow for temporary exceedances of certain water quality standards in state waters immediately adjacent to a permitted project, provided that the discharger fully applies all known, available, and reasonable methods of prevention, control, and treatment (AKART). For this project, a mixing zone of 300 feet from the downstream edge of the in-water activities, as allowed by WAC 173-201A-110, is considered reasonably sufficient to allow for temporary water quality exceedances for turbidity. Within the mixing zone, the Class A standard for turbidity is waived. All other applicable water quality standards including pH shall remain in effect within the mixing zone and all other water quality standards are to be met outside of the authorized mixing zone.

A3. The waiver of specified standards within the mixing zone is intended for brief periods of time (such as a few hours or a day) and is not an authorization to exceed those standards for the entire duration of construction. In no case does the waiver authorize degradation of water quality that significantly interferes with or becomes injurious to characteristic water uses, including fisheries habitat, or causes long-term harm to Issaquah Creek.

A4. A Water Quality Monitoring Plan shall be submitted to the Department of Ecology for review and approval at least 60 days prior to the beginning of construction. Ecology may require revisions to the Plan. The Plan shall include the following minimum specifications:

- Sampling for turbidity shall occur <u>a minimum of four times per day on each day of construction, excavation, and/or grading activity waterward of the ordinary high water mark when flows are not diverted</u> (prior to and during installation of the river bypass pipe, routing water through the completed project, and during removal of the bypass pipe). Sampling shall increase if exceedances are detected.

- Locations of water quality sampling sites shall be identified on a map, described in the plan, and marked in the field. At a minimum, sampling shall take place at the point of compliance 300 feet from the downstream edge of the construction zone, and at 150 feet so that potential non-compliance is identified ahead of time.

- Identification of personnel responsible for turbidity monitoring and reporting shall be included in the plan.

A5. Results of water quality sampling, as determined by the water quality monitoring plan, shall be forwarded to Department of Ecology on a weekly basis to Alice Kelly at e-mail akel461@ecy.wa.gov or fax (425) 649-7098.

A6. If water quality standards are exceeded at any time during construction, the applicant shall:

- Immediately take action to stop, contain, and clean up unauthorized discharges or otherwise stop the violation and correct the problem.

- Notify Ecology of the failure to comply within 24 hours to Ecology's Alice Kelly at (425) 649-7145.
- Submit a detailed written report to Ecology within five days that describes the nature of the violation, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of any samples taken, and any other pertinent information. The report shall be submitted to: Alice Kelly, Department of Ecology, 3190 – 160th Ave SE, Bellevue, WA 98008, or fax (425) 649-7098.
- Spill events shall be reported immediately to Ecology's 24-Hour Spill Response Team at (425) 649-7000.

B. Notification:

B1. The U.S. Army Corps of Engineers project manager shall provide notice to Ecology's Federal Permit Coordinator at least 7 days prior to the start of construction. Notification can take place by e-mail to akel461@ecy.wa.gov, telephone to (425) 649-7145, fax to (425) 649-7098, or in writing.

B2. The U.S. Army Corps of Engineers shall incorporate woody debris into the design of the grade control weirs, and provide updated drawings and site plans (65% design or greater) to Ecology as soon as they are available.

C. Construction:

C1. The Applicant shall implement and comply with the Construction Stormwater Pollution Prevention Plan, Issaquah Creek Section 206 Restoration Project (Issaquah Creek Diversion Dam) dated February 25, 2004.

C2. Issaquah Creek shall be diverted around the construction area of the new dam, fish ladder, and the grade control weirs by use of a bypass pipe and temporary dam structure.

C3. Gravel, rock, and rip-rap placed below ordinary high water mark shall be washed or free from fine particles to prevent turbidity impacts.

C4. Construction Stormwater and Erosion Control: Work in or near waters of the state shall be done so as to minimize turbidity, erosion, and other water quality impacts. Construction stormwater, sediment and erosion control Best Management Practices suitable to prevent exceedances of state water quality standards (*e.g.*, detention areas, silt fences, etc.), shall be in place before starting clearing, filling, and grading work at the impact sites.

C5. Prior to clearing and grading in the riparian area, adjacent areas shall be protected from construction impacts. Construction fencing or flagging (using brightly colored tape at no less than twenty-five foot (25') intervals) shall be installed prior to clearing. Equipment

shall not be moved into or operated in riparian areas unless necessary for construction or staging.

C6. During clearing and excavation, the U.S. Army Corps of Engineers shall take all necessary measures to minimize the alteration or disturbance of existing wetland, riparian, and upland vegetation.

C7. Wet concrete shall not come in contact with surface water. Construction de-watering water in contact with wet concrete or concrete sawcuttings shall be treated and/or disposed upland such that it does not violate surface or groundwater quality standards.

C8. Equipment used for this project shall be free of external petroleum-based products. Accumulation of soils or debris shall be removed from the drive mechanisms (wheels, tires, tracks, etc.) and undercarriage of equipment prior to work below the Ordinary High Water Line.

C9. Wash water containing oils, grease, or other hazardous materials resulting from wash down of equipment or working areas shall be contained for proper disposal, and shall not be discharged into state waters or storm drains.

C10. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc., shall be checked regularly for drips or leaks, and shall be maintained and stored properly to prevent spills into state waters. No refueling of equipment shall occur over, or within 50 feet of creeks or wetlands.

C11. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities.

C12. Before water is diverted back into the channel, approved fish habitat components, streambed materials, and bank protection to prevent erosion shall be in place.

D. Revegetation:

D1. All areas cleared for construction or staging shall be replanted with native riparian species.

D2. With seven calendar days of project grading work, all disturbed riparian areas shall be protected from erosion using vegetation or other means.

D3. Installation of the project plantings shall be completed prior to the start of the first growing season (March 1) subsequent to project clearing or grading. Project plantings shall be maintained and irrigated as necessary to ensure 80 percent or greater survival at the end of five years.

D4. Spring and fall inventories for invasive species shall be taken annually for the first five years post-construction. Invasive species shall be controlled such that they do not exceed more than 10% total cover at any time.

E. Emergency/Contingency Measures:

E1. In the event the US Army Corps of Engineers is unable to comply with any of the permit terms and conditions due to any cause, the applicant shall:

- Immediately take action to stop, contain, and clean up unauthorized discharges or otherwise stop the violation and correct the problem.
- Notify Ecology of the failure to comply. Spill events shall be reported immediately to Ecology's 24-Hour Spill Response Team at (425) 649-7000, and within 24 hours to Ecology's Alice Kelly at (425) 649-7145.
- Submit a detailed written report to Ecology within five days that describes the nature of the violation, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of any samples taken, and any other pertinent information.

F. General Conditions:

F1. For purposes of this Order, the term "Applicant" shall mean the U.S. Army Corps of Engineers and its agents, assigns, and contractors.

F2. This certification does not exempt and is provisional upon compliance with other statutes and codes administered by federal, state, and local agencies.

F3. The applicant will be out of compliance with this certification if the project is constructed and/or operated in a manner not consistent with the project description contained in the Public Notice for certification, or as otherwise approved by Ecology. Additional mitigation measures may be required through other local, state, or federal requirements.

F4. The applicant will be out of compliance with this certification and must reapply with an updated application if five years elapse between the date of the issuance of this certification and the beginning of construction and/or discharge for which the federal license or permit is being sought.

F5. The applicant will be out of compliance with this certification and must reapply with an updated application if the information contained in the Public Notice is voided by subsequent submittals to the federal agency. Any future action at this project location, emergency or otherwise, that is not defined in the Public Notice, or has not been approved by Ecology, is not authorized by this Order. All future actions shall be coordinated with Ecology for approval prior to implementation of such action.

F6. Copies of this Order shall be kept on the job site and readily available for reference by Ecology personnel, the construction superintendent, construction managers and foremen, and state and local government inspectors. To avoid violations or non-compliance with this Order, the applicant shall ensure that project managers, construction superintendents, and other responsible parties have read and understand relevant aspects of this Order and any subsequent revision or Ecology-approved plans.

F7. The applicant shall provide access to the project site and all mitigation sites upon request by Ecology personnel for site inspections, monitoring, necessary data collection, or to ensure that conditions of this Order are being met.

F8. Nothing in this Order waives Ecology's authority to issue additional orders if Ecology determines further actions are necessary to implement the water quality laws of the state. Further, Ecology retains continuing jurisdiction to make modifications hereto through supplemental order, if additional impacts due to project construction or operation are identified (*e.g.*, violations of water quality standards, downstream erosion, etc.), or if additional conditions are necessary to further protect the public interest.

F9. Liability: Any person who fails to comply with any provision of this Order shall be liable for a penalty of up to ten thousand dollars ($10,000) per violation for each day of continuing noncompliance.

Appeal Process:

Any person aggrieved by this Order may obtain review thereof by appeal, within thirty (30) days of receipt of this Order, to the Washington Pollution Control Hearings Board, P.O. Box 40903, Olympia, WA 98504-0903. Concurrently, a copy of the appeal must be sent to the Department of Ecology, Shorelands and Environmental Assistance Program, P.O. Box 47600, Olympia, WA 98504-7600. These procedures are consistent with the provisions of Chapter 43.21B RCW and the rules and regulations adopted thereunder.

Dated 4/15/04 at Bellevue, Washington.

Jeannie Summerhays, Section Manager
Shorelands and Environmental Assistance Program
Department of Ecology
State of Washington

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

NMFS Tracking No.:
2003/01488

August 24, 2004

Mark Ziminske
Environmental Resources Section
Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7 Informal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Issaquah Creek Section 206 Fish Passage Restoration Project, HUC 171100120201, Issaquah Creek

Dear Mr. Ziminske:

This correspondence is in response to your request for consultation under the Endangered Species Act (ESA). Additionally, this letter serves to meet the requirements for consultation under the Magnuson Stevens Fishery Conservation and Management Act (MSA).

Endangered Species Act

NOAA's National Marine Fisheries Service (NOAA Fisheries) has reviewed the above referenced Biological Evaluation (BE) and supporting documents received from the U.S. Army Corps of Engineers (COE) December 8, 2003. In addition, NOAA Fisheries has continued technical support discussions on the project with the COE and other project cooperators seeking to resolve some outstanding design issues. According to the BE and supporting documents, the COE is proposing to rehabilitate the Issaquah hatchery water supply dam. The purpose of the project is to provide safe passage for juvenile and adult salmonids both upstream and downstream under most flow stages in the affected reach of Issaquah Creek. The action area is the Issaquah Creek watershed. Issaquah Creek drains into Lake Sammamish approximately 3.5 miles northwest of the project site. The Lake Sammamish system is part of the Lake Washington watershed. Chinook pass above the Issaquah Creek hatchery diversion dam and inhabit Issaquah Creek seasonally.

The COE is proposing to conduct a section 206 environmental restoration project to reconstruct the existing Issaquah hatchery water supply dam to provide both upstream and downstream passage meeting state and Federal fish passage criteria for juvenile and adult salmonids utilizing Issaquah Creek for spawning and rearing. The COE has determined that the proposed project "may affect, not likely to adversely affect", Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*). This species is listed as threatened under the ESA.

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During the project preliminary design phase, the COE identified the following measures that will be taken to avoid and minimize the potential effects of the project during final design and construction:

All requirements and/or agreements set forth in the Issaquah Creek Restoration Project BE and the 30% design report November 2003 draft will be implemented in their entirety. The requirements include the Conservation Measures as stipulated in Section 5 of the BE (pg. 5-7).

Because the stated purpose of the project is to provide unimpeded fish passage for juvenile and adult salmonids and the COE is coordinating closely with both Washington Department of Fish and Wildlife (WDFW) and NOAA Fisheries' Northwest Hydro Division, NOAA Fisheries expects the project will meet all passage criteria. Since the COE also proposes to incorporate all appropriate avoidance and minimization measures into the final design and construction of the project, NOAA Fisheries concurs with your effect determination of "may affect, but not likely to adversely affect" for PS chinook.

However, NOAA Fisheries does find that a relatively high degree of uncertainty remains as to how successful the project may be in achieving the passage criteria and incorporation of all appropriate avoidance and minimization measures. Specifically, details on fluvial processes and hydraulic conditions within and downstream of the project have not yet been addressed in sufficient detail to resolve issues of streambed stability and suitability as spawning substrate for chinook salmon. Please note, for example, the enclosed WDFW and NOAA Fisheries' comments on the 30% design (Attachments 1, 2 and 3). NOAA Fisheries' staff has continuing concerns that the project could create a recurring take of chinook salmon embryos and pre-emergent fry resulting from repeated spawning gravel deposition and scouring.

We have suggested the COE will need to design the hydraulic energy regime of the weirs to either avoid deposition of gravels suitable for spawning or to avoid scouring of redds for all but very extreme flow events. Discussions of this issue among the involved COE, NOAA Fisheries, and WDFW staff has identified the potential for increasing the hydraulic regime for the upper weirs and reducing it for the lower weirs as one potential alternative design that could be explored. NOAA Fisheries has not yet been provided with sufficient design details on the grade control weirs and associated bank protection to determine whether all appropriate avoidance and minimization measures have been taken. The COE will need to develop a final draft design, including documentation that the design meets all WDFW and NOAA passage criteria, for our review and approval prior to construction.

Even with substantial additional hydraulic analyses and design work, NOAA Fisheries expects some uncertainty will remain as to the long-term post project site conditions. We, therefore, believe that monitoring and adaptive management is an essential project element to ensure the project will rapidly detect and correct any inadvertently created "attractive nuisance" spawning habitat condition. NOAA Fisheries, therefore, requires the COE develop a monitoring and adaptive management plan for our review and approval prior to construction. We refer the COE to Appendix J of the *Integrated Streambank Protection Guidelines* for guidance on development

of the appropriate objectives, monitoring parameters, and protocols. Further, we suggest the monitoring focus particularly on assessing the effects of the configuration of the spillway and weirs on the streambed substrate composition and suitability for spawning, documentation of the actual utilization of the affected reach for spawning, and assessment of the probability of redd scouring and resulting losses of embryos and pre-emergent fry.

Because the COE proposes to meet all WDFW and NOAA Fisheries' passage criteria and to incorporate all appropriate avoidance and minimization measures into the final design and construction of the project, NOAA Fisheries can expect the effects of the action to be discountable or insignificant. Therefore, COE submittal of the final design and monitoring plans documenting project achievement of these objectives to NOAA Fisheries' satisfaction will conclude informal consultation on these actions in accordance with 50 CFR 402.14(b)(1). The COE must re-analyze this ESA consultation: (1) if new information reveals effects of the action that may affect listed species in a way not previously considered; (2) if the action is modified in a manner that causes an effect to the listed species that was not previously considered; or (3) if a new species is listed or critical habitat designated that may be affected by the identified actions. Please note in particular that the consultation has not addressed any proposal for increasing the volume of water diverted from Issaquah Creek above current levels (stated in the BE as 12 cfs).

Magnuson-Stevens Fishery Conservation and Management Act

Federal agencies are required, under section 305(b)(2) of the MSA and its implementing regulations (50 CFR 600 Subpart K), to consult with NOAA Fisheries regarding actions that are authorized, funded, or undertaken by that agency that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." If an action would adversely affect EFH, NOAA Fisheries is required to provide the Federal action agency with EFH conservation recommendations (MSA section 305(b)(4)(A)). This consultation is based, in part, on information provided by the Federal action agency and descriptions of EFH for Pacific salmon contained in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (August 1999) developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce (September 27, 2000).

