UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
BIN C15700
Seattle, WA 98115-0070

February 20, 2002

Colonel Ralph Graves
District Engineer
Seattle District, Corps of Engineers
P.O. Box 3755
Seattle, Washington 98124-3755

Attn.: Thomas F. Mueller, Chief, Regulatory Branch

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation on the Tacoma Public Utilities Pipeline Number One Crossing of the White River, Washington (NMFS No. WSB-00-519; Corps # 1999-4-01589)

Dear Colonel Graves,

Attached is the National Marine Fisheries Service's (NMFS) Biological Opinion (Opinion) on the Tacoma Public Utilities Pipeline Number One Crossing of the White River, including issuance of the 404 Clean Water Act authorization. This Opinion was prepared in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16U.S.C. 1531 *et seq.*) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996. NMFS concludes in this Opinion that implementation of the proposed action is not likely to jeopardize the continued existence of Puget Sound chinook salmon or result in the destruction or adverse modification of their critical habitat. Please note that the incidental take statement (*Section II-G* of the Opinion) includes nondiscretionary reasonable and prudent measures and terms and conditions designed to minimize take of Puget Sound chinook salmon.

The U.S. Army Corps of Engineers (ACOE) initiated formal consultation with NMFS on November 9, 2000, after having determined that the proposed action is likely to adversely affect the Puget Sound chinook salmon *(Oncorhynchus tshawytscha)* Evolutionarily Significant Unit. This Opinion reflects the results of formal ESA consultation and contains an analysis of the effects of the proposed action on threatened Puget Sound chinook salmon in the White River, Washington. This Opinion is based on information provided in the biological assessment sent to NMFS by the ACOE and additional information contained in a number of other supporting documents, emails and meetings.

This Opinion also serves as consultation on Essential Fish Habitat pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and its implementing regulations at 50 CFR Part 600.

A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office. Questions regarding this consultation should be directed to Ann Garrett of my staff at (206) 526-6146.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

Enclosure

ENDANGERED SPECIES ACT – SECTION 7
BIOLOGICAL OPINION

and

MAGNUSON- STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT CONSULTATION

Tacoma Public Utilities
Pipeline Number One
White River Crossing
(WSB-00-519)

Agency: U.S. Army Corps of Engineers

Consultation
Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Issued by: for Michael R Crouse ______________________ Date: 02/25/2002
D. Robert Lohn
Regional Administrator

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I. INTRODUCTION

The U.S. Army Corps of Engineers (ACOE) Seattle, Washington, proposes to issue a permit pursuant to section 404 of the Clean Water Act to Tacoma Public Utilities for the excavation of material and placement of fill below the ordinary high water mark (OHWM) and in wetlands associated with the White River. The fill is part of a larger action proposed by Tacoma to replace a section of water pipeline number one and remove the associated concrete slab dam (dam), which cross the White River at river mile (RM) 23.3 in King and Pierce Counties.

This document presents the National Marine Fisheries Service's (NMFS) biological opinion (Opinion) of the effects that the proposed project will have on threatened Puget Sound chinook salmon (*Oncorhynchus tshawytscha*) and their critical habitat, and is in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). This document also serves as consultation on Essential Fish Habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and its implementing regulations at 50 CFR Part 600.

A. Background and Consultation History

Tacoma's water supply pipeline number one conveys water from the Tacoma Headworks Diversion Dam on the Green River (RM 61.5) to the City of Tacoma. The section of pipeline being replaced was installed across the White River at RM 23.3 in 1912. The steel pipeline is 46 inches in diameter and is encased in concrete. According to Bates (1989) a rock mattress was constructed with the pipeline in 1920, and then a reinforced concrete slab dam was constructed in 1922 and 1923. The structures were installed downstream of the pipe to control the grade of the riverbed and prohibit the river from undermining the pipe. The dam was cast in stages over several years. The height of the dam has been raised and the face of the dam has been extended downstream at least three times, probably to repair scour under the dam (Bates 1989).

In the early 1950s, a ladder was incorporated into the dam to facilitate fish passage to upstream reaches. The ladder was designed to function at 30 cubic feet per second (cfs), which was the minimum instream flows at the time. Subsequent changes in flows and deterioration of the concrete due to the bedload movement has exposed rebar and impeded the passage of salmonids, particularly chum *(O. keta)* and pink salmon *(O. gorbuscha*).

On November 9, 2000, the ACOE initiated formal consultation with NMFS to determine whether issuing the 404 permits, and the subsequent replacement of the pipe and removal of the barrier are likely to jeopardize the continued existence of Puget Sound chinook salmon. On March 2, 2001, the U.S. Fish and Wildlife (FWS) submitted comments and questions regarding the biological assessment and sent a carbon copy of the questions to NMFS. A site visit was made by numerous agency personnel, including NMFS and the ACOE, on March 20, 2001 at which time NMFS requested a copy of Tacoma's reply to FWS' comments, a copy of the feasibility report, and additional information on the timing of salmon migration through the action area.

NMFS received a multi-species periodicity chart on June 25, 2001, the feasibility report on June 29, 2001, and a copy of Tacoma's response to FWS on July 5, 2001 (S. Madsen, R2 Resource Consultants, pers. comm., 2001). Subsequently, NMFS received additional information on chinook salmon returns on July 6, 2001, and Essential Fish Habitat on August 3, 2001. NMFS requested additional information on the project during a site visit in September, and received responses to those questions on September 12, 2001. On October 17, 2001 Tacoma held a meeting for agency personnel, including NMFS, to discuss outstanding issues regarding the project.

This Opinion is based on the following information: the biological assessment, site visits by NMFS personnel in March and September 2001, and supplemental information provided in meetings, and by telephone and email. A complete administrative record of this consultation is on file in the Washington State Branch of the Habitat Conservation Division of NMFS, located in Lacey, Washington.

B. Description of the Proposed Action

The action proposed by the ACOE is the issuance of a permit pursuant to the Clean Water Act for the excavation of material below the ordinary high water mark (OHWM), placement of fill below the OHWM to stabilize the river bank in the project area, and placement of temporary wetland fill and riparian impacts (R2 2000). Additional components of the project include the removal of the dam and the existing pipe section, installation of a new pipe, and restoration of the site.