The proposed action is described in the BE and supporting documents submitted by COE. The project area includes habitat, which has been designated as EFH for various life stages of chinook and coho (*O. kisutch*).

As noted above, NOAA Fisheries finds that there remains a relatively high degree of uncertainty regarding the success of the project, and that this uncertainty extends to designated EFH. NOAA Fisheries notes that the spawning gravel suitability and redd depth criteria are different for coho than they are for chinook salmon. As such, the project may adversely affect the designated EFH of coho.

EFH Conservation Recommendations: Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies

regarding actions that would adversely affect EFH. NOAA Fisheries recommends that the COE implement the following conservation measure to minimize the potential adverse effects to the EFH of coho salmon:

> The COE, in developing both the final design and the monitoring plan described in the ESA section above, should concurrently address the habitat requirements of coho salmon.

Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations (MSA (section 305(b)(4)(B)) and 50 CFR 600.920(k)). The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

This concludes consultation under the MSA. If the proposed action is modified in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations, the COE will need to reinitiate consultation in accordance with the implementing regulations for EFH at 50 CFR 600.920(l).

Thank you for your efforts to protect and restore threatened PS chinook and designated EFH for chinook and coho salmon. If you have any questions, please contact Bill Graeber of the Washington State Habitat Office at (360) 753-6042.

Sincerely,

D. Robert Lohn
Regional Administrator

Attachments

cc: Chuck Ebel, COE
Pat Powers, WDFW

CHRON

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

In Reply Refer To:
1-3-04-I-0351

JAN 16 2004

Colonel Debra M. Lewis, District Engineer
Seattle District, Corps of Engineers
ATTN: Environmental Resources Section (Ebel)
P.O. Box 3755
Seattle, Washington 98124-3755

Dear Colonel Lewis:

Subject: Issaquah Creek Hatchery Diversion Dam

This is in response to your letter dated December 5, 2003, and enclosed Biological Evaluation (BE). The letter and BE for the modification of the hatchery diversion dam on Issaquah Creek, King County, Washington, were received in our office on December 10, 2003. Your letter requests our concurrence with your determination of "may affect, not likely to adversely affect" for bald eagles (*Haliaeetus leucocephalus*) and bull trout (*Salvelinus confluentus*), as evaluated in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

We believe that sufficient information was provided to determine the effects of the proposed project to federally listed species and to conclude whether this project is likely to adversely affect those species. We, therefore, concur with the "may affect, not likely to adversely affect" determination for bald eagles and bulltrout. Our concurrence is based on the information and conservation measures described in the BE and cover letter, and the following information:

Bull trout
-Work will be conducted at a time when bull trout are least likely to be present in the project area.
-Work will improve fish passage above hatchery.

Bald Eagle
-No bald eagle nests are located within one mile of the proposed project.
-No foraging, perching or wintering habitat will be impacted.

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 2

To Chuck Ebel	From
Dept./Agency	Phone #
Fax #	Fax # 206-764-4470

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

This concludes informal consultation pursuant to the regulations implementing the Endangered Species Act (50 CFR 402.13). This project should be reanalyzed if new information reveals effects of the action that may affect listed species or critical habitat in a manner, or to an extent, not considered in this consultation. The project should also be reanalyzed if the action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this consultation, and/or a new species is listed or critical habitat is designated that may be affected by this project.

If you have further questions about this letter or your responsibilities under the Act, please contact Brian Missildine at (360)753-9561 or Lynn Childers at (360)753-9440.

Sincerely,

Lynn P. Childers

for Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

cc:
WDFW, Region 6
WDOE, Lacey (H. Pressley)

APPENDIX F

Memorandum of Agreement for Historic Preservation

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STATE OF WASHINGTON

Office of Archaeology and Historic Preservation

1063 S. Capitol Way, Suite 106 - Olympia, Washington 98501
(Mailing Address) PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 Fax Number (360) 586-3067

June 1, 2005

Mr. Mark T. Ziminske, Chief
Environmental Resources Section
U.S. Army Corps of Engineers
Att: CENW-PM-PL-ER
P.O. Box 3755
Seattle, Washington 98124-3755

In future correspondence please refer to:
Log: 102704-03-COE-S
Re: Memorandum of Agreement, Issaquah Creek Diversion Dam & Railroad Bed

Dear Mr. Ziminske:

Enclosed please find one original copy of the Memorandum of Agreement (MOA) pertaining to the above referenced action at the Issaquah Creek Diversion Dam. The MOA has been signed by State Historic Preservation Officer (SHPO) Allyson Brooks. I am retaining a copy of the original document with all signatures here at OAHP for our files and future reference.

On behalf of the SHPO and OAHP staff, I want to thank you for your assistance in this process. As you work to implement the stipulations called for in the MOA, please be sure to contact our office should any questions arise about the various tasks. I may be reached at 360-586-3073 or gregg@cted.wa.gov.

Sincerely,

Gregory Griffith
Deputy State Historic Preservation Officer

Enclosure

MEMORANDUM OF AGREEMENT
AMONG
THE U. S. ARMY CORPS OF ENGINEERS, WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE, CITY OF ISSAQUAH, AND WASHINGTON STATE OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION REGARDING REMOVAL AND RECONSTRUCTION OF THE ISSAQUAH CREEK DIVERSION DAM, ISSAQUAH, KING COUNTY, WASHINGTON

WHEREAS, in accordance with the draft feasibility report, the U.S. Army Corps of Engineers (Corps) and its non-Federal sponsor the Washington State Department of Fish and Wildlife (WDFW) propose to jointly undertake the removal of the historic-period Issaquah Creek Diversion Dam in the City of Issaquah, King County, Washington, known as the Issaquah Creek Section 206 Restoration Project, and

WHEREAS, the Corps has conducted a cultural resources survey of the area of potential effect (APE), and identified a diversion dam and a previously disturbed railroad bed that are eligible for the National Register of Historic Places (Register), and

WHEREAS, the Corps and the WDFW have determined that 1) the dam removal and reconstruction will adversely affect a property eligible for inclusion in the Register, and 2) excavation activities associated with the project will have no effect to the Register eligible railroad bed as it has been previously disturbed within the APE and it will be filled back in to recreate its present appearance and configuration, and

WHEREAS, the Corps and the WDFW have consulted with Washington State Historic Preservation Officer (SHPO) pursuant to 36 CFR § 800, regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470s) (NHPA); and will present a copy of this document to the Advisory Council on Historic Preservation (Council) for their review and acceptance, and

WHEREAS, the City of Issaquah is the location of the Register eligible properties and has an interest in the history and preservation of these properties and has participated in the consultation, and the City of Issaquah has been invited to concur in this Memorandum of Agreement, and

NOW, THEREFORE, the Corps, WDFW, City of Issaquah, and the Washington SHPO agree that the project activities shall be implemented in accordance with the following stipulations in order to take into account the effect of the aforementioned activities on historic properties.

STIPULATIONS

I. The Corps and WDFW shall ensure that the following measures will be carried out:

A. The Corps shall ensure that both photographic and inventory documentation of the diversion dam be undertaken so that there will be a permanent record of its present appearance and history. As per agreement with the SHPO, and in accordance with Section 110(b) of the NHPA, documentation will conform, at a minimum, to Historic American Building Survey Level 4 standards. The appropriate records will be held in local repositories at the Washington State Office of Archaeology and Historic Preservation (OAHP), the Issaquah Historical Society, and the Corps.

B. Prior to removal, the entire diversion dam structure shall be recorded in medium format black and white photographs. Photography will consist of three sets of approximately ten views that depict the design, setting, materials, and details of the diversion dam from several angles. Photos will be labeled and indexed; one set to be provided to the Issaquah Historical Society, one set will be provided to the SHPO, and the third set will be kept on file at the Corps.

C. The Corps shall submit electronic inventory forms for the dam and railroad bed to OAHP.

D. The previously disturbed historic railroad bed will be filled back in to recreate its present appearance and configuration.

II. Implementation of this Agreement

A. DISPUTE RESOLUTION. The Corps and the SHPO will together attempt to resolve any disagreement arising from implementation of this Agreement. The Council will assist in attempting to resolve any disagreement if so desired by either party. If the Corps determines that the disagreement cannot be resolved, the Corps will request the further comments of the Council in accordance with 36 CFR § 800.6(b). Any Council comments provided in response will be considered by the Corps in accordance with 36 CFR § 800.6 (b)(2), with reference only to the subject of the dispute. The Corps' responsibility to carry out all other actions under this Agreement that are not the subjects of the dispute will remain unchanged.

B. USE OF THIS AGREEMENT. The signatories also do hereby concur that this Agreement will be submitted for review and approval to the Council, under the terms of 36 C.F.R. 800.6(1)(b)(iv).

C. EVIDENCE. Execution of this Memorandum of Agreement by the U.S. Army Corps of Engineers, Seattle District and the Washington State Historic Preservation Office, the submission of documentation and filing of this Agreement with the Council pursuant to 36 CFR Section 800.6(b)(1)(iv), prior to the demolition of the diversion dam and related properties, and implementation of all other the terms of this Agreement, shall stand as evidence that the U.S. Army Corps of Engineers has taken into account the effects of this undertaking on historic properties and afforded the Council an opportunity to comment.

U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT

Debra M. Lewis 14 Mar 05

Debra M. Lewis
Colonel, Corps of Engineers
District Engineer

Date

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

MAY 16 2005

Bill Brooks, Contracts Officer

Date

ON BEHALF OF THE CITY OF ISSAQUAH

4/14/05

Julie Koler, King County Historic Preservation Officer

Date

WASHINGTON STATE OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION

6/1/05

Dr. Allyson Brooks, SHPO

Date

APPENDIX G

Biological Evaluation, Issaquah Creek Section 206 Restoration Project

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Biological Evaluation

Issaquah Creek Section 206 Restoration Project

King County, Washington

December 2002

US Army Corps
of Engineers®
Seattle District

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1. INTRODUCTION

The Seattle District, U.S. Army Corps of Engineers (Corps) is planning to replace the Issaquah Creek Hatchery Diversion Dam, located on Issaquah Creek near Issaquah, Washington. This project is located at approximately River Mile 3.5, just upstream of the Issaquah Hatchery. The existing structure supplies water to the hatchery; however, the existing dam has passage problems associated with the ladder, the water supply intake, the spillway, and the accompanying apron. At present, adult fish passage is only possible at a narrow range of flows, and the project causes unacceptable mortality to both adult and juvenile salmonids. The proposed project will consist of removing the existing diversion dam and replacing it with a dam and seven weirs that meet or exceed current NOAA Fisheries and Washington Department of Fish and Wildlife (WDFW) passage criteria. The proposed project will provide low mortality passage at least 90% of the time for both upstream and downstream passage, including juvenile upstream passage, while maintaining an existing water supply to the Issaquah Hatchery.

2. PROJECT LOCATION AND HISTORY

In 1936, in response to growing demands of fish resources and diminishing returns, the WDFW began supplementing salmon production through operation of the Issaquah creek Fish Hatchery as a salmon production facility in the City of Issaquah. Two dams were constructed to support the hatchery, the lower dam or “barrier dam” located at the hatchery site and an upper dam, “diversion dam”. This project focuses on the upper dam – and its associated fish passage problems. The existing dam is located at river mile (RM) 3.5 on Issaquah Creek in Section 33, T24 N, R6E, City of Issaquah, King County, Washington.

The intake structure or diversion dam located ½ mile upstream of the hatchery has supplied water to the hatchery since 1960 through diverting creek flow and creating the elevation head necessary to deliver a gravity flow water supply. In 1972 the gravity intake was reconstructed, the walls at the intake were raised one foot, two additional pools were added to the fish ladder, and a new screen structure incorporated. Since then, the hatchery has become a historical and cultural feature as well as a fish production facility.

Downstream of the project area, the creek runs through the City of Issaquah into Lake Sammamish State Park and empties into Lake Sammamish. Upstream of the project

the creek flows primarily through forested areas, draining approximately 55 square miles of quality habitat.

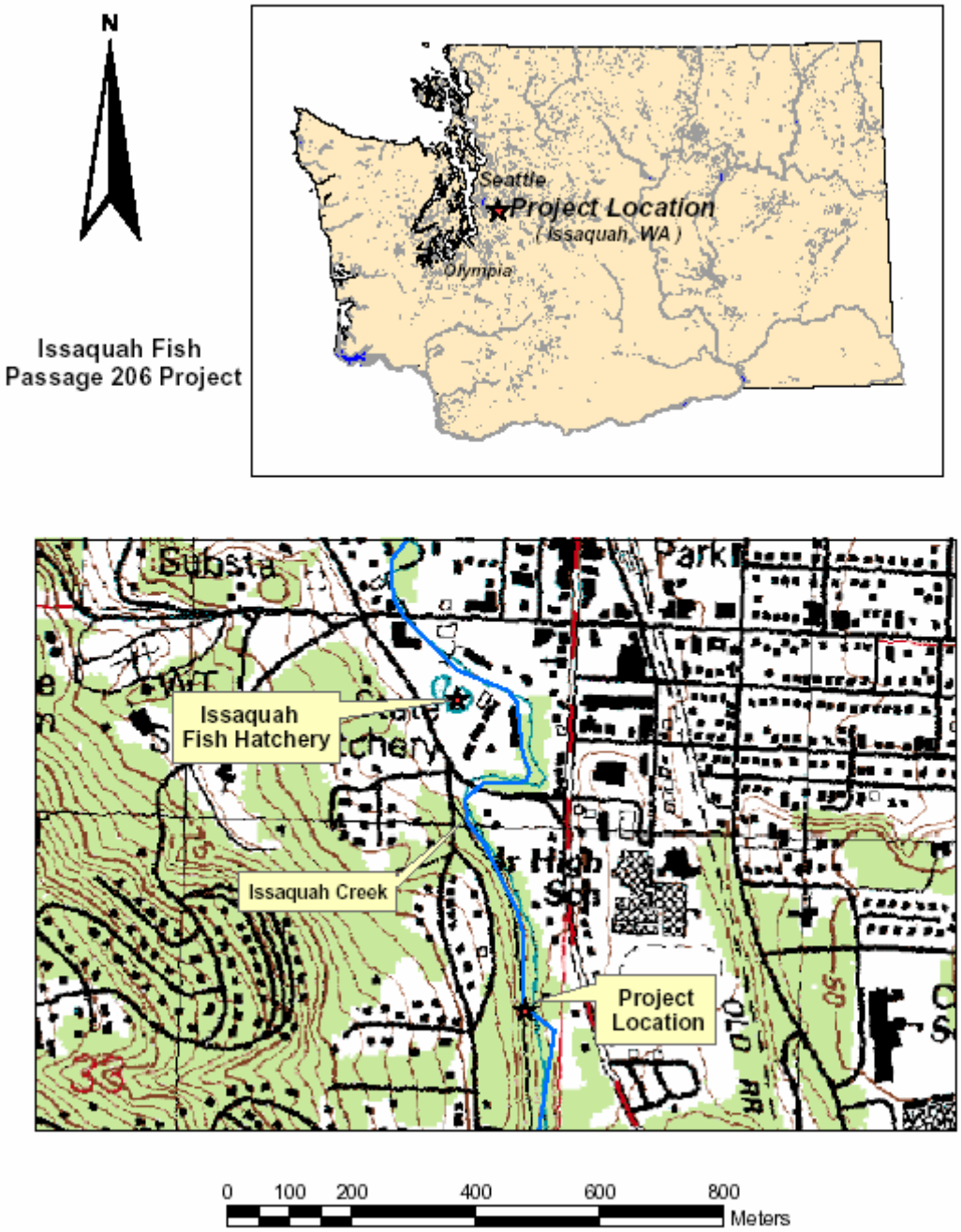

FIGURE 1. PROJECT LOCATION

1.1 Authority

This Biological Evaluation is submitted under Section 206 authority of the Water Resources Development Act of 1996, P.L. 104-303 (WRDA). This authority authorizes the Secretary of the Army to carry out aquatic ecosystem restoration and protection projects if the Secretary determines that the project will improve the quality of the environment, is in the public interest, and is cost-effective. This BE is in accordance with EC 1105-2-214, Project Modifications for Improvement of the Environment and Aquatic Ecosystem Restoration. The Washington Department of Fish and Wildlife (WDFW), by letter dated April 18, 2001, requested federal assistance in planning, designing and conducting a stream restoration project along Issaquah Creek while maintaining a water supply to the Issaquah Hatchery.