The ACOE has also determined that an interrelated action may be necessary to address fish access in Boise Creek (RM 23.9), should the project degrade existing access (Smith and Terzi 2000). The need or extent of the interrelated action for Boise Creek cannot be determined presently; however, it shall be evaluated through monitoring outlined in the biological assessment. Any work or action necessary in response to monitoring will necessitate reinitiation of this consultation. No other interrelated or interdependent actions have been identified.

The proposed project will occur in three stages. First, the site will be cleared and prepared. Second, the project will be constructed. Third, site restoration, and post-construction and long-term monitoring will occur. The proposed project will take about 11 weeks from site preparation, beginning in late June or early July 2002, to demobilization by October 1, 2002 (R2 2000; RCI 2000).

Site preparation includes the construction of a temporary road on the north side of the river from 244th Avenue SE (Mud Mountain Road),along Tacoma's pipeline right of way to the river (R2 2000). The temporary roadway will be surfaced with gravels. Approximately 1.5 acres (0.75 acres each on the north and south bank) will be cleared of vegetation, logs and other materials for construction access, temporary stockpiles, and settling basins (Baker tanks). These disturbances will be confined to a 100-foot wide corridor above the existing pipeline, except where the corridor crosses wetlands then the width will be reduced to 30 feet (R2 2000; S.

Madsen, R2, pers. comm. (Email 7/5/01)). Trees greater than or equal to 4 inches and less than 8 inches in diameter at breast height will be retained and used to restore wetland and upland areas. Stockpiles will be placed greater than 300 feet from wetlands and the ordinary high water mark (OHWM) of the White River, and will be located in previously disturbed areas. Areas to be left undisturbed will be fenced prior to construction (S. Madsen, R2, pers. comm. [Email 7/5/01]).

Construction of the project has been subdivided into four phases. The first phase consists of removing a portion of the existing concrete dam on the left bank to provide fish passage during initial construction activities. Phase 2 of the project involves installing the north half of the new pipeline. During phase 3 the south half of the new pipeline will be installed and connected to the north half of the pipeline, and the existing concrete dam and pipeline will be removed from the left bank. Finally in phase 4, the dam and the existing pipeline will be removed from the north side of the river.

In phase 1, a portion of the structure near the south bank will be cut and removed using concrete saws, a Hoe-Ram and excavator, and a 65-ton crane. This will create a narrow opening in the structure, less than 10 feet wide, to allow fish passage. The exposed riverbed will then be armored with approximately 200 cubic yards of riprap (construction drawings Tacoma 9/20/00). All heavy equipment will be operated outside of the wetted channel and temporary spoils will be located above the ordinary high water mark of the channel (R2 2000). Only personnel using hand equipment, and retrieving debris by hand will enter the wetted channel during phase one. After the cut is made in the concrete dam the flow will be shifted to the left bank and the slot will serve as a bypass for migrating fish. According to the biological assessment, this work will be done without a coffer dam (R2 2000).

Next (Phase 2), construction will proceed on the north side of the river. First, a coffer dam will be erected around the construction area (the trench site) and the existing dam. The coffer dam will extend across about 60 percent of the channel (roughly 150 feet across, enclosing about 25,000 square feet) and will take an estimated 3 days to install. Once the coffer dam is installed, the enclosed area will be dewatered using sump pumps routed to a series of Baker tanks or mobile settling basins. Fish trapped in the work area will be collected by seining and relocated downstream of the project area. Tacoma proposes to use a backpack electroshocker to remove fish remaining in the work zone following seining.

Turbid water from the construction area will be pumped to the Baker tanks for settling, then routed back into the White River. Pumping will be continuous from the time excavation begins until the pipe installation is complete, the trench has been backfilled, and the work area is regraded.

According to R2 (2000), artesian (upwelling) flows may lead to problems during construction by undermining the integrity of the newly excavated trench. To reduce flows through the construction site and relieve artesian pressure, four well points will be drilled, two on each end of the dam. The wells will be 30 inches in diameter and 10 feet below the pipe invert. The bore holes will be encased in perforated steel, backfilled with sand around the casing, and sealed with bentonite (R2 2000).

The new pipe will be located downstream of the existing dam. During phase 2 the pipe trench will be excavated from about the center of the White River to about 300 feet upslope of the right bank OHWM. The trench will be about 18-21 feet below the existing river bed elevation, resulting in the removal of about 6,000 cubic yards of material (R2 2000). Upon completing the north half the trench the new pipe will be installed. The pipe will be bedded in sand and then covered by an additional 12 inches of sand. Next, two feet of light loose riprap will cover the sand and pipe. Then the remainder of the trench will be backfilled using native river materials removed during excavation. Finally, the top 18 inches of substrate placed in the trench will consist of a mixture suitable for chinook salmon spawning (maximum size 102 mm, minimum size 12.5 mm, D_{50} approximately 51 mm). Once the north half of the pipe is placed and covered the riverbank will be stabilized with riprap (R2 2000).

A portion of the existing dam will then be removed near the right bank to provide fish passage during construction of the second half of the project. As described previously, the dam will be cut and removed using concrete saws, a Hoe-Ram and excavator, and a 65-ton crane. This will create a narrow opening in the structure, less than 10 feet wide, to allow fish passage. The exposed riverbed will then be armored with approximately 200 cubic yards of riprap (construction drawings, Tacoma, 9/20/00). The coffer dam will then be removed and the White River flow will be shifted towards this portion of the channel to provide migrating fish passage beyond the project area.

Phase 3 is similar to phase 2, except that the construction activities would be shifted to the south half of the channel. A work area of approximately 11,000 square feet will be enclosed by the coffer dam, as it extends across about 60 percent of the channel. The work area will be dewatered and fish removed as described previously. Once the southern half of the pipe is installed the two sections will be adjoined. Then the pipe will be bedded and the trench backfilled, as described above. When the new pipeline is in place the existing water main upstream of the dam will be shut-down and dewatered. The pipes will be connected and water flow established through the new pipeline.

Next the southern half of the concrete dam, which would be enclosed in the coffer dam, will be removed as would the old pipe. Tacoma proposes to remove the pipe using the Hoe Ram, a large track-hoe, and/or a cable winch. Once the pipe and dam are removed the river bed will be smoothed to a gradual level surface using a track hoe and bucket. The left bank will then be stabilized using rip-rap and the coffer dam will be removed and relocated to the north bank.

In phase 4, the coffer dam will enclose the remaining portion of the dam and the work area will again be dewatered and fish relocated, as described previously. Then, the remaining portions of the concrete dam and old pipe will be removed. The channel bed will be smoothed to a gradual surface to facilitate fish passage and minimize the potential for development of localized split flow paths or scour holes. The coffer dam will then be removed from the river.

Minimization and conservation measures proposed as part of the project include: relocating fish from construction and dewatering zones; daily visual observations of the river downstream of the project site to ensure fish are not congregating below the project site; maintaining adequate water depth and velocity for chinook salmon migrating around the construction site; and daily measurements of water quality (turbidity) in the wells, leaving the Baker tanks, and 500 feet upstream and downstream of the construction site. Proposed monitoring during construction activities are described in detail in the biological assessment for the project (R2 2000). If turbidity at the outfall exceeds background levels in the White River by more than 5 NTUs or 10 percent of the upstream value, the contractor will be notified within 24 hours and construction will be halted, or additional erosion control or water treatment measures will be implemented. If turbidity in the any of the four wells exceeds that of the White River upstream of the project site, then water from the wells will be routed to the Baker tanks for settling, before it is returned to the White River (R2 2000).

The third and final stage of the project consists of additional minimization and conservation measures, including revegetation, bank stabilization, road decomissioning, and post construction monitoring and long-term monitoring. Tacoma proposes to return small and large woody debris that was removed from the channel or cleared from upland areas to the White River channel. Wood will be piled below the OHWM along the margins of the construction site, and allowed to redistribute naturally. Large logs would be placed in positions expected to remain stable; however, no anchors or engineered jams are proposed. Finally, disturbed banks will be protected with riprap and willow bundles, and upland areas will be replanted. Upland areas will first be scarified, graded, and additional topsoil tilled to promote plant growth. About 0.1 acres of a wetland on the north bank will be disturbed during construction. Exposed upland areas and the disturbed portion of the wetland will be hydroseeded or planted with native trees and shrubs. Tacoma proposes to monitor these plants for 5 years following construction.

II. ENDANGERED SPECIES ACT

The ESA of 1973 (16 USC 1531-1544), as amended, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with NMFS and FWS to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats.

This document is a product of an interagency consultation pursuant to Section 7(a)(2) of the ESA and its implementing regulations found at 50 C.F.R. Part 402. The objective of this interagency consultation is to determine whether issuance of the permit and the subsequent construction of the proposed project is likely to jeopardize the continued existence of Puget Sound chinook salmon, or destroy or adversely modify designated critical habitat. In making this determination, NMFS must examine the area affected by the proposed project, termed the action area. The action area is defined by regulation as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). In accordance with the implementing regulations, NMFS, the ACOE, and Tacoma have defined the action area for the proposed project to include: three miles of the mainstem White River from RM 21.3 to 24.3, riparian and areas upslope of the White River at RM 23.3 (the 100-foot wide construction corridor), and the lower 500 feet of Boise Creek (RM 23.9). This definition of the action area is based on the biotic, physical and chemical effects of the action, such as bedload changes (riverbed aggradation and degradation) induced by the action. This area serves as a migratory corridor for both adult and juvenile life stages, and is also used by spawning and rearing chinook salmon.

A. Rangewide Status

NMFS completed a status review of chinook salmon from Washington, Idaho, Oregon, and California in 1998, which identified fifteen distinct species (termed Evolutionarily Significant Units [ESUs]) of chinook salmon in the region (Myers *et al.* 1998). After assessing information concerning chinook salmon abundance, distribution, population trends, risks, and protection efforts, NMFS determined that chinook salmon in the Puget Sound ESU are at risk of becoming endangered in the foreseeable future. Subsequently, NMFS listed Puget Sound chinook salmon as threatened on March 24, 1999 (64 Fed. Reg. 14308, March 1999). This listing extends to all naturally spawning chinook salmon populations residing below natural barriers (e.g., long-standing, natural waterfalls) in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula, inclusive.

The Puget Sound ESU is a complex of many individual populations of naturally spawning chinook salmon, and 36 hatchery populations (64 Fed. Reg. 14308, March 1999). Recently, NMFS' Puget Sound Technical Recovery Team (TRT 2001) tentatively identified 21 geographically distinct populations of chinook salmon in Puget Sound, including one in the White River. Through the recovery planning process NMFS will define how many and which naturally spawning populations of chinook salmon are necessary for the recovery of the ESU as a whole (McElhany *et al.* 2000). At this time, only five hatchery stocks are considered essential to the recovery of Puget Sound chinook salmon. The listed hatchery stocks are: Kendall Creek (spring run), North Fork Stillaguamish River (summer run), White River (spring run), Dungeness River (spring run), and Elwha River (fall run)(64 Fed. Reg. 14308, March 1999).

In most streams within Puget Sound, both short- and long-term trends in chinook salmon abundance are declining. Overall abundance of chinook salmon in this ESU has declined substantially from historical levels and many populations are small enough that genetic and demographic risks are likely to be relatively high. Migratory blockages and degradation of freshwater habitat, especially in upper river reaches, has contributed to these reduced abundances. Widespread agriculture and urbanization have significantly altered the complexity of freshwater and estuarine habitats used by chinook salmon. Spring- and summer-run chinook salmon populations through the Puget Sound ESU have been particularly affected. These life histories have exhibited widespread declines throughout the ESU and some runs are believed extinct (Nehlsen *et al.* 1991; 64 Fed. Reg. 14308, March 1999). These losses represent a significant reduction in the life history diversity of this ESU (Myers *et al.* 1998; 64 Fed. Reg. 14308, March 1999).