1.2 Resource Problems

The degraded project area is really only a small part of an otherwise healthy watershed. But under the existing without-project condition, the dam is a bottleneck that restricts fish use of the watershed. Four species of anadromous salmonids (coho, chinook, sockeye salmon, and steelhead) inhabit the creek. In addition, numerous cutthroat trout inhabit the entire watershed, kokanee historically inhabited the creek, and some anecdotal information suggests that native char have sporadically inhabited the creek.

The intake dam and its associated fish ladder currently present a challenge to migrating juvenile and adult salmonids, marginalizing access to at least 10 miles of spawning and rearing habitat. The numerous passage problems associated with the project vary in degree of magnitude depending on the stream flow that is passing the project.

The fish ladder has many problems such as ladder step heights that exceed current guidelines, ladder step volumes that do not meet guidelines for energy dissipation, sediment that often accumulates in the pools, and attraction flow that is inadequate. The existing gravity intake screen structure is detrimental to downstream juvenile fish passage as it was originally designed primarily for flushing the screen box of sediment and debris. For example, during low flow when little water is bypassed, the intake chamber can trap juvenile fish. The intake structure poses other problems for migrating juveniles such as screening that does not meet current standards and that routes fish through hardware and then discharges then from a height of 6-8 ft onto rocks during higher flows.

The spillway and the accompanying concrete apron also produce problems for both adult and juvenile salmonids at this facility. During high flow events, the elevated size and quantity of bedload being moved can plug the pools of the fish ladder, significantly marginalizing the ability of fish to pass upstream. In addition, high flow attracts the adult fish to the apron below the spillway where they are unable to pass the structure. The concrete apron below the spillway attracts adult fish during times of low flow also, resulting in the stranding of adult fish on this apron. The spillway on this dam consists of timbers angled at about 60° from the crest of the dam to the concrete apron. Most of these timbers are missing and the majority of fish passing the project fall from the crest of the dam about 4 ft to the concrete apron. Even the fish that happen to pass the project in an area with the timbers still present, encounter a rapid descent and abrupt impact with the concrete apron (See Section 6.7.4 for a detailed discussion of passage issues).

No detailed survival studies of juvenile salmon and trout passing the project have been completed to date, but based on current passage criteria, and the previously listed observations, the project is clearly resulting in unnecessary mortality to juvenile salmonids and substantially restricting adult passage. In October through December of 2002, the Corps conducted an adult passage rate study at the site. The results indicated that 115 chinook passed the fishway and diversion dam and although coho salmon were observed in the pool below the diversion dam and attempting to migrate upstream through the fishway, no coho salmon were observed successfully passing upstream of the diversion dam.

Downstream of the dam, the City of Issaquah surrounds this portion of the creek, which has been extensively altered by both natural processes and human activity. Hardened banks dominate this reach and riparian habitat is often sparse varying from native vegetation to bare riprap. However, all salmonid species that inhabit the Issaquah Creek basin have been observed spawning in this reach. Upstream of the dam over ten miles of quality habitat features exist which have high value for biological use. Special habitat features including snags, down logs, and open water contribute to high habitat values. The side channels associated with many of the tributaries provide winter rearing habitat for juvenile fish and refuge from seasonal high flows following large storm events. The limited amount of instream large woody debris recruited from riparian areas also provides excellent habitat. Without the proposed restoration the high value habitat areas would continue to be under-utilized by key anadromous fish species.

3. DESCRIPTION OF THE PROJECT AREA AND ACTION AREA

The scope of the current study and project area is focused on the dam and adjacent areas, including 10 feet upstream of the dam and roughly 200 feet downstream. The action area must consider not only the activity proposed by the Corps but also all interrelated and interdependent activities. The action area for this project has been determined as Issaquah creek and all of its tributaries from the headwaters to the mouth of Lake Sammamish. In addition, the existing access road for the diversion dam that will be used as the staging area is included in the action area.

4. DESCRIPTION OF THE PROPOSED ACTION

The proposed project will correct the current problems of upstream adult and juvenile salmon migration and downstream juvenile passage at the upper water intake of the Issaquah Salmon Hatchery on Issaquah Creek. The design guidelines include a 50-year project life, 100-year flood levels, and fish passage for flows ranging from 5-95% of the daily averaged values, 16 cfs – 320 cfs.

Construction will take two to four months to complete and will be conducted during the proposed extended in water work window of June 15-September 1.

The project will replace the existing dam and fish ladder with new configurations, modify the existing intake structure and replace the intake screens, provide a juvenile fish bypass return and alarm system, and install seven downstream grade control weirs. Specifics include:

- The spillway will be moved downstream coincident with the entrance of the fishway to prevent fish from being attracted beyond the fishway entrance by spill flows. The right abutment will also be extended at least 17 feet downstream to the crest of the new spillway.
- The spillway will be founded on the existing apron, removing it as a potential location for stranding of adults at lower tailwater levels.
- A new ten-foot apron will be placed below the new spillway to prevent scour, and two feet below the minimum water elevation.
- A new fish ladder consisting of five pool and chute weirs will provide upstream and downstream fish passage past the dam. The four pools will each be twenty feet wide, ten feet long, and three feet deep from crest to floor. The weirs will each have a low flow notch and sloping sides. A sluice opening will be provided on each side of each fishway weir to allow flushing of accumulated sediment and debris.

- Seven grade control weirs spaced at 25 foot intervals with 0.8 foot drops will be constructed downstream of the dam. The weir spans range from 70 to 120 feet in length.
- The weirs will be constructed of H-pile with concrete panels, and concrete caps
- Streambed and bank protection will be placed for each weir to prevent scour and weir failure. Riprap will be placed at the depth of expected scour and covered with gravel having a range of sizes that replicate existing substrate.
- The inlet and trashrack of the screen will be extended upstream, approximately 10 feet, so that debris will sweep past the trashrack and continue down the fishway rather than accumulate in front of the intake. The extension of the structure will require fill along the left bank and excavation along the right bank.
- The intake structure will be modified into a V-shaped configuration to meet the screen sweeping and approaching velocity criterion
- A collection trough and outfall conduit will transport juvenile fish from the intake structure to below the fishway
- The existing sluiceway and walls will remain but be extended upstream parallel to the intake and fishway
- The bank will be planted with native plant species following construction
- An alarm system, using water level sensors, will be installed to alert the hatchery when the intake system needs to be cleaned.
- For additional details, please see the attached design drawings in Appendix A.

5. CONSERVATION MEASURES

5.1 Environmental Coordination

During the design of this project, the USACE engaged in dialogue with multiple state, federal, tribal, and local agencies to discuss design alternatives and the potential impact to the surrounding resources.

5.2 Best Management Practices

Construction best management practices (BMPs) as suggested by the Washington State Department of Ecology will be implemented. See Table 1.

TABLE 1. BMPS TO BE USED DURING CONSTRUCTION.

1. Equipment that will be used near the water will be cleaned prior to construction.
2. Work is planned to be conducted during a period of low flow that coincides with the established and proposed extended in-waterwork window.
3. Temporary sediment traps will be used to minimize turbidity where possible.
4. Biodegradable hydraulic fluids will be used for machinery at the site.
5. Refueling will occur at a safe distance from the project area.
6. Construction equipment will be regularly checked for drips or leaks.
7. At least one fuel spill kit with absorbent pads will be onsite at all times.
8. Drive trains of equipment will not operate in the water.
9. At least one biologist will monitor construction.
10. Tubidity will be monitored during various phases of construction.
11. Concrete panels for the weirs will be fabricated offsite.
12. Concrete that cannot be fabricated offsite will have forms sufficient not to allow concrete to make contact with surrounding environment.

5.3 Demolition and Construction Sequencing

Demolition of portions of the existing diversion dam will conducted prior to construction (see *Appendix A, Figure A-2*). The following demolition sequence is proposed:

1. Construct a temporary dam consisting of ecology blocks and sandbags or an inflatable dam upstream of the project to divert the water away from the area of construction for the intake of the bypass pipe.
2. Install 6 foot diameter bypass pipe that will be of corrugated iron with its entrance placed in the stream near the left bank and upstream of the existing log boom and

continuing approximately 25 feet downstream of the last downstream weir. The 6 foot diameter pipe will pass a flow of 400 cfs.

3. Rearrange and place concrete ecology blocks and sand bags around and adjacent to the upstream intake of the bypass pipe to divert the water into the pipe. And inflatable dam could also be used to divert the stream into the pipe.
4. After the bypass pipe is in place and the stream water is being diverted into the pipe, remove the existing stream bed material on the existing upstream apron area.
5. Remove the wood portion of the existing dam.
6. Horizontally saw cut the bottom of the concrete dam stem wall flush with the surface of the existing upstream concrete apron. Remove the stem wall concrete from the area.
7. Horizontally cut the east wall of the fish ladder at its base level with the downstream concrete apron. Remove the east wall fish ladder concrete.
8. Jackhammer the fish ladder steps adjacent to the east and west walls of the fish ladder. Then jackhammer individual pieces of the fish ladder steps and remove the concrete. A bulldozer with a pronged bucket could possibly be used to lift the slabs and remove them.
9. In the intake structure remove the screens, steel frame and steel supports for the frames.
10. In the intake structure remove the walkway on top of the screens.
11. Remove the two control gates upstream of the intake screens.
12. Remove the existing log boom upstream of the intake structure.
13. Remove the existing trash rack and wooden deck upstream of the intake screens.
14. Remove steel support beams for trash rack.
15. Vertically saw cut the existing intake west wall and east wall just downstream of the existing pilasters and remove the concrete.

Construction sequencing is designed to provide upstream passage as soon as possible. The upstream passage components of the project (fish ladder and weirs) will be completed first followed by the intake components (see *Appendix A, Figure A-3*). The following construction sequence is proposed:

1. Creek bypass pipe is already installed.
2. To divert water into the bypass pipe construct a temporary dam consisting of ecology blocks and sandbags or an inflatable dam across the stream.
3. Construct fish ladder floor slab.
4. Construct fish ladder east wall.
5. Construct fish ladder weirs.
6. Construct dam.
7. Construct downstream apron.
8. Construct downstream weirs.
9. Once the above construction is complete, move the cofferdam to allow water down the newly constructed dam and fish ladder, while maintaining intake area dry.
10. Construct and extend the intake structure walls and floor upstream.

11. Install new wood decking.
12. Fabricate and install new screens.
13. Extend east wall and floor of water bypass upstream.
14. Add (raised) east wall of water bypass which is the west wall of the new fish ladder to new design height of wall.
15. Fabricate and install vertical louvered screen (trash rack) at front of intake structure.
16. Install log boom upstream of louvered screen.

6. ENVIRONMENTAL BASELINE

6.1 General

The Issaquah Creek basin drains about 61 square miles of King County and includes both Issaquah Creek and Tibbetts Creek. Tibbetts Creek basin drains approximately 6 square miles and does not connect to Issaquah creek. Both creeks flow from steep headwaters in the southern basin into Lake Sammamish at the northern edge of the basin. The basin elevations range from approximately 3,000 feet at the peak of Tiger Mountain to near sea level at the mouth of Issaquah Creek. More than 80 percent of the basin is forested, with the remainder in wetlands, pastures, urban, and low-density single-family residences.

(Washington Agricultural Experiment Station 1973). The till plain is undulating and slopes are mostly between 6 and 15 percent.

6.2 Sediments

Over the years the forebay immediately upstream of the dam has trapped an estimated 63 to 94 tons (36-53 cubic yds) of sediment.

Sediment in the Issaquah Creek basin is produced by soil surface erosion and stream erosion. Finer-grained sediment is carried downstream most of the year, while coarser sediment is moved only during higher flows in most of the subbasins. The coarser sediment accumulates in the bed of the stream and in point and side-channel bars at times of lower flow. Sediment transport and deposition varies throughout the Issaquah Creek Basin as the numerous subbasins have many different characteristics. For example, Fifteenmile Creek has a slope averaging 10 percent resulting in high levels of sediment transport. Carey Creek maintains a balance between water and sediment discharge and the Middle Issaquah Creek Subbasin consists of both flat and steep tributaries resulting in a relatively consistent sediment movement throughout the subbasin. Detailed erosion and deposition information is available in the Current/Future Conditions & Source

Identification Report produced by King County Surface Water Management in October 1991.

6.3 Water/Water Quality

6.3.1 General

Water quality in the Issaquah Creek basin is generally good. Although the lower reaches of the creek are listed on the Washington State 303(d) list of impaired waters for elevated temperatures and fecal coliform levels, state water quality standards designate Issaquah Creek as Class A (excellent). Localized pollution from urban sources, roads, and agricultural and forestry activities likely contribute to the 303(d) listing of Issaquah Creek.

6.3.2 Hydraulics and Hydrology

Issaquah Creek is one of the larger creeks in the Lake Washington watershed, with stream flows ranging from several hundred cubic feet per second (cfs) in the winter to summer lows of about 30 cfs. Mean flow is 134 cfs. Drainage area for Issaquah Creek is about 61 square miles. Unit area discharges have been calculated for the basin and range from 0.06 to 0.12 cfs/acre, with a mean flow of 0.099 cfs/acre. This number is relatively large compared to other highly urbanized Lower Puget Sound basins that are typically in the 0.078 cfs/acre range (King County, 1991). The large unit area discharge in the Issaquah Creek basin is the result of greater local precipitation, generally steeper topography, and a local geology dominated by significant amounts of bedrock and till. The 100-year flood discharge is estimated to be 3,320 cfs, the 50- year flood discharge is approximately 2,950 cfs and the 10-year flood discharge to be 2,060 cfs.

6.4 Land Use and Potential Pollution Sources

More than 80 percent of the basin is forested, with the remainder in wetlands, pastures, urban, and low-density single-family residences. The current land use surrounding Upper Issaquah creek and its tributaries is mostly forestry uses. The forest surrounding Holder Creek is under management of the Washington State Department of Natural Resources and the forest surrounding Carey Creek is primarily in private ownership. This sub-basin is largely undeveloped and represents the most abundant and relatively undamaged salmonid habitat in the Issaquah Creek basin (King County 1996).

The Middle Issaquah Creek Sub-basin is much like the upper basin but also contains farms with pastures, homes, and highway passing through it.

The Lower Issaquah Creek Sub-basin will be defined here as RM 3.5 just downstream of the diversion dam to the confluence with Lake Sammamish. The City of Issaquah surrounds this portion of the creek, which has been extensively altered by both natural processes and human activity. The lowest reach from the mouth to about RM 0.6 winds through Lake Sammamish Park where the stream is large, deep, and slow moving.

Potential sources of nonpoint pollution in Issaquah basin include agriculture, stormwater runoff, failing onsite septic systems, improper pesticide and fertilizer application, hazardous wastes, underground storage tanks, landfills, resource extraction, forestry operations, and gravel mining.

6.5 Vegetation

Generally the vegetation in the project area is generally comprised of a mixed coniferous forest on the valley slopes and mixed deciduous forest in the valley floor. Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), bigleaf maple (*Acer macrophyllum*) and red alder (*Alnus rubra*) dominate the overstory, while Indian plum (*Oemleria cerasiformis*), salal (*Gaultheria shallon*), and oregon grape (*Berberis aquifolium*) are common understory species. The riparian area of the Upper Issaquah Creek Sub-basin is in excellent condition, primarily vegetated with deciduous species along with conifers. This sub-basin is largely undeveloped it represents the most abundant and relatively undamaged salmonid habitat in the Issaquah Creek basin (King County 1996). The riparian area through the middle Issaquah reach is in very good condition and is dominated by deciduous species. The riparian zone varies from a width of 30-50 feet per bank to over 200 feet per bank, interrupted by pastures, highways, and homes. The canopy vegetation consists primarily of alder (*Alnus rubra*), cottonwood (*Populus trichocarpa*), and Oregon ash (*Fraxinus latifolia*), and the understory consists of salmonberry (*Rubus spectabilis*), snowberry (Symphoricarpos albus), elderberry (*Sambucus racemosa*), Indian plum (*Oemleria cerasiformis*), swordfern (*Polystichum munitum*), and Oregon grape (*Berberis aquifolium*). The City of Issaquah surrounds the lower portion of the creek, which has been extensively altered by both natural processes and human activity.

The project area has approximately 20 deciduous trees on the left bank with little to no understory vegetation present, and on the right bank there are a few conifers and deciduous trees with some understory vegetation.

6.6 Fish and Wildlife

Anadromous fish found in Issaquah Creek include chinook, coho, sockeye, and Steelhead. In recent years large numbers of chinook, coho, and sockeye have returned to Issaquah Creek but only a small percentage of these salmonids have been documented upstream of the intake dam. Resident fish in the creek include sculpin, and large numbers of cutthroat trout. There has been an observation of a native char in the creek in the early 1990's and a population of kokanee apparently inhabited the creek at one time but two years of sampling in 1999 and 2000 did not result in a capture of a single char or kokanee. Further information is described below.

6.6.1 Stream Habitat

The Lower Issaquah Creek Sub-basin will be defined here as RM 3.5 just downstream of the diversion dam to the confluence with Lake Sammamish. The City of Issaquah surrounds this portion of the creek, which has been extensively altered by both natural processes and human activity. The lowest reach from the mouth to about RM 0.6 winds through Lake Sammamish Park where the stream is large, deep, and slow moving. The mean stream width is over 30 feet, and pools can exceed six feet in depth, with the substrate consisting of fine sand and silt. This section of the stream is utilized for spawning by bass, perch, and suckers, and provides rearing habitat for salmonids. From RM 0.6 to about RM 1.2 the gradient increases, and gravels become present along with some pools and riffles. In addition some very old large woody debris is present along with some smaller woody debris. This area provides excellent spawning substrate as evidenced by the large number of redds observed in the area but survival of these redds is unknown. From about RM 1.2 to the hatchery diversion dam at RM 3.5 Issaquah Creek flows through the City of Issaquah. Hardened banks dominate this reach and riparian habitat is often sparse varying from native vegetation to bare rip-rap. However, all salmonid species that inhabit the Issaquah Creek basin have been observed spawning in this reach.

The proposed project would greatly improve access to approximately 10 to 11 miles of quality fish spawning and rearing habitat to anadromous and resident fish. The Issaquah Creek Basin includes Issaquah Creek and many of its tributaries such as Holder, Carey, Fifteenmile, and McDonald Creeks. The basin also includes the North and East Forks of Issaquah Creek and Tibbetts Creek. The North and East Forks of Issaquah Creek are located below the diversion dam and Tibbetts Creek is not a tributary of Issaquah Creek but they would all benefit indirectly by the increased production that would result from the proposed project. The middle and upper Issaquah Creek Basin has exceptional fisheries habitat primarily provided from Carey and Holder Creeks (WIRA 8 2002).

The Middle Issaquah Creek Sub-basin is defined here as RM 3.5 to RM 11.4 with Fifteenmile Creek entering the mainstem at RM 6.9 and McDonald Creek entering at RM 7.45 both of which are utilized by anadromous and resident fish. The gradient throughout this long reach is less that 1 percent, and many channel braids are present providing excellent summer rearing habitat and refuge during high flow events. The gravels are free of fines, providing excellent spawning conditions and the pool to riffle ratio is slightly uneven with riffles being more frequent.

The riparian area through this reach is in very good condition and is dominated by deciduous species. The riparian zone varies from a width of 30-50 feet per bank to over 200 feet per bank, interrupted by pastures, highways, and homes. The canopy vegetation consists primarily of alder, cottonwood, and Oregon ash, and the understory consists of salmonberry, snowberry, elderberry, Indian plum, swordfern, and Oregon grape (King County 1991).

The Upper Issaquah Creek Sub-basin is formed by the drainages of Holder and Carey creeks. Holder Creek headwaters on the southeastern slopes of Tiger Mountain and flows approximately 6-7 miles to its confluence with Carey Creek. Holder Creek is dominated by large cobble and boulders, and the gradient is typically greater than three percent. In addition, the habitat is generally low in complexity, lacking large woody debris thus this creek provides little salmonid habitat. Carey Creek headwaters on the southeastern slopes of South Taylor Mountain and flows 7 miles to the confluence with Holder, which forms the upstream end of the mainstem Issaquah Creek. Unlike Holder Creek, Carey Creek is an ideal salmon stream. It has a very low gradient, extensive pool and riffle complexes, and abundant large woody debris. Gravel beds are numerous, and the gravels are typically free of fines. Coho salmon, steelhead, and both sea run and resident cutthroat trout utilize the river for both spawning and rearing. Unfortunately, the stream appears to be underutilized by anadromous salmonids given the quality and abundance of habitat (King County 1991). At RM 5.2 a series of cascades provides an anadromous barrier and resident cutthroat inhabit this section to the headwaters.

The riparian area of the Upper Issaquah Creek Sub-basin is in excellent condition, primarily vegetated with deciduous species along with conifers. The current land use surrounding both tributaries is mostly forestry uses. The forest surrounding Holder Creek is under management of the Washington State Department of Natural Resources and the forest surrounding Carey Creek is primarily in private ownership. This sub-basin is largely undeveloped it represents the most abundant and relatively undamaged salmonid habitat in the Issaquah Creek basin (King County 1996).

Biota

The City of Issaquah (2001) performed a Benthic Index of Biotic Integrity (B-IBI) in 1999. This index evaluates general stream health in comparison to similar lowland streams in Puget Sound. Three sites were sampled, two sites were located below the diversion dam, and one site was above the diversion dam. All of the sites are located within 2 miles of the proposed project. The downstream site closest to the proposed project was rated as “poor’ and the site farther downstream was rated as “fair”. The benthic macroinvertebrate sample site above the proposed project was rated as “fair”. The fair score is similar to other streams in newly urbanizing areas such as Bear Creek, which was sampled in 1999 (Morley 2000).

6.6.2 Anadromous Fish

Chinook Salmon

For details regarding chinook salmon please refer to Section 8.3

Coho Salmon

For details regarding coho salmon please refer to Section 8.4

6.6.3 Resident Fish

General

Coastal, or anadromous cutthroat trout, are distributed on the Pacific Coast from Prince William Sound in southern Alaska to the Eel River in northern California, rarely penetrating more than 100 miles inland (Johnston 1982; Behnke 1992).

Little information is available on the status of coastal cutthroat trout in Issaquah Creek. It is known that the adult coho return to Issaquah creek in February through April, and the juvenile migrate downstream in February through June. The Lake Washington cutthroat spawn in tributaries and appear to spend their entire life in Lake Washington rather than migrating into the Puget Sound. This theory is based on 4 years of purse-seining in Lake Union and the Large Lock where thousands of sockeye, coho, and chinook have been sampled and only a few cutthroat have ever been captured. As mentioned previously several times, trapping was conducted in the spring of 2000 from March 14 through July 3 to estimate the wild coho production of Issaquah Creek. In addition to obtaining coho production, information on cutthroat trout was obtained. It was

estimated that 14,803 cutthroat migrated past the trap during the sample period. However, no attempts were made to adjust this number to represent the total basin production.

Bull Trout

For details regarding bull trout please refer to Section 8.2

6.6.4 Fish Passage

The intake dam and its associated fish ladder currently present a challenge to migrating juvenile and adult salmonids restricting access to at least 10 miles of spawning and rearing habitat. The existing dam has passage problems with the ladder, the water supply intake, the spillway, and the accompanying apron. The numerous passage problems associated with the project vary in degree of magnitude depending on the stream flow that is passing the project.

The fish ladder has many problems such as ladder step heights exceeding current guidelines, ladder step volumes do not meet guidelines for energy dissipation, sediment often accumulates in the pools, and attraction flow is inadequate. Another problem occurs during high flow events, when the sediment that has built up around the intake erodes, plugging the ladder with sediment and rendered it unusable. The existing gravity intake screen structure is detrimental to juvenile fish passage as it was originally designed for flushing the screen box of sediment and debris. For example, during low flow when little water is bypassed, the intake chamber can trap juvenile fish. The intake structure poses other problems for migrating juveniles such as screening not meeting current standards and routing fish through hardware and then discharging fish from a height of 6-8 ft onto rocks during higher flows. The spillway and the accompanying concrete apron produce problems for both adult and juvenile salmonids at this facility also. During high flows, the apron below the spillway attracts the adult fish to an area where they are unable to pass the project (false attraction). During these high flows the fish attempt to ascend the spillway until they become exhausted and they then locate the ladder entrance only because they are looking for a refuge from the high velocity flows below the spillway. The concrete apron below the spillway attracts adult fish during times of low flow also. The problem with this is that once fish jump on to the apron they can become stranded. Another passage issue for the spillway is that the spillway consists of timbers angled at about 60° from the crest of the dam to the concrete apron. Most of these timbers are missing and the majority of fish passing the project fall from the crest of the dam about 4 ft to the concrete apron. Even the fish that happen to pass the project in an area with the timbers still present, encounter a rapid descent and abrupt impact with the concrete apron.

No detailed survival studies of juvenile salmon and trout passing the project have been completed to date, but based on current passage criteria, and the previously listed observations, the project is clearly resulting in unnecessary mortality to juvenile salmonids and substantially restricting adult passage.

In an attempt to determine the extent that the project was restricting adult passage, the Corps conducted an adult passage rate study at the site in October through December of 2002. The results indicated that 115 chinook passed the fishway and diversion dam, and although coho salmon were observed in the pool below the diversion dam and attempting to migrate upstream through the fishway, no coho salmon were observed successfully passing upstream of the diversion dam. In addition to the survey conducted by the Corps, numerous spawning surveys have been conducted upstream and downstream of the project. The results of the 2001 surveys identified 14 chinook, 197 coho, 88 sockeye, and 28 unidentified fish at RM 3.3 below the diversion dam. The results of the RM 5.8 surveys identified 9 chinook, 42 coho, 43 sockeye and 8 unidentified fish above the diversion dam. This data shows that out of the total numbers of fish identified at the 2 sites, 39% of the chinook, 21% of the coho, 33% of the sockeye, and 22% of the unidentified fish were identified above the diversion dam at RM 5.8. Combined with the knowledge that salmonids have been identified spawning up to 11 miles upstream of the diversion dam and that there is approximately 11 miles of quality spawning and rearing habitat upstream of the dam, this data provides further evidence of a passage problem at the project site.

6.6.5 Bald Eagle

A review of the Washington State PHS and Department of Natural Resources databases indicated that 2 Bald eagle nests are located at the SE end of Lake Sammamish. This review also identified the southern end of Lake Sammamish as an area utilized for both feeding and breeding. The closest nest is approximately 3.5 miles from the project area.

7. EFFECTS OF THE PROPOSED PROJECT

7.1 Geology/Soils

Construction activities associated with the proposed project will result in soil being disturbed and compacted from heavy machinery throughout the construction area. The installation of grade control structures will include the placement of large rock immediately below the weirs to reduce the potential of scour. This area between the weirs

including the large rock immediately below the weirs will be covered with pool mix (gravel coble mix). The installation of seven weirs will require a total of approximately 1000 cubic yds of substrate placed between the weirs. Rock armoring may be necessary on the banks immediately above and below each weir also. In addition, some rock armoring will need to be placed on the right bank immediately below the dam.

7.2 Sediments

The proposed project's dam face will be built approximately 10 ft downstream of the existing dam face. The sediment that has accumulated in the existing dam forebay will likely need to be removed for construction. Following removal of the river diversion, and consequential rerouting of the river through the creek channel, some of the sediment that has accumulated in the upper forebay will be mobilized a short distance to the new dam face until the forebay fills with sediment. This will result in a short term sediment trap. After a few high flow events the sediment will accumulate in the new forebay and continue to pass the project as it has been doing for decades.

Any effect of sediment input to Issaquah Creek is likely to be of minor consequence to benthic invertebrates since the biological effect of episodic inputs has been found generally to be temporary. Rapid recovery often results from invertebrate drift from upstream reaches. In an Ohio stream, sediments from eroding deposits of glacial lacustrine silt, although natural, simulated episodic events. The glacial silt periodically reduced benthic macroinvertebrates up to 5 km downstream from the site (DeWalt and Olive 1988). However, after one of the glacial silt deposits was completely eroded, sediment input ceased, the stream deposits cleared, and drift from upstream quickly restored benthic populations. In British Columbia, temporary siltation from a pipeline crossing reduced local benthos populations by up to 74% but benthos recovery was rapid after construction stopped (Tsui and McCart 1981).

Significant sedimentation impacts are not expected upstream, within, nor downstream of the project reach. Sediments which will be conveyed downstream as a result of the proposed project construction, which are not currently being conveyed downstream will be of small grain size classes in very limited amounts. Thus, this project is not expected to result in significant inputs of suspended sediment to Issaquah Creek.

7.3 Water/Water Quality

7.3.1 General

Water quality and flow in Issaquah Creek are expected to change little. Because the project area is in a relatively small area in comparison to the remainder of the watershed, flow stability will not be altered. The stream will continue to transport fine sediment throughout its length, through Issaquah into Lake Sammamish.

Potential point and non-point sources of water pollution will not be affected by this project. Some canopy cover in the project area may be lost during project construction. Though replanting will occur, it may take several years for the canopy to return to pre-project conditions. This loss is not expected to result in any temperature increases even during warm temperature and low flow conditions within the project reach.