B. Critical Habitat

The entire action area for the proposed project is within designated critical habitat for Puget Sound chinook salmon (65 Fed. Reg. 7764, February 16, 2000). In general, the ESA defines critical habitat as "(i) the specific areas within the geographical area occupied by the species on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection and (ii) specific areas outside the geographical area occupied by the species... upon a determination by the Secretary of Commerce that such areas are essential for the conservation of the species" (50 C.F.R. Part 226).

NMFS has identified the current freshwater estuarine, and marine range of Puget Sound designated critical habitat to encompass all essential habitat features adequate to ensure the species' conservation (65 Fed. Reg. 7764, February 16, 2000). Essential features of this critical habitat include sites for breeding and rearing, water, cover or shelter, food, riparian vegetation, space, and safe passage conditions (65 Fed. Reg. 7764, February 16, 2000). NMFS also identified a limited number of specific activities that may require special management considerations due to their propensity to significantly degrade or modify habitat, including land use activities and placing barriers to migration (65 Fed. Reg. 7764, February 16, 2000). Essential features of critical habitat affected by the proposed action include spawning sites, food resources, water quality, safe passage conditions, and riparian vegetation.

C. Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of (1) defining the biological requirements and current status of the listed species, and (2) evaluating the relevance of the environmental baseline to the species' current status.

The purpose of interagency consultation is to protect threatened and endangered species from Federal activities that are expected to jeopardize their continued existence or destroy or adversely modify habitat that has been designated as critical to the conservation of listed species (16 U.S.C. 1536). NMFS must determine whether an action is or is not likely to (a) jeopardize listed species and (b) destroy or adversely modify critical habitat. In making this determination, NMFS must consider the estimated level of mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account the species' biological requirements in the action area, and also those biological requirements necessary for the survival and recovery of naturally reproducing population levels. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives for the action.

NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' designated critical habitat. Then NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. If NMFS concludes that the action will adversely modify critical habitat it must identify any reasonable and prudent alternatives. NMFS relies upon guidance in *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids,* August 1999 (Attachment 1) for making determinations of jeopardy and adverse modification of habitat. Actions that are found likely to impair currently properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat towards properly functioning ecological conditions at the population or ESU scale will generally be determined likely to jeopardize the continued existence of listed salmon, adversely modify their critical habitat, or both (50 C.F.R. PART 402.02; NMFS 1999).

1. Biological Requirements

The first step in the ESA section 7(a)(2) analysis is to define the species' biological requirements that are most relevant to each consultation. NMFS also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NMFS starts with the determinations made in its decision to list Puget Sound chinook salmon for ESA protection and also considers new data available that is relevant to the determination.

This Opinion relates the biological requirements for chinook salmon in terms of the habitat attributes, or pathways, established in the Matrix of Pathways and Indicators (MPI) (NMFS 1996). These pathways are: water quality, habitat access, physical habitat elements, channel condition and dynamics, flow/hydrology, and watershed conditions. The pathways indirectly measure the baseline biological, physical and chemical health of chinook salmon habitat. Specifically, each pathway is made up of a series of individual indicators (e.g., indicators for water quality are temperature, sediment/turbidity, chemical contamination/nutrients) that are measured or described directly (NMFS 1996). Based on the measurement or description, each indicator is described in terms of their existing condition level. Three condition levels are possible: "properly functioning," "at risk," and "not properly functioning." Properly functioning conditions are defined as "the sustained presence of natural habitat forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation (NMFS 1996)."

Relevant biological requirements are those necessary for Puget Sound chinook salmon to survive and recover to naturally reproducing population levels that would make protection under the ESA unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. The biological requirements of chinook salmon include: food, flowing water (quantity), high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content), abundant clean spawning substrates, and unimpeded migratory access to and from spawning and rearing areas (adapted from Spence *et al.* 1996). The biological requirements of chinook salmon affected by the proposed action include water quality, food, spawning substrates, and access.

2. Environmental Baseline

The term "environmental baseline" means "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" (50 C.F.R. § 402.02). Myriad activities influence the current environmental conditions in the action area. Important insights on the magnitude and extent of habitat changes are gained when information is examined on human activities within the action area and upstream areas, because habitat processes and changes in upstream reaches strongly influence downstream conditions. Therefore, information is included on activities and conditions upstream of the action area as we have defined it, because they provide context for understanding the status of the species and the environmental baseline of the action area. Similarly, because the only long-term reliable information on population trends for White River chinook salmon is collected at the upper extent of the action area, the Buckley trap (RM 24.3), it is also considered in this discussion.

Status of the Species within the Action Area

Recently, NMFS' Puget Sound TRT delineated one independent population of chinook salmon within the White River. These fish are genetically unique and comprise the last existing spring chinook salmon stock in South Puget Sound (WDFW *et al.* 1996; B. Sanford, pers. comm., 2000). In the early 1970s an artificial propagation program was established for White River spring chinook salmon because returns were critically low (WDFW *et al.* 1996). The artificial propagation program was initially started to restore the south Puget Sound fishery, and by the late 1970s, NMFS was working cooperatively with WDFW and the Muckleshoot and Puyallup Indian Tribes to recover the stock (WDFW *et al.* 1996).

Counts of adult chinook salmon in the White River dropped precipitously from the earliest counts at the Buckley trap to a critical low in the 1970s (WDFW *et al.* 1996). The Buckley trapping effort provides the longest data set available on White River chinook salmon. Trap and haul operations began in 1940 and counts of fish returning to the trap began in 1941 (see Figure 1). Chinook salmon returning to the trap averaged 2800 annually, ranging from 1,200 to almost 5,500 in the first decade of operation[1] (WDFW *et al.* 1996; Ladley *et al.* 1999). Counts declined steadily until about 50 chinook salmon returned in 1977, and in 1986 only 8 fish (6 adults and 2

[1]WDFW *et al.* (1996) suggested that these early returns were already depressed as a result of "unmitigated" hydropower operations since 1911.

jacks) were passed above the dam (ACOE, Seattle District, *unpubl. data*; WDFW *et al.* 1996; Ladley *et al.* 1999).

In 1991, Nehlsen *et al.* identified the White River spring run as having a moderate risk of extinction and in 1999, NMFS listed the White River spring-run as one of only five hatchery populations essential for the recovery of the Puget Sound ESU (64 Fed. Reg. 14308, March 1999). The decline of the stock is attributed to the additive, cumulative, and synergistic effects of intense human activities (Ladley *et al.* 1999). Harvest and habitat constraints, specifically flow regime, sedimentation, streambed instability, estuarine loss, reduced large woody debris volumes, and passage problems associated with dams affect White River chinook salmon, threatening the long-term viability of the population (Bishop and Morgan 1996). These and other threats to White River chinook salmon are described below, under *Factors Affecting the Species in the Action Area.*

In 1996, WDFW *et al.* established an interim recovery goal of passing 1,000 natural spawners above Mud Mountain Dam (RM 29.6) for "three out of the four consecutive years with the normal level of incidental sport, commercial and tribal harvest." The number of spawners passed above Mud Mountain Dam has exceeded 1,000 three times in recent years (1999, 2000, and 2001), while the average number of chinook salmon passed above the Dam from 1982 to 2001 was 477 chinook salmon (ACOE and the Puyallup Tribal Fisheries Division (PTFD), *unpubl. data*).

Abundance of chinook salmon passed over the dam may overestimate the actual number spawning in the upper White River because some fish may fall back and spawn in the lower river or re-enter the trap resulting in duplicate counts, and others may die prior to successful spawning (Smith 2000; Ladley et al. 1999). Nonetheless, data suggest that the stock is responding to recent management efforts to increase returns, particularly reduced harvest and the "increasingly conservative management of Washington fisheries (PSIT and WDFW 2001)." Total exploitation has been falling from greater than 70 percent in the early 1980s to below 50 percent since brood year 1992, and was projected at 16 percent for 2000 (PSIT and WDFW 2001). Adult chinook salmon typically spawn between ages 3 and 5, entering the White River as early as arch (Williams *et al.* 1975). Between 1942 to 1950, chinook salmon were typically encountered at the Buckley trap from May through August, with peak returns in June (WDFW *et al.* 1996;

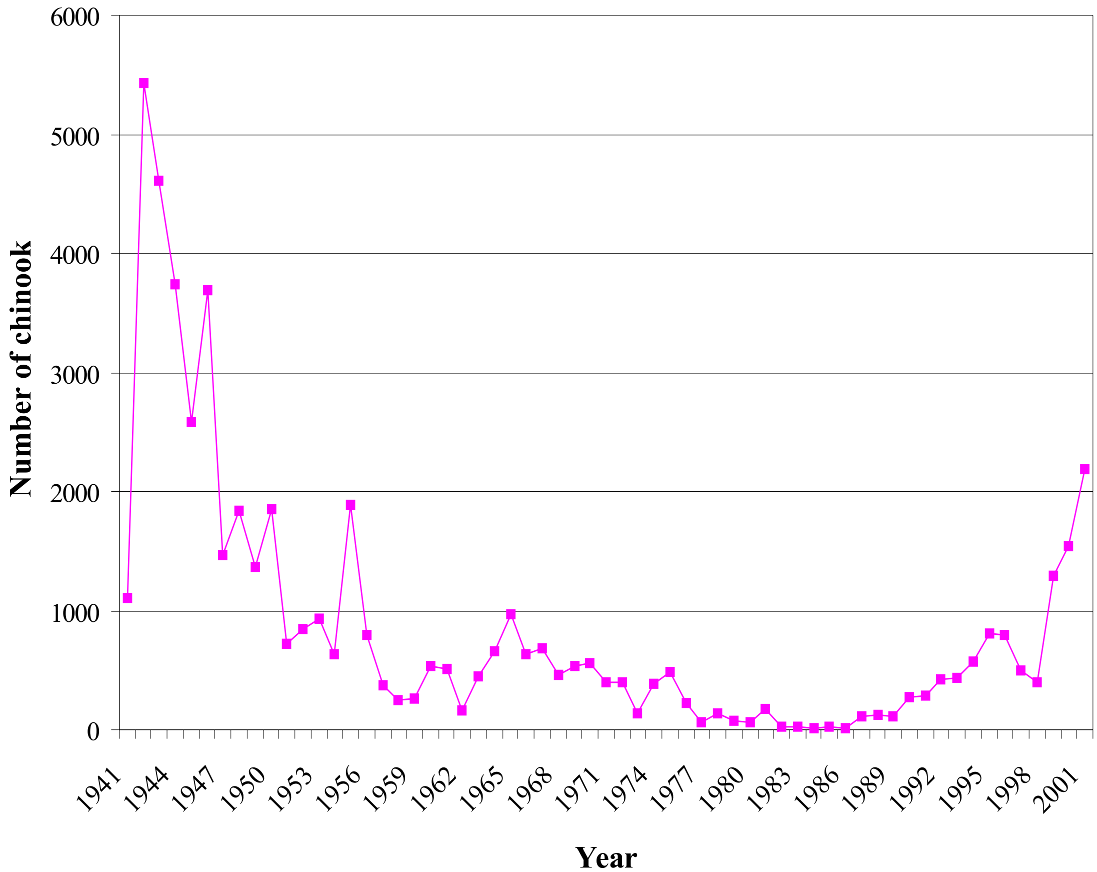

Figure 5. Number of chinook salmon (adults and jacks) transported above Mud Mountain Dam (RM 29.6) from 1941 to 2001 (ACOE and PTFD, *unpubl. data*).

Ladley *et al.* 1999). Currently, chinook salmon exhibit a bimodal return to the Buckley trap. The peak number of chinook salmon returning to the Buckley trap, according to average weekly returns between 1986 and 2000, occurs first in July, and then again at the end of September (data is for total chinook catch at Buckley, which includes hatchery fish) (ACOE*,* Seattle District, *unpubl. data*). For the 10 year period considered, the second peak (September) was highest, but more recently (1996 to 2000) returns have been highest during July (ACOE*,* Seattle District, *unpubl. data*). See Figure 2.