There will be some construction impacts on water quality at several stages during the construction process. Large pulses of sedimentation following diversion of the stream back into the restored stream bed will result in short term turbidity until the water slows sufficiently to allow settlement, potentially lowering dissolved oxygen concentrations for short durations. Localized shifting of sediments will continue sporadically as the new stream adjusts to post-construction conditions. Floods during the winter and spring following construction will continue to mobilize sediments in the project area, potentially contributing to small increases in turbidity over that normally seen during flood events. Sedimentation impacts will be controlled through best management and conservation practices during construction. They should be temporary and of short duration. Water quality will be monitored in the project area and downstream during construction to detect any water quality impacts.

7.4 Land Use and Potential Pollution Sources

The proposed project will not alter land use or pollution sources except for the temporary water quality issues discussed in the previous paragraph.

7.5 Hydraulics and Hydrology

The hydraulic impacts of any of the proposed alternatives were viewed from the perspective of changes from the existing condition. The intent of the hydraulic evaluation was to ascertain any changed conditions in water surface profiles.

There are three potential areas of concern related to the performance of the recommended plan; sedimentation, flood conveyance, and erosion. Substantial efforts have been made to reduce any possibility of impacts outside of the project area. The flood conveyance through the project reach is equal to the existing condition. By maintaining existing channel cross-section widths, with appropriate side-slopes and tying into high ground ensures flood flows will be contained. Finally, the potential for any increased erosion, through changes in channel depth or velocity, have been minimized in the project design. Increased velocities are expected through the project reach, however the hydraulic model indicates that the water surface profile of the preferred plan matches the existing condition profile downstream of the last weir groups, indicating that the weir groups are able to dissipate sufficient energy so that the existing channel controls flow conditions. In other words, implementing the preferred plan should not alter hydraulic conditions below the last element of the project. As such it is not expected that the project as designed will exacerbate existing instabilities downstream of the project reach. Also, due in part to the increases in velocity in the project reach, bank protection is required intermittently through the project footprint to reduce erosion potential. Bank protection is also required to ensure the integrity of the grade control features.

7.6 Vegetation

Riparian impacts are not expected upstream of the project reach. However, between the downstream end of the project reach and the dam site, which requires the installation of grade control weirs, riparian areas will be affected due to construction activities. Riparian impacts downstream of the project area will be non-existent in some areas and moderate in others, depending on construction access needs, siting, and practices. The left bank through the project area where access will be required has very little understory vegetation and only a few large alder and cottonwood trees. It is anticipated that construction, including access, will only require a few large alder trees to be removed as an access road currently exists . New vegetation will be planted along the disturbed riparian zone following construction. This new vegetation will take several years to replace the shading and detrital functions provided by existing vegetation within the construction area.

7.7 Wetlands

The proposed project is not expected to have any direct impacts to wetlands in the basin. Hydraulic analysis has determined that the project will not effect water elevations upstream or downstream of the project. Therefore, it will not have any impacts to wetlands in the basin. One potential effect is that the proposed project will provide

upstream migration for juvenile salmonids such a coho. Therefore, it is theorized that juvenile coho may choose to pass upstream of the project to find refuge during high flow events and the refuge they choose may be a wetland that is accessible during this high flow event.

7.8 Fish and Wildlife

7.8.1 Habitat

Effects to wildlife, if any, will be temporary and occur primarily during construction. The riparian plantings will likely increase some habitat values in the project area. In addition, the increase in fish passage will provide more adult fish and decaying carcasses upstream benefiting numerous species.

7.8.2 Anadromous Fish

Populations of salmon in the Pacific Northwest have declined precipitously over the past several decades (Nehlsen *et al.* 1991). Small streams like Issaquah Creek have the capacity to buffer the declines in larger systems and support the efforts of the federal and state agencies to preserve and recover wild salmonid stocks.

The existing dam has passage problems associated with the ladder, the water supply intake, the spillway, and the accompanying apron. At present, adult fish passage is only possible at a narrow range of flows and the projects causes unacceptable mortality to both adult and juvenile salmonids. The proposed project will provide low mortality passage at least 90% of the time for both upstream and downstream passage including juvenile upstream passage, while maintaining an existing water supply to the Issaquah Hatchery.

7.8.3 Resident Fish

Considering the small size of the project reach, there will be little impact to the resident fish population during construction. After diversion of the stream flow into the bypass pipe, as many fish as possible will be collected in the dewatered section. Fish could be trapped in the few pools in this section. Resident fish will be placed upstream a minimum of one mile to avoid the project area and downstream sedimentation.

A significant increase in anadromous fish above the dam could affect the current population of resident trout. The upper watershed has always had some level of salmonid use, including natural spawning and some hatchery supplementation using steelhead fry. The proposed project would result in an incremental increase of primarily chinook, coho, and sockeye fry above the dam.

An increase in cutthroat trout smolt numbers in western Washington streams coincided with declines in coho salmon abundance (Dave Seiler, personal communication). There has also been some evidence that cutthroat trout are relegated to riffles by the more dominant coho salmon (Glova 1986), although other authors have found that cutthroat trout select the shallower and faster waters in riffles even though coho salmon are not present (Sabo and Pauley 1999). When coho salmon fry are present they can dominate cutthroat trout fry because juvenile coho salmon emerge from redds earlier and are larger in size (Laufle *et al.* 1986). Yet, adult cutthroat trout will readily prey on coho salmon fry or other small fish.

Anadromous salmonids currently and historically occurred in the upper watershed. Additional nutrients and elevated primary productivity levels resulting from increased adult carcass densities will partially offset the detrimental effects to resident fisheries associated with the increased abundance of juvenile anadromous salmonids.

7.8.4 Fish Passage

The Issaquah Creek Barrier Dam is the primary bottleneck to salmonid upstream rearing and spawning habitats. Without a project to either remove the dam or significantly modify the fishway, the bottleneck would remain and continue to restrict most salmonids from accessing the upper watershed. This habitat is particularly limited in northern Puget Sound and the condition of Issaquah Creek is better than most other streams in the area. Downstream passage for juvenile and resident fish will also improve through the proposed project. Specifically the intake structure and ladder currently present a challenge to migrating juvenile and adult salmonids. At least 10 miles of prime spawning and rearing habitat experience limited use due to the difficulty of adult upstream migration past the dam. During low flows downstream migrating juvenile fish also experience difficulty as they can be trapped in the intake area or are passed onto a concrete apron. Specific concerns are as follows:

Dam:

1) Low flows over the spillway attract adult fish, where they are stranded on the exposed concrete apron below the spillway,
2) There is not a plunge pool in the tailrace so juvenile fish passing downstream interact with concrete,
3) There is erosion downstream of the right abutment, and
4) The spillway has deteriorated and is clogged with sediment and debris.

Fish Ladder:

1) Ladder step heights exceed the current guidelines,

2) Ladder step volumes do not meet volume guidelines for energy dissipation,
3) Sediment often accumulates in the pools after high flow events, and
4) Attraction flow is inadequate.

Intake Structure:

1) Screen openings are larger than current guidelines,
2) Juvenile fish can be trapped in front of the screens, since a bypass is not provided,
3) The sweeping components of velocities decrease along screens, and
4) The velocity gradient at the screen entrance exceeds guidelines due to sudden contraction of the flow cross section.

All of these issues detailed above will be addressed, resulting in more efficient fish passage and higher survival for adult and juvenile salmonids during both upstream and downstream migrations.

This project will improve fish passage for all species in the creek. The stranding issue associated with the apron below the dam face will be resolved as this apron will always be at least 2 ft below the water surface; this will also address the problems encountered by juvenile fish passing over the dam crest. The passage problems associated with the fish ladder will be addressed as the proposed project will meet or exceed current NOAA Fisheries and WDFW guidelines for ladder step heights, and pool volumes. The sediment and attraction problems will be alleviated by the pool and chute design that utilizes the majority of stream flow through the fish passage structure, increasing attraction flows and passing sediment more efficiently than the present structure. The intake issues will be resolved by meeting current passage criteria for screen opening size, screen configuration, and screen velocities. In addition, a juvenile bypass will be installed to return fish to the river that may occasionally enter the intake structure of the dam.

7.8.4.1 Short Term Impacts (Construction)

Project construction will require approximately two to four months, depending upon the construction schedule, to complete. During this period, the creek will be diverted into a pipe for the length of the project area, and will provide little or no fish habitat along the length of the diversion.

The construction period will follow the spring high-flow period, so it will avoid impacts to the juvenile salmon migrating downstream during the spring. Most of the construction (all in-water work) will occur prior to the adults arriving in the fall. There is the potential that upstream migrants, particularly early chinook and sockeye, will arrive in Issaquah Creek prior to completion of the stream restoration. However, in recent years water temperatures in Issaquah Creek have been extremely high creating a barrier for passage until mid to late September when water temperatures decrease.

The placement of the downstream grade control weirs will temporarily disturb approximately 200 feet of streambed. Presently this area consists of one pool and tailout where all species of anadromous fish in Issaquah Creek repeatedly spawn in throughout the multiple species spawning periods. The construction of the weirs will provide numerous pools and tailouts that can be utilized for spawning. As stated previously, appropriate substrate will be placed in the area between the weirs mimicking the present susbstrate.

7.8.4.2 Construction Contingency Plan (Stream Bypass/ Adult salmon Trap and Haul)

To avoid the most direct adverse construction impacts to salmonids, ideally the temporary stream bypass by pipe should only occur between June 15 and July 31, for a construction window of approximately 6 weeks. The downstream migration of smolts is completed by June 15 and the adult return of chinook and sockeye salmon for spawning can begin in early August. However, the chinook often do not show up in large numbers until September. The Corps and WDFW are determining if a more appropriate in water work window of June 15- September 1 would be more approprate, and will continue to coordinate with NMFS. Preliminary consultation with NMFS indicates that the in water work window extending to September may be acceptable. However, if weather conditions in August and early September were cold and wet, the adult migration would likely begin earlier than in recent years. If this occurred a trap and haul operation would likely be necessary. All reasonable effort will be made to require the contractor(s) to include a concentrated and intensive work schedule to complete instream work that requires flow bypass within this time frame.

After diversion of the stream flow into the bypass pipe, a concerted effort will be made to collect as many fish as possible in the dewatered section. Salmonid smolts will be placed downstream to allow them to continue their outmigration and resident fish will be placed at least two miles upstream to remove them from any effects of construction and sedimentation.

If the project in-water work and temporary bypass by pipe cannot be completed in the preferred time frame, even with a concentrated and intensive work schedule, then it would preferable to initiate the work prior to June 15 rather than extend the work into September. However, based on the project schedule, it is extremely unlikely that in-water work could be initiated prior to 15 June 2003. During plans and specifications the project construction schedule will be revisited. If it appears likely that the in-water construction period required exceeds approximately 10 weeks, coordination will occur among all the project stakeholders to determine the best course of action. The options may include delaying construction one year so that the work could begin earlier the following spring, or continuing construction into September, in which case a trap and haul facility would be necessary.

If construction (in water work) is initiated prior to 15 June, the diversion structure would need to accommodate passage of outmigrating fish. No detailed evaluations have been completed as part of the feasibility phase to determine the design requirements that would need to be incorporated into the diversion structure to allow for safe passage of outmigrating fish. However, the Corps will be determining if a bypass pipe can be sized to accommodate all reasonable stream flows during the construction period and still maintain a few inches of depth throughout the pipe during construction to allow for juvenile fish passage.

It must be understood that even if the stream diversion is anticipated to be completed by August 31, unplanned delays may make this impossible. A contingency plan must be developed to mitigate this potential problem. Work progress will be carefully monitored throughout the construction period to determine if the schedule is being met. The decision to initiate collection and trucking procedures will be made by July 15 to allow sufficient time for implementation. WDFW has the capability to accomplish this contingency plan very rapidly as the hatchery collection weir and holding facilities are located about ½ mile downstream of the project. If a trap and haul operation is required, fish will have an adequate supply of well aerated water available. Dissolved oxygen will be at or above a level of 5 mg/l. Hauling tanks will be fitted with circulating pumps to ensure that aerated water is distributed evenly throughout the tank. Holding water temperature will be maintained as similar to temperature at the collection site as possible so that thermal shock is avoided. If a temperature change of more than two to three degrees C^o cannot be avoided, fish will be tempered into the new environment. Regardless of when construction occurs, a contingency plan will need to be in place prior to initiating construction.

7.8.4.2.1 Fish Collection after Channel Dewatering

After diversion of the stream flow into the bypass pipe, a concentrated effort will be made to collect as may fish as possible in the dewatered stream. Salmonid smolts will be placed downstream to allow them to continue their out-migration.

7.8.4.3 Long Term Impacts

This project is proposed as a means to remove the existing adverse impact the dam has on anadromous fish passage in Issaquah Creek. The overall goal of the proposed project is to improve the spawning success of salmonids and reduce the mortality of juvenile and adult fish in Issaquah Creek. Providing more efficient and effective fish passage at the Issaquah Creek barrier dam is the specific objective of the proposed project.

The proposed project will eliminate the existing problems associated with the dam, fish ladder, and intake structure, that has been an impediment to upstream and downstream passage of salmonids. The dam has apparently impeded the movement of chinook salmon, coho salmon, sockeye salmon, steelhead, cutthroat, and possibly kokanee and native char to productive areas of Issaquah Creek upstream from the dam. Since most of the potential spawning and rearing habitat (about 10 miles) of Issaquah Creek exists upstream of the dam, eliminating this passage impediment has the potential to substantially increase the salmonid production from Issaquah Creek.

7.8.5 Wildlife

Effects to wildlife, if any, will be temporary and occur primarily during construction. The riparian plantings that will be added to the site will increase some habitat values. In addition, the increase in fish passage success will provide more adult fish upstream benefiting numerous species. Overall effects, both adverse and favorable, will be insignificant.

8. EVALUATION OF PROJECT EFFECTS ON PROTECTED SPECIES

Three species protected under the Endangered Species Act of 1973 (16 USC 1531-1544) potentially occur in the project vicinity. Table 2 summarizes the information received from USFWS and NMFS regarding listed species in the project area. The following sections briefly summarize relevant life history information on the protected species, synthesize current knowledge on the presence and utilization of the project and

action areas by these species, and then evaluate how the proposed project may affect the species concluding with a determination of effect.

TABLE 2. PROTECTED SPECIES POTENTIALLY OCCURRING IN THE PROJECT VICINITY.

Species	Listing Status	Critical Habitat
Bald Eagle *Haliaeetus leucocephalus*	Threatened	—
Coastal/Puget Sound Bull Trout *Salvelinus confluentus*	Threatened	—
Puget Sound Chinook Salmon *Oncorhynchus tshawytscha*	Threatened	Designated
Puget Sound/Strait of Georgia Coho Salmon *Oncorhynchus kisutch*	Candidate	—

8.1 Bald Eagle

The Washington State bald eagle population was listed as threatened under the Endangered Species Act of 1973, as amended, in February 1978. Since DDT was banned in 1972, bald eagle populations have rebounded. The bald eagle was proposed for de-listing in July 1999.

The bald eagle wintering season extends from October 31 through March 31. Food is recognized as the essential habitat requirement affecting winter numbers and distribution of bald eagles. Other wintering habitat considerations are communal night roosts and perches. Generally large, tall, and decadent stands of trees on slopes with northerly exposures are used for roosting; eagles tend to roost in older trees with broken crowns and open branching (Watson and Pierce 1998). Bald eagles select perches on the basis of exposure, and proximity to food sources. Trees are preferred over other types of perches, which may include pilings, fence posts, power line poles, the ground, rock outcrops, and logs (Steenhof 1978).