According to chinook salmon returns to Buckley from 1986 to 2000, it appears that about 70 percent of the White River chinook salmon population will migrate through the action area during the proposed 11 week construction period. White River chinook salmon spend roughly 16 to 18 weeks in fresh water before spawning (Ladley *et al.* 1999). A radio-telemetry study conducted by PTFD revealed that once chinook salmon entered the lower Puyallup River they took an average of about two weeks before entering the White River, and another 40 days to pass through the lower White River to the Buckley trap (Ladley *et al.* 1999).

Generally, chinook salmon will hold in deep pool habitat during their upstream migration, particularly during extended freshwater holding before spawning. Deep pool habitat typically provides important resting areas to migrants and could provide some thermal relief from warm

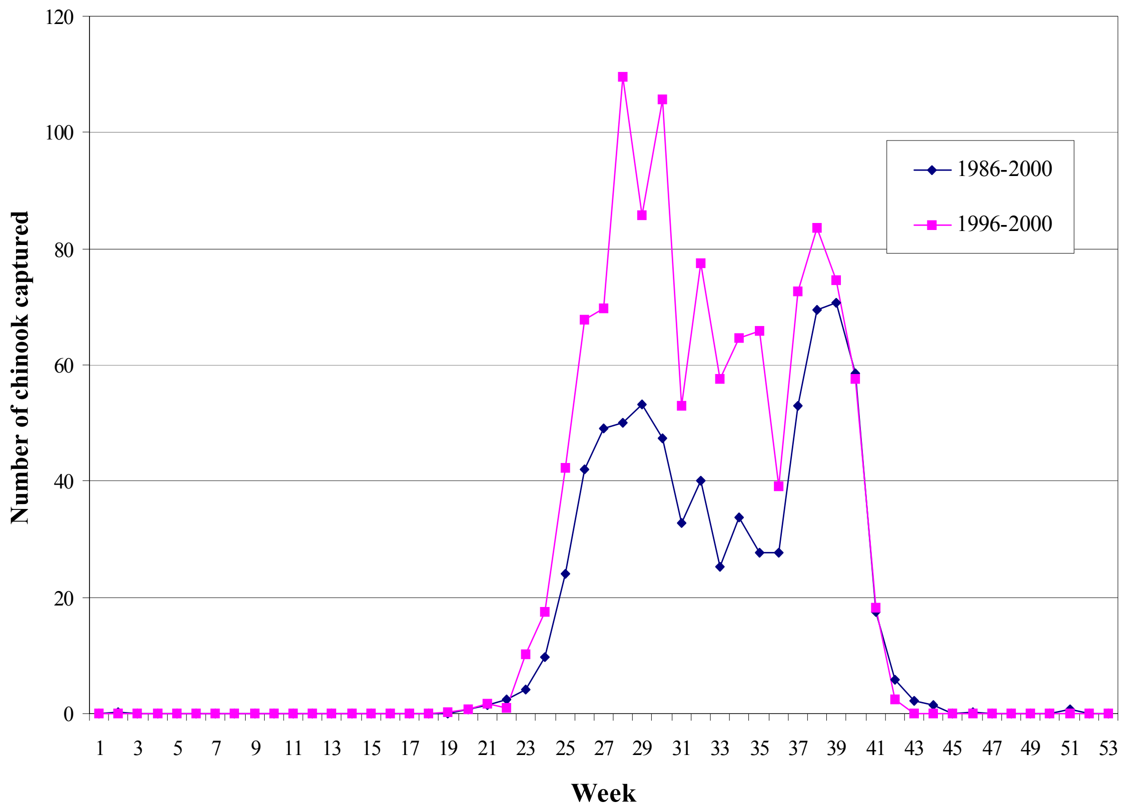

Figure 6. Average weekly returns of chinook salmon to the Buckley trap from 1986 to 2000 (ACOE, Seattle District, *unpubl. data)*.

water in the mainstem White River. Ladley *et al.* (1999) did not observe chinook salmon holding exclusively in pools during their telemetry study. This may be, in part, a result of poor pool quality (insufficient pool depths and cover) in the White River.

The majority of White River chinook salmon spawning occurs in 4 major non-glacial tributaries in the upper watershed: Boise Creek (RM 23.9), Clearwater River (RM 35.3), Greenwater River (RM 45.8), and Huckleberry Creek (RM 53.1) (Ladley *et al.* 1999; Williams *et al.* 1975). Peak spawning in tributaries above the dam occurs about mid-September, roughly 8 weeks after peak returns to the Buckley trap (Ladley *et al.* 1999). Boise Creek, which enters the White River about 140 feet upstream of Tacoma's existing pipeline, produces a large portion of the chinook salmon within the White River basin (J. Iverson, PTFD, pers. comm., 2001). Most of the chinook salmon that spawn within Boise Creek are probably not enumerated at the Buckley trap, because Boise Creek enters the White River about ½-mile downstream of the trap. Even so, Ladley *et al.* (1999) observed some fish that were captured at Buckley fell back to eventually spawn in Boise Creek.

The PTFD has conducted chinook salmon spawning surveys in Boise Creek for a number of years. The average number of chinook salmon returning to spawn in Boise Creek, based upon PTFD spawner surveys for the years 1995 to 2000 (PTFD, *unpubl. data*; R2 2000), is about 290 fish. Generally, PTFD divides Boise Creek into 2 reaches for spawning surveys, the first of which covers RM 0.0 to 2.2 and the second of which covers RM 2.2 to 4.5. A waterfall at RM 4.5 prevents upstream use of the Creek by anadromous fish (Williams *et al.* 1975; PTF *unpubl. report*). According to the PTFD surveys from 1993 to 2001, roughly half of the chinook salmon spawn between RM 0.0 and 2.2 (PTFD, *unpubl. data*), although most of the fish spawn upstream of RM 0.5 (R. Ladley, pers. comm., 2001 [Email 12/27/01]). However, some spawning occurs in a small area about RM 0.4, roughly 1600 feet upstream of the action area for the proposed project.

For the mainstem White River, information on chinook salmon spawning is limited, largely by visibility. Surveys for adult chinook salmon below the Puget Sound Energy (PSE) diversion have been conducted annually by the PTFD (unpub. data) since 1995. These surveys typically began at the diversion (RM 24.3) and terminated at the 8th Street Bridge (RM 7.5). Annual redd counts for the years 1995 to 2001 have ranged from 0 to 99, with an average of 36 redds for the seven years considered. A portion of the action area was surveyed as a distinct reach in 1995 and 1996. According to R2 (2000), data indicate that 51 chinook were observed and 7 redds were observed between RM 23.1 and 24.3 in 1995. In 1996, 22 chinook and 2 redds were observed in the same reach.

According to fish surveys conducted by the Muckleshoot Indian Tribe downstream of the action area (between RM 8.9 and 15.5), the density of chinook salmon spawning in side channels is much higher than in the mainstem (Malcom and Fritz 1999). Of the 80 chinook salmon redds counted by Malcom and Fritz (1999), only 7 redds (9 percent) were recorded within the mainstem White River. Malcom and Fritz (1999) surmised, based on observations during their study and previous observations, that spawning in side channels is a typical behavior for White River chinook salmon. It seems reasonable that chinook salmon prefer side channels in the action area as well, where available. Thus, the actual number of chinook salmon spawning in the action area may be considerably higher than the PTFD data suggests, as these surveys are typically conducted by boat and only infrequently include side channel habitats.

After incubation, fry emerge from the gravel from late winter to early spring. Juvenile chinook salmon may then migrate downstream to rear in low-gradient channels (WDFW *et al.* 1996). The majority (80 percent) of chinook salmon in the White River rear for short periods (1 to 3 months) in fresh water, outmigrating as subyearlings and the remainder (about 20 percent) outmigrate as yearlings after rearing in fresh water for about one year (Dunston 1955). Scales collected from adult chinook salmon at the Buckley trap confirm age at outmigration (WDFW *et al.* 1996).

Short periods of freshwater rearing may represent an adaptive response by juvenile chinook salmon to the turbid waters of the White River. Characteristically high suspended sediment loads may affect timing and age of fish at outmigration by limiting rearing densities compared to what would be expected in a rain dominated (clear) river of comparable size (Ptolemy *in* Newcombe and Jensen 1996). In other basins, side channels fed by clear groundwater, and valley-wall runoff provide critical non-turbid (or low turbid) habitat and are extensively used by chinook salmon fry (Murray and Rosenau 1989; Chamberlin *et al.* 1991; Scrivener *et al.* 1994). Studies suggest that even nonnatal clear-water tributaries are used by juvenile chinook salmon and that these habitat types provide juveniles an opportunity to maximize their growth and survival through increased feeding success (Murray and Rosenau 1989). Such habitat may be particularly important to those fish that outmigrate as yearlings.

Factors Affecting The Species In The Action Area

The life history characteristics (e.g., migration timing) of White River chinook salmon are an expression of genetics and also adaptation to the local glacial environment of the basin. White River chinook salmon have evolved in a basin with frequently shifting braided channels, highly turbid waters, a history of large wildfires and major channel shifts between the Puyallup and Duwamish basins. The headwaters of the White River, which originate at the terminus of Winthrop, Emmons, and Fyingpan glaciers, are considered pristine where they have been protected since 1899 with the creation of Mt. Rainier National Park. The river drains a watershed of approximately 494 square miles to the confluence with the Puyallup River at about RM 10.4, entering south-central Puget Sound at Commencement Bay. The majority of this basin has undergone pronounced changes since European settlement began in the region, as early as 1850 (Williams *et al.* 1975; Kerwin 1999).

Human land use practices that induce alterations to chinook salmon habitat have the potential to alter responses to local conditions and could indirectly lead to genetic changes in the population (NRC 1996). For instance, changes in the hydrograph, specifically reduced low flows, have resulted in a shift in the timing of the upstream migration of adult White River chinook salmon (Ladley *et al.* 1999). Since White River chinook salmon return to the river early and remain in fresh water for much of the summer before spawning, reductions in summer flows have been particularly detrimental to this stock, nearly resulting in its extirpation in the 1980s (WDFW *et al.* 1996). Other factors contributing to the decline of White River chinook salmon include intense logging and road building, loss of estuarine habitat, agriculture, urban development, channelization, streambed instability, gravel extraction, and over-harvest (Bishop and Morgan 1996; WDFW *et al.* 1996; Ladley *et al.* 1999). This section of the Opinion describes the environmental baseline of the action area. Specifically, chinook salmon habitat in the White River is described in the context of indicators of the MPI, where appropriate.

Riparian Vegetation, Large Woody Debris, and Pool Frequency. The White River basin has been intensely managed for timber harvest, particularly in the last 50 years. Timber harvest practices have reduced large woody debris (LWD) recruitment, channel sinuosity, pool habitat, and increased the sediment load as streambanks have eroded and landslides resulted (WDFW *et* *al.* 1996; Kerwin 1999). Vegetation composition and LWD recruitment have also been affected by an intense history of wildfires within the basin. Shortly after the fires, wood recruitment to the channel probably increased, while the long term potential for wood recruitment likely reduced. Notably, some creeks including Ranger, Dry, Lightening, Deep, and Goat Creeks have low potential for recruiting LWD to the channel and downstream reaches as a result of wildfires (USFS 1995).

Although recruitment potential was reduced by wildfires, active debris cleaning and the presence of the dams, which act as a barrier to the downstream transport of wood, have significantly reduced debris loading in the action area. Intent on preventing massive debris jams from forming in the lower river, the Inter-County River Improvement Commission (ICRI) constructed two debris barriers, one at RM 11.5 and another at about RM 24.0, where they periodically hauled away and burned wood as it collected on the barriers (Kerwin 1999; R. Ladley, pers. comm., 2000). Built in the early 1900s, these barriers were about 2,000 feet long, and consisted of several large concrete blocks strung together by cables. Records indicate that in 1915 about 35,000 cords of wood had been removed in a five-mile reach near Auburn, and by 1920 an estimated 100,000 cords of wood had been removed from the White River (WDFW *et al.* 1996). As a result, LWD loading is presumed degraded in the action area.