Bald eagles nest between early January and mid-August. The characteristic features of bald eagle breeding habitat are nest sites, perch trees, and available prey. Bald eagles primarily nest in uneven-aged, multi-storied stands with old-growth components. Factors such as tree height, diameter, tree species, position on the surrounding topography, distance from water, and distance from disturbance also influence nest selection. Snags, trees with exposed lateral branches, or trees with dead tops are often present in nesting territories and are critical to eagle perching, movement to and from the nest, and as points of defense of their territory.

Birds and fish are the primary food source for eagles in Western Washington, but bald eagles will also take a variety of mammals and reptiles (both live and as carrion) when fish are not readily available (Knight et al. 1990).

Utilization of the Action Area

No bald eagle nests occur within one mile of the project or disposal site (Washington Priority Habitat and Species List Database, November 2003). Bald eagles likely use or occur near the project area only sporadically. Bald eagles are more active and abundant in areas closer to Lake Sammamish, more than three miles from the project site. Bald eagle use of the site is most likely during the winter in association with the salmon spawning period when salmon are easily available. Construction at the site will occur during the spring and summer months, minimizing the effects to the bald eagle prey base. After construction, the habitat will provide similar eagle habitat to that which currently exists. Accordingly, the proposed project is not likely to adversely affect bald eagles.

Effects of the Proposed Action

Construction activities will occur more than three miles away from the nearest nest therefore the project is not likely to disrupt eagle nesting and rearing of young. A few trees may be disturbed however no trees in the project area are known to have nests or be used as communal night roosts (according to the WDFW priority habitat and species database). Construction operations will be complete before the start of the wintering season.

Foraging bald eagles may be displaced by the noise of heavy equipment, but the availability of prey will not be significantly disrupted by the proposed construction. Once construction is completed, the habitat features incorporated into the repair design may aid juvenile salmonid survival and production, ultimately potentially increasing food sources for eagles. Eagles should be somewhat accustomed to high levels of human

activity in and near the project site. Eagles tend to tolerate more disturbances at feeding sites than in roosting areas (Steenhof 1978).

Effect Determination

Since construction activities will not occur during the nesting season, will not affect nesting habitat or behaviors, prey (salmonid) production may increase due to added habitat features, and only minor disruptions to foraging activities are expected during construction, the proposed project **may affect, but is not likely to adversely affect** the bald eagle.

8.2 Coastal/Puget Sound Bull Trout

The Coastal/Puget Sound bull trout population segment was listed as a threatened species under the Endangered Species Act of 1973, as amended, in October 1999. Bull trout populations have declined throughout much of the species' range; some local populations are extinct, and many other stocks are isolated and may be at risk (Rieman and McIntyre 1993). Combinations of fact ors including habitat degradation, expansion of exotic species, and exploitation have contributed to the decline and fragmentation of indigenous bull trout populations.

Bull trout are known to exhibit four types of life history strategies. The three freshwater forms include adfluvial, which migrate between lakes and streams; fluvial, which migrate within river systems; and resident, which are non-migratory. The fourth and least common strategy, anadromy, occurs when the fish spawn in fresh water after rearing for some portion of their life in the ocean.

Anadromous sub-adults and non-spawning adults are thought to migrate from marine waters to freshwater areas to spend the winter. Based on research in the Skagit Basin (Kraemer 1994), anadromous bull trout juveniles migrate to the estuary in April-May, then re-enter the river from August through November. Most adult fish entered the estuary in February-March, and returned to the river in May-June. Sub-adults, fish that are not sexually mature but have entered marine waters, move between the estuary and lower river throughout the year.

Utilization of the Action Area

A 1998 WDFW study reported 80 bull trout/Dolly Varden populations in Washington: 14 (18%) were healthy; two (3%) were in poor condition; six (8%) were critical; and the status of 58 (72%) was unknown. Bull trout are estimated to have

occupied approximately 60% of the Columbia River Basin and presently occur in only 45% of the estimated historical range (Quigley and Arbelbide 1997).

In the past 10 years, only two "native char" have been reported in Issaquah Creek and none have been reported in the Sammamish River (64 FR 16397; 1999; WDFW 1998). The USFWS is not certain that the latter subpopulation is "viable." There is no known spawning subpopulation resident in Lake Washington or Lake Sammamish, however, bull trout have been observed in the fish ladder viewing pool at the Locks as recently as 1997 (F. Goetz, USACE, *pers. comm*.) and isolated reports of bull trout captures in or around Lake Washington occur every few years. A larger juvenile bull trout (~250 mm, 3 year old) was caught in the lower Cedar River in July of 1998 (M. Martz, USACE, *pers. comm*.).

The only likely viable bull trout subpopulation in the Lake Washington watershed is the Chester Morse Reservoir subpopulation. However, the Chester Morse Reservoir subpopulation is above an anadromous barrier and is a glacial relic population (WDFW 1998). The population exhibits an adfluvial life history strategy, although residents could exist in the upper watershed (WDFW 1998). Because all life history strategies can arise from the same population, it is possible that some fish emigrate from the Chester Morse Reservoir to exhibit anadromy or to reside in Lake Washington. Water temperatures in the lower Cedar River may be too high to support a fluvial population (WDFW 1998).

The Washington Resources Inventory Area (WRIA) 8 has recommended an investigation for char (bull trout and/or Dolly Varden) to be completed throughout the watershed, especially in the upper watershed above 1,000 feet and in cool water. Preliminary surveys were scheduled for summer 2000. The findings of this recommended three to five year investigation will determine the likelihood of needing future studies to determine char strategies in the basin. The preliminary results of the WDFW sampling conducted in the spring of 2000 from 14 March through 3 July indicated that 0 char were caught out of more than 6,500 fish sampled. The sample collected at the trap consisted of chinook, coho, steelhead, and cutthroat trout.

Effects of the Proposed Action

Little is known about bull trout in Issaquah Creek as they do not appear to inhabit the Creek, however, the project has been designed to provide upstream juvenile salmonid passage which will also accommodate bull trout. If bull trout were to enter Issaquah Creek the proposed project will provide passage for both upstream and downstream movement.

Effect Determination

The proposed project **may affect, but is not likely to adversely affect** bull trout. Best management practices to reduce or eliminate the possibility of turbidity during construction will be implemented. This determination is based upon the low likelihood that bull trout would be present in the action area during construction activities in the summer when water temperatures increase and the potential positive benefits attributed to the project providing upstream and downstream passage. In the unlikely event that bull trout are present, effects would be similar to those identified for chinook salmon in Section 7.3.

8.3 Puget Sound Chinook Salmon

The Puget Sound Evolutionarily Significant Unit chinook salmon was listed as a threatened species under the Endangered Species Act of 1973, as amended, in March 1999. Chinook are anadromous and semelparous. Within this general life history strategy, chinook display a wide range of variation in life histories including variation at age at seaward migration, variation in length of freshwater, estuarine and oceanic residence, variation in ocean distribution and ocean migratory patterns, and variation in age of spawning migrations. There are two predominant life history patterns in the eastern north Pacific populations: stream-type and ocean-type (Healy 1992). Stream type populations may rear as juveniles in streams for up to a year or more prior to migrating out to marine waters. Spring run populations have a wide range of rearing strategies, some fish immediately migrate downstream after emerging from the gravel and rear in estuaries, whereas others rear for 1-6 months in freshwater prior to migrating to estuaries. Summer/fall run populations are typically considered to be ocean-type fish.

Utilization of the Action Area

Three stocks of chinook are present in Lake Washington: (1) the Issaquah Creek stock, a composite population (utilizing Green River stock) that is at least partially sustained by production from the Issaquah hatchery; (2) the Cedar River stock, classified as native/wild; and (3) the north Lake Washington tributary stock also classified as native/wild. Lake Washington chinook represent approximately 12% of the natural escapement occurring in the Puget Sound ESU.

Issaquah Creek is one of the three major chinook spawning streams in the Lake Washington basin. It has been estimated that Issaquah Creek produced approximately 33% of all wild chinook smolts entering the Lake Washington basin in 2000. The Issaquah Creek Hatchery and the accompanying barrier dam weir are located about .5

miles downstream of the diversion dam and the collection of broodstock precludes any chinook and coho escapement above the hatchery. The chinook can return to Issaquah Creek from July through October, with the peak in September. The collection of adult coho and chinook for egg propagation takes place during the months of September, October, and at least part of November. Approximately 2,400 coho and 1,200 chinook are required to meet the egg take goals of 3.3 million coho and 2.425 million chinook. During the collection period, essentially all salmonids other than chinook and coho are sorted out manually and released back into Issaquah Creek upstream of the weir. During the rest of the year, approximately December through August, upstream-bound fish are allowed to pass over the hatchery weir on their own volition. Therefore, if any Chinook were to return before or after the collection period they would be able to move upstream of the hatchery and spawn naturally.

As stated previously, the hatchery's production goals require approximately 1,200 adult chinook for egg production and the escapement goal is 500 chinook. However, the escapement goal had not been met from 1990 to 1996. In fact, some years the 1,200 spawners needed for egg-take was not achieved. As a result there has been some discussion regarding the priority of allowing some chinook to spawn naturally upstream of the hatchery regardless if the 1,200 fish needed for production is achieved. Presently this has not been an issue due to the recent increase in adult returns. From 1997 to present, the escapement (upstream of the hatchery) has ranged from approximately 1,100 fish in 1999, to 7000 adult chinook in 2001 (Table 3).

TABLE 3. ISSAQUAH HATCHERY ADULT CHINOOK RETURNS 1994-2001 BROOD YEARS

	Fish Trapped		Fish Released Upstream	
Brood Year	Adults	Jacks	Adults	Jacks
2001	10,451	287	7,014	146
2000	3,776	458	1,321	49
1999	3,529	434	1,113	59
1998	4,867	24	3,820	20
1997	3,815	125	1,700	116
1996	1,246	2	150	0
1995	1,910	270	0	0
1994	3,703	43	0	0

As stated previously, Issaquah Creek is one of the three major Chinook spawning streams in the Lake Washington basin, but it differs from Cedar River and Bear Creek, in that the majority of the "wild" production is believed to be progeny of hatchery fish. The majority of spawning occurs in the East Fork Issaquah Creek and in the mainstem below the hatchery. The WDFW installed and operated a screw trap on the lower mainstem in the spring of 2000 primarily to measure the production of naturally produced chinook along with obtaining other biological data. The preliminary results of this study estimated that 29,196 chinook migrants passed the screw trap between 14 March and 3 July. It is likely that many juvenile chinook may have migrated out of Issaquah Creek prior to or after the period of trap operation due to the typical migrational characteristics of the Lake Washington chinook. The chinook in Issaquah creek and other local streams and rivers, migrate downstream as fry from January through March and later in the year from May through early July as smolts. Based on migration timing curves generated in 2000 for the Cedar River, Soos Creek, and Bear Creek it is believed that the sample period may have missed 30% to 50% of total chinook migrants leaving the system (Seiler 2003). The vast majority of chinook that the sampling missed would have been the fry that migrate out of the creek prior to the sampling that began 14 March. By incorporating the estimate of the early migrants along with the estimate of chinook passing the trap during the sample period, the estimated production from Issaquah Creek in 2000 ranges from about 39,000 to 45,000 chinook.

Effects of the Proposed Action

- This project will result in unobstructed juvenile and adult fish passage for all species that inhabit the creek or have inhabited the creek historically. For specific details please refer to Section 6.7.4 Fish Passage.
- The construction period will follow the spring outmigration period, so it will avoid impacts to the juvenile chinook migrating downstream during the spring. Ideally the in water work will be completed prior to the returning adult chinook therefore avoiding impacts to adult chinook. If the planned construction requires more time than anticipated or the adult chinook return to Issaquah creek earlier than usual a trap and haul operation will be implemented. For specific details please refer to Sections 6.7.4.1 Short Term Impacts (Construction), and 6.7.4.2 Construction Contingency Plan (Stream Bypass/ Adult salmon Trap and Haul).
- Impacts to benthic invertebrates will be minimal
- Effects to juvenile chinook resulting from the channel diversion will be reduced by making a concentrated effort to collect as may fish as possible in the dewatered stream. Chinook smolts will be placed downstream to allow them to continue their out-migration.
- The proposed project will eliminate the existing problems associated with the dam, fish ladder, and intake structure, that has been an impediment to upstream and downstream passage of salmonids including chinook. For specific details please refer to Section 6.7.4.3 Long Term Impacts.

Effect Determination

The proposed project **may affect, but is not likely to adversely affect** chinook salmon or designated critical habitat for this species. Construction will be planned and managed to minimize potential impacts to salmonids and other aquatic species. It will be attempted to conduct all in-water work from June 15 to July 31, the standard WDFW work window for Issaquah Creek that is designed primarily for protection of salmonids. However, this 6 week window may not be practical and an extension of the in water work window until September 1 may be necessary. Seasonal abundance of chinook and coho salmon adults and juveniles is the lowest of the year during the standard and expanded construction window. Considering the magnitude, timing, and management of construction of the project, the likelihood of impacts to chinook salmon during construction are insignificant and discountable. After construction, habitat for salmonids, including chinook salmon, coho salmon, and bull trout, will be readily accessible by the creation of the new diversion dam.

8.4 Puget Sound/Strait of Georgia Coho Salmon

In July 1995, NMFS determined that listing was not warranted for the Puget Sound/Strait of Georgia ESU coho salmon. However, the ESU is designated as a candidate for listing due to concerns over specific risk factors.

Coho salmon within this ESU are abundant and, with some exceptions, run sizes and natural spawning escapements have been generally stable. However, artificial propagation of coho salmon appears to have had a substantial impact on native, natural coho salmon populations, to the point that it is difficult to identify self-sustaining, native stocks within this region (Weitkamp et al. 1995). In addition, continuing loss of habitat, extremely high harvest rates, and a severe recent decline in average size of spawners indicate that there are substantial risks to whatever native production remains. There is concern that if present trends continue, this ESU is likely to become endangered in the foreseeable future (Weitkamp et al. 1995).

Utilization of the Action Area

Coho salmon, like chinook, are raised at the Issaquah hatchery so there is a hatchery component and a wild component to the Issaquah Creek coho. As stated previously in the chinook salmon section, coho returning to Issaquah Creek are collected during the months of September, October and part of November. Generally the procedure has been to collect approximately 2,400 coho for egg propagation and allow 1,300 to 2,400 coho above the rack to spawn naturally. The coho escapement goals for Issaquah Creek and other Puget Sound streams have been determined by various methods through the years resulting in varying escapement goals depending on the methods used. King County Surface Water Management has suggested that enough usable habitat is available in Issaquah Creek and its tributaries upstream of the hatchery to justify allowing 6,000 to 10,000 adult coho to pass upstream of the hatchery every year. In addition, if nutrients are limiting production, allowing larger numbers of fish upstream of the hatchery may increase the capacity of the stream as the decaying carcasses provide needed nutrients.

Adult coho return and migrate upstream from early September through late December and juvenile coho migrate downstream in mid March through May in Issaquah Creek. Trapping was conducted in the spring of 2000 from March 14 through July 3 to estimate the wild coho production of Issaquah Creek. The entire coho migration was sampled in 2000, estimating a production of 18,232 wild coho (Seiler 2002).

Effects of the Proposed Action

The effects of the proposed action on coho will be similar to those described for chinook and bull trout.

Effect Determination

Effect determinations are not made for candidate species.

9. INTERRELATED AND INTERDEPENDENT EFFECTS

There are no known interrelated or interdependent actions associated with the proposed action at this time.

10. CUMULATIVE EFFECTS

Several restoration projects have been or will be constructed within a few miles of the Issaquah Creek Diversion Dam Project that will benefit from the proposed project. However, these projects require their own Section 7 consultation therefore they cannot be legally considered when discussing cumulative effects. Therefore, the Corps does not anticipate any cumulative impacts resulting from the proposed project.

11. CONCLUSION

Table 4 summarizes the effect determinations made for each of the species potentially occurring in the project vicinity.

TABLE 4. DETERMINATION SUMMARY TABLE.

Species	Effect Determination
Bald Eagle	Not likely to adversely affect
Bull Trout	Not likely to adversely affect
Chinook	Not likely to adversely affect

12. ESSENTIAL FISH HABITAT

The project area has been designated as Essential Fish Habitat (EFH) for various life stages of four species of Pacific salmon.

Freshwater Essential Fish Habitat (EFH) for pacific salmon consists of 4 major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; (4) adult migration corridors and adult holding habitat. Important features of essential habitat for spawning, rearing, and migration include adequate: (1) substrate composition; (2) water quality (e.g. dissolved oxygen, nutrients, temperature, etc.); (3) water quantity, depth and velocity; (4) channel gradient and stability; (5) food; (6) cover and habitat complexity (e.g. large woody debris, pools, channel complexity, aquatic vegetation, etc.); (7) space; (8) access and passage; and (9) flood plain and habitat connectivity.

Based on the rational discussed in Section 8 the Corps has determined that the proposed action will not reduce the quality and/or quantity of EFH for Pacific salmon. No adverse effects to EFH are expected to result from the proposed action. The condition of EFH should likely improve because of the improved fish passage and willow plantings incorporated into the repair design.

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APPENDIX A

Project Drawings

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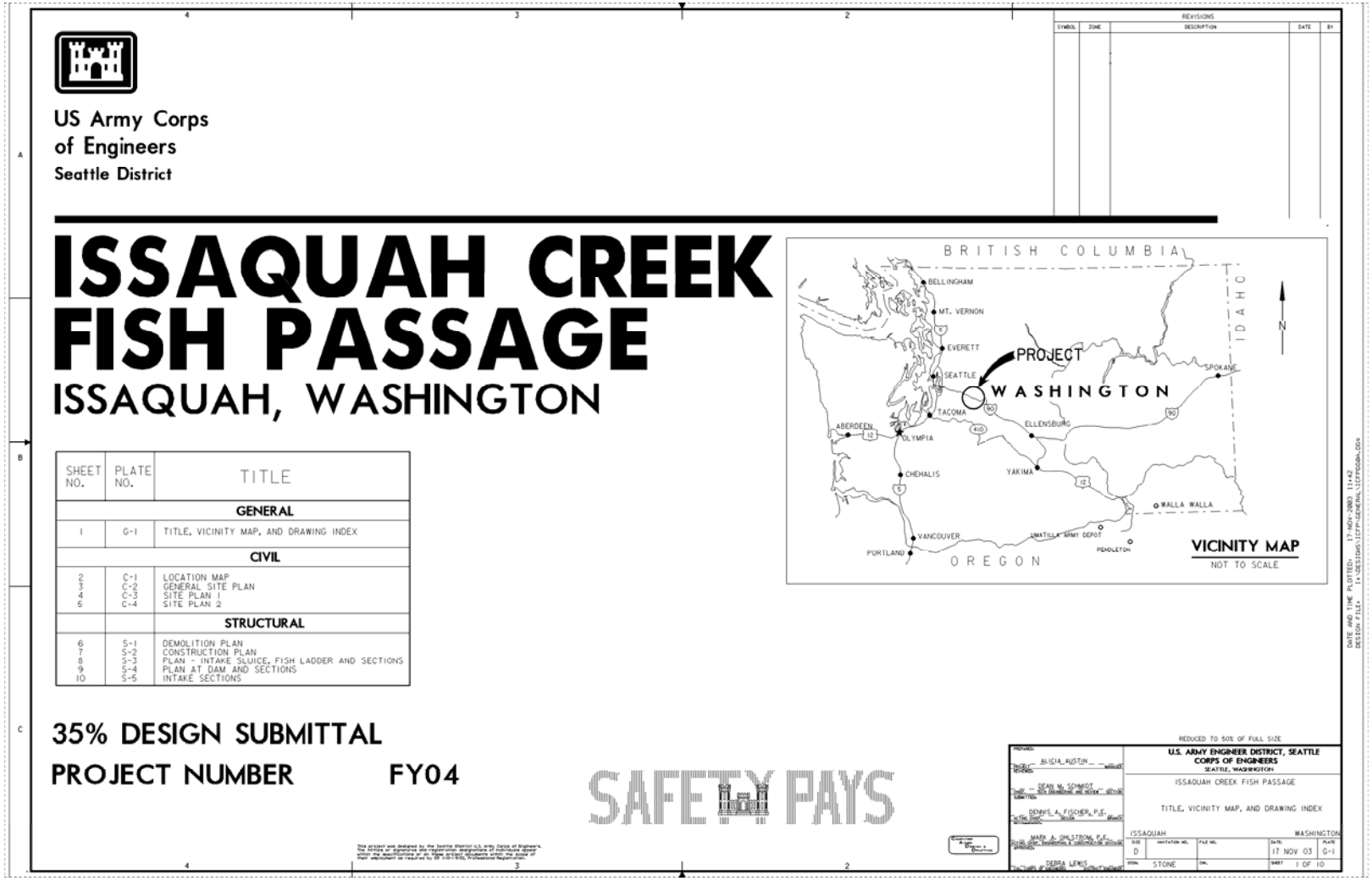

Figure A-1. Vicinity Map

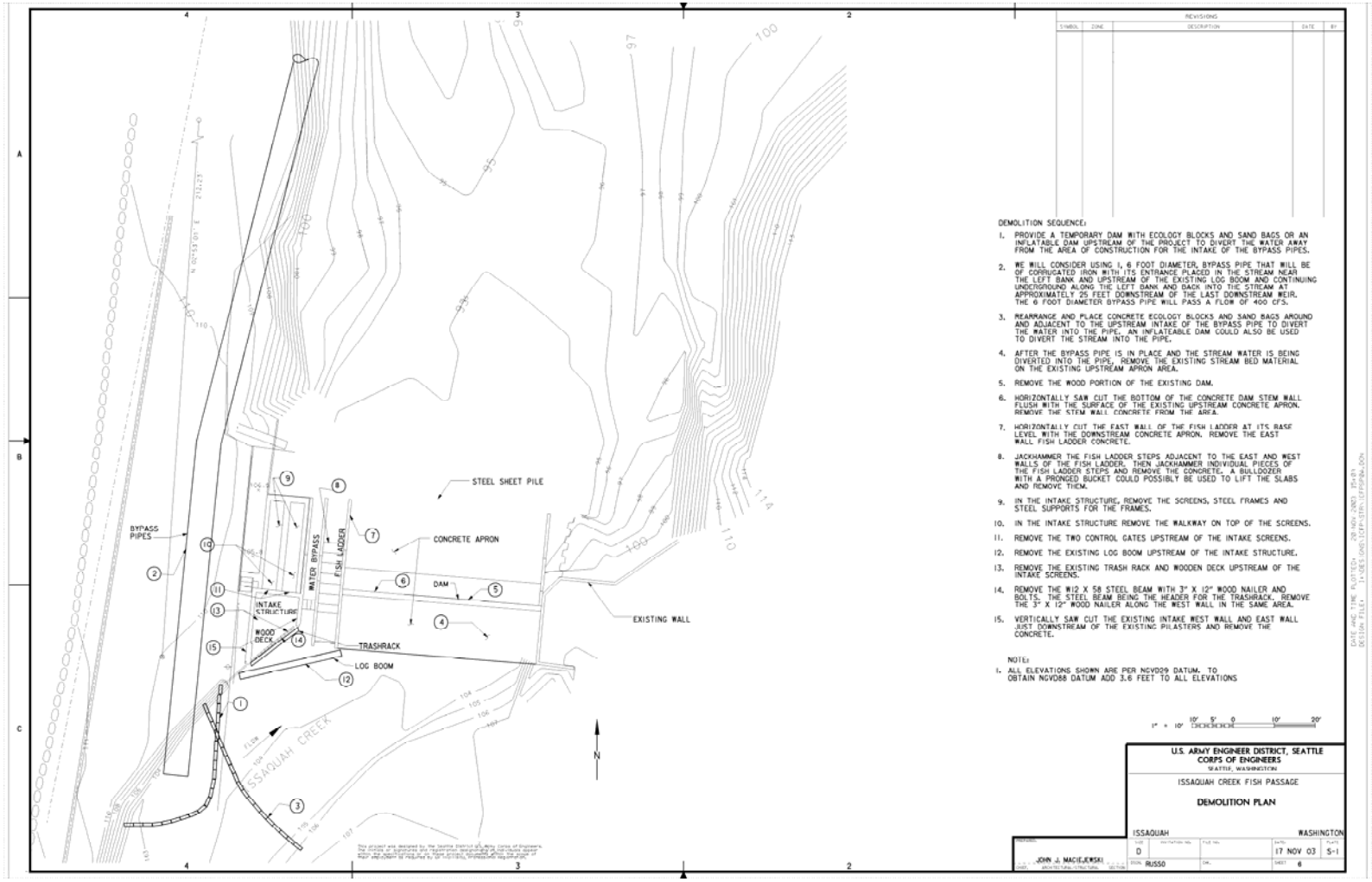

Figure A-2. Proposed Demolition Plan

Figure A-3. Proposed Construction Plan

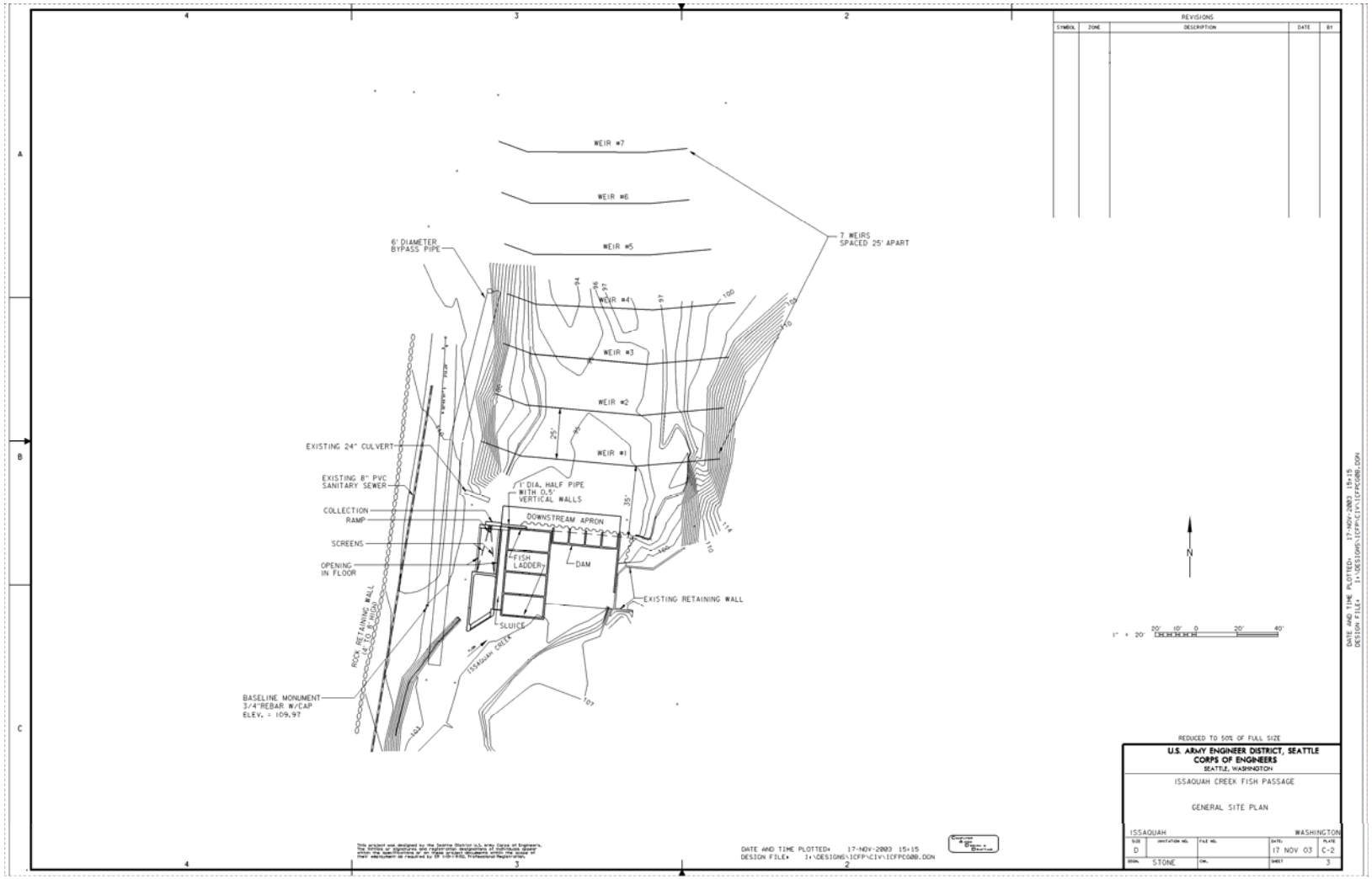

Figure A-4. Entire Site Plan

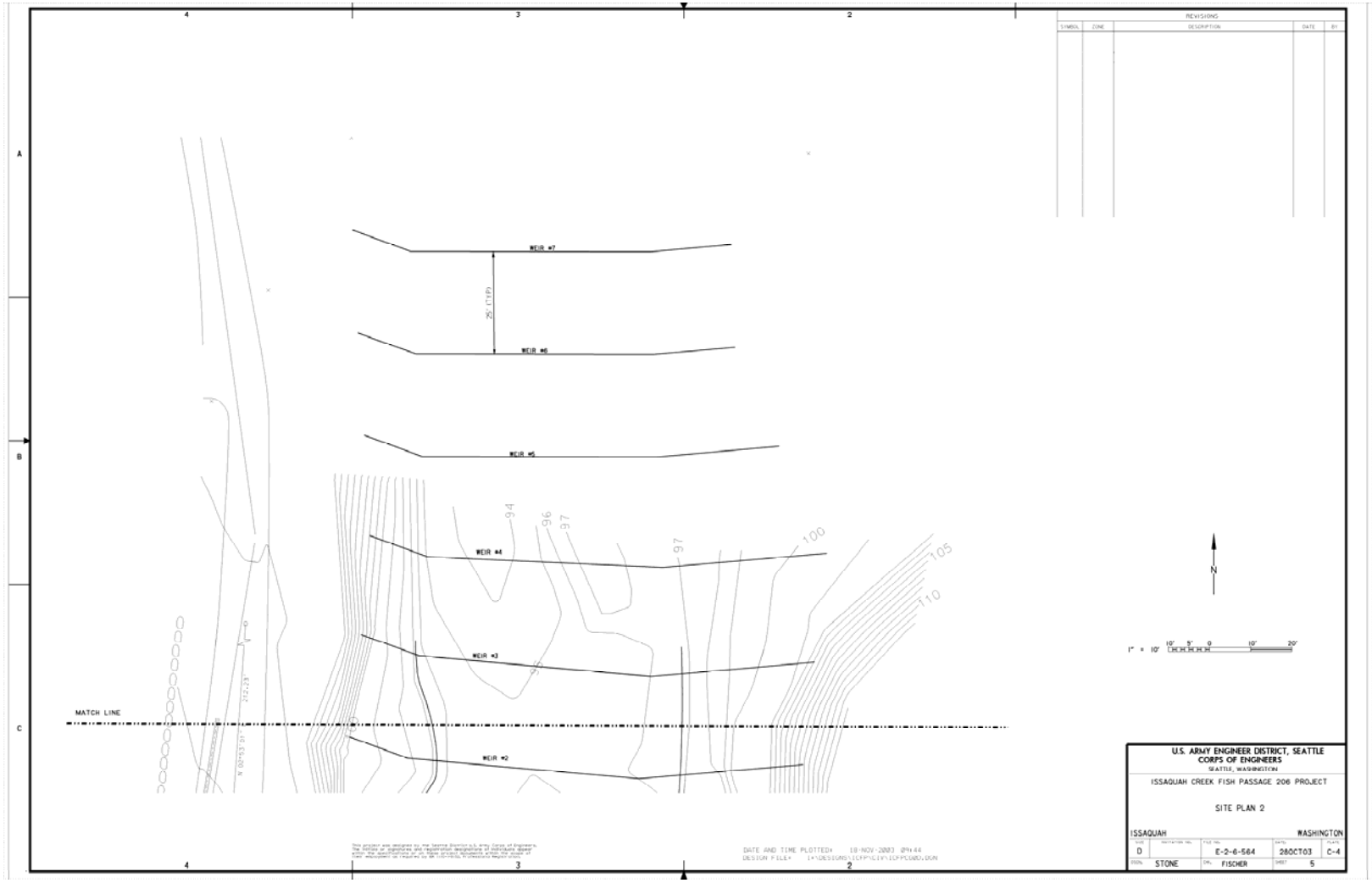

Figure A-5. Site Plan Downstream

Figure A-6. Site Plan Upstream

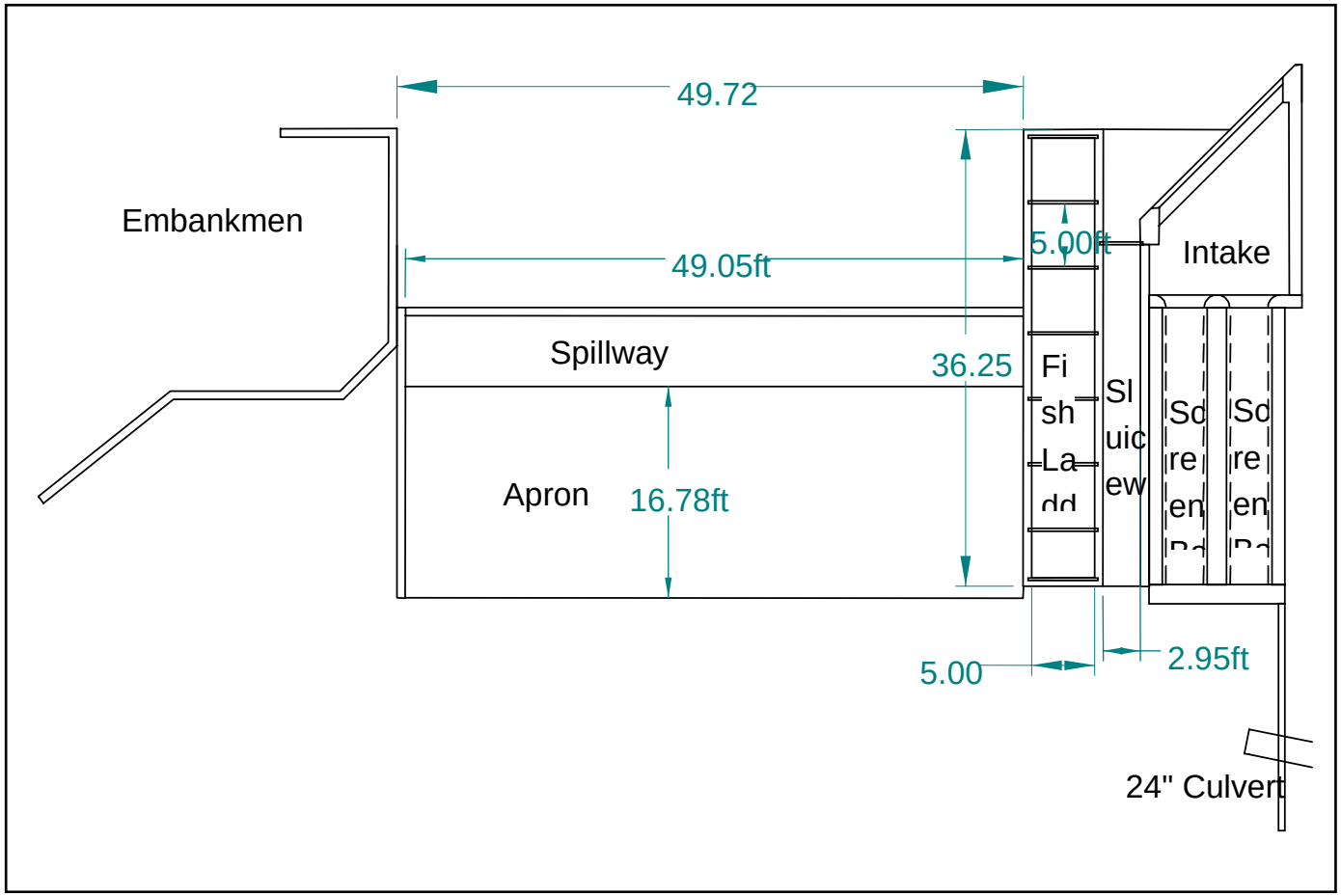

Figure A-7. Existing Structure

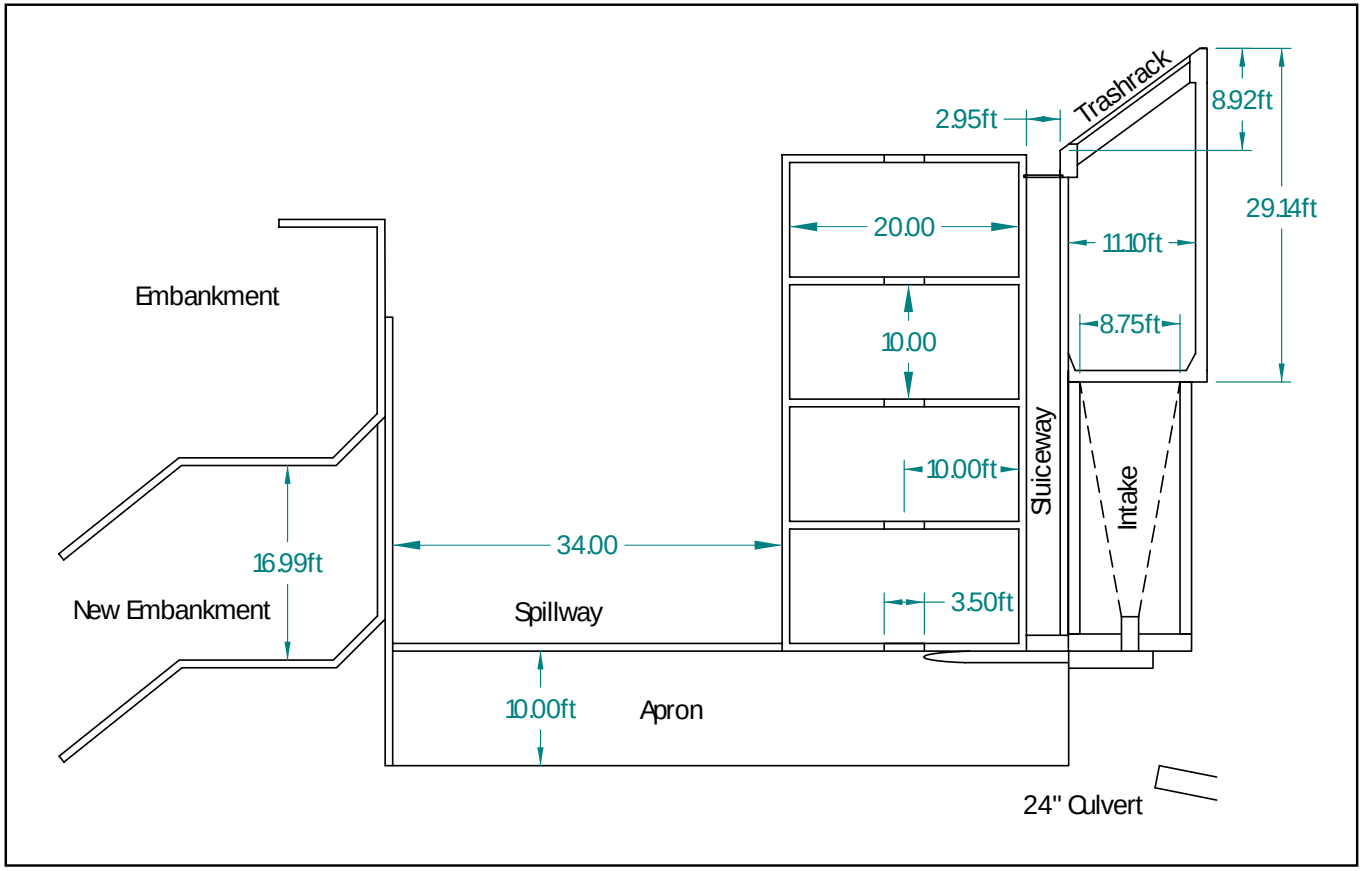

Figure A-8. Proposed Project

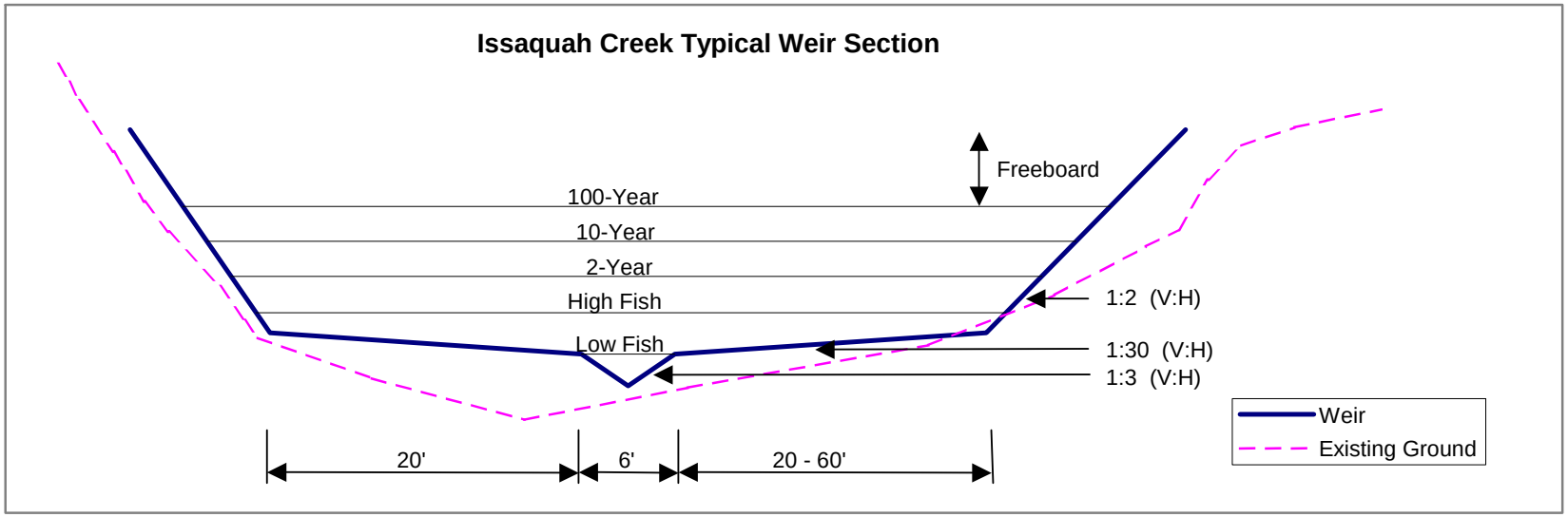

Figure A-9. Cross-section view of a typical pool and chute weir.

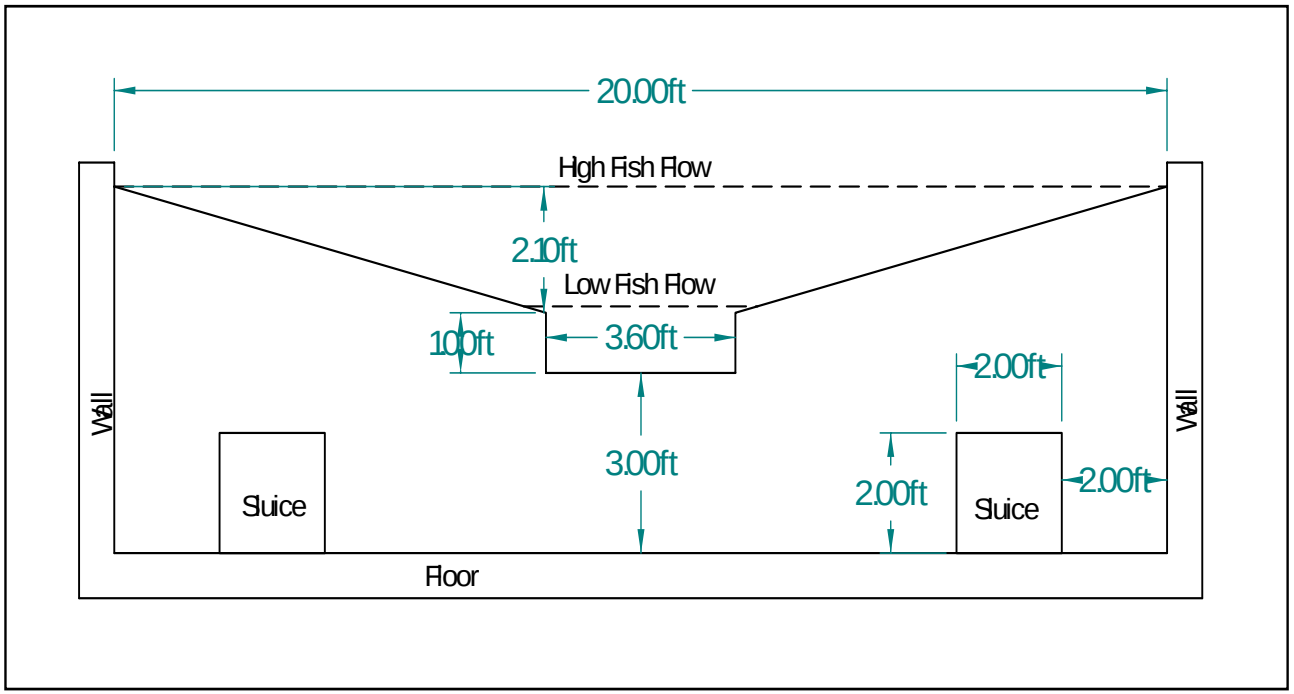

Figure A-10. Typical cross-section view of one of seven grade control weirs.