In general, LWD would be expected to collect less frequently in large channels like the White River than in smaller streams; however, log jams would tend to be quite massive. LWD jams are a critical component of chinook salmon habitat through their influence on bed and bank scour, hydraulic complexity, side channel development, pool formation and stability, and bar and island formation (Montgomery *et al.* 1995; Spence *et al.* 1996). LWD jams may also help maintain appropriate thermal gradients by inhibiting the mixing of cool water tributaries with mainstem reaches (Spence *et al.* 1996).

For the action area, and in general within the White River basin, LWD does influence pool formation and frequency, although so do more stable obstructions like large boulders or steep bluffs (R2 2000; Tinoco 2002). According to the Muckleshoot Indian Tribe Fisheries Department, half of the pools they observed in their survey were formed by wood (Tinoco 2002). However, in the roughly one mile reach downstream of the dam only 14 pieces of wood qualified as LWD according to the MPI (Tinoco 2002; NMFS 1996).

The average bankfull width of the White River in the action area is about 300 feet (Tinoco 2002). Although the MPI was not written for a river the size of the White River, it appears that the White River portion of the action area is not properly functioning for LWD loading as a result of historic activities and wildfires. According to Fox (In Press *in* Tinoco 2002) a system the size of the White River should have more than 200 pieces of wood greater than 10 cm in diameter and 2 m in length, and more than 4 key pieces, defined as having a volume of 10.75 m^3, per 100 meters of reach length. Rather, the survey reach averaged 10 pieces of wood with less than 1 key piece per 100 m (Tinoco 2002).

According to R2 (2000) the pool frequency for the action area is about 3 pools per mile. R2 (unpubl. data) surveyed five pools greater than one meter deep below the dam, and six pools upstream of the dam. R2 (2000) believes that the low pool frequency is not unexpected for a river with a tendency towards braided conditions and little stable LWD. On the other hand, the Muckleshoot Indian Tribe asserts that pool frequency is low as a result of the low LWD loading (Tinoco 2002). While the MPI does not contain numeric criteria for pool frequency for a river the size of the White River, NMFS expects that historic and persistent activities that affect wood recruitment to the action area have in turn degraded the pool frequency and quality in the action area. As a result, pool frequency and quality likely range from "at risk" to "not properly functioning" in the White River portion of the action area.

It appears that pool frequency and quality in Boise Creek is "not properly functioning" as well. Roughly the lower 1½ miles of Boise Creek was rerouted with the construction of State Route 410 (City of Tacoma 1924 *in* R2 2000). These changes are believed to have substantially altered the channel gradient and overall morphology. Formerly Boise Creek joined the White River downstream of its present location and likely exhibited a lower gradient. Early maps suggested that the channel was more sinuous, and likely exhibited a higher pool frequency. According to surveys by R2 (2000) the lower 500 feet of Boise Creek is essentially straight and it exhibits a plane bed morphology. Channel slope averages 1.7 percent with the lower most 200 feet exhibiting a gradient of 2.5 percent. The bankfull channel width of Boise Creek in the action area ranges from about 25 to 50 feet (R2 2000).

Sediment Yield. The White River basin is inherently unstable as its heavy bedload causes frequent lateral shifts of the channel. The river naturally transports a high volume of both fine suspended sediments and coarse-grained sediments from the erosion of glacial and mudflow deposits. Several thousand to well over a million tons of sediment are delivered annually from the upper basin to lower gradient reaches, most of which is transported during winter storm events (WDFW *et al.* 1996; Kerwin 1999). Suspended sediment varies from 1 to 6,200 milligrams per liter with annual loads estimated, during a three year study, as ranging from 440,000 to 1,400,000 tons (Nelson 1979; WDFW *et al.* 1996).). Annual average transport above Mud Mountain Dam is estimated at 500,000 tons per year (Dunne 1986) and turbidity during summer months, July through September, ranges from 100 to 1000 NTU for the basin (Ladley *et al.* 1999). Data collected by the Washington Department of Ecology (WDOE) in 1996 indicates turbidity at the Sumner station (RM 4.9) ranged from 2 to 260 NTUs, and generally exceeded 25 NTU during summer months (WDOE 2001).

Sediment transport to the action area has been interrupted by Mud Mountain Dam since its construction in 1948. Originally, the configuration of the dam's tunnels was such that frequent deep pooling of impounded waters resulted, reversing the natural sediment regime as high sediment loads were mobilized with the falling water level rather than during high flow events (WDFW *et al.* 1996). The tunnels were modified in September 1995 allowing for more natural fluctuations in discharge rates and shortened water impoundment periods reducing the likelihood of suspended materials settling in the reservoir (WDFW *et al.* 1996). However, during high flow events, material still settles behind the dam and erodes over a much longer period than would occur in the absence of the dam. For instance, following a flood in February 1996 material that collected behind the dam continued to erode for three months afterwards (WDFW *et al.* 1996).

Sediment affects the abundance and quality of spawning gravels, pool riffle ratios, water quality, survival to emergence, the delivery of organic materials, and can potentially affect fish access. Determining the condition of the sediment indicator is difficult because the MPI was not written for glacial rivers like the White River, which naturally carry a high sediment load. Nonetheless, information exists to suggest that land use activities, gravel extraction, and the presence of instream barriers have altered the natural sediment regime within this basin (Kerwin 1999). Accordingly, changes in the timing, duration, and volume of sediment in the action area suggest that this indicator is functioning "at risk" under the MPI.

Changes induced by Flood Control and Water Withdrawal Projects. *Channel morphology, hydrology, and habitat access*. The most extensive changes in the White River have been the modifications to natural hydrological regime. These changes have significantly reduced chinook salmon rearing and spawning habitat and have altered channel morphology. Geological evidence suggests that the lower White River historically migrated, albeit sporadically, between the Puyallup and Green River basins. The last such event occurred in November of 1906 when heavy winds and rains flooded the basin and a log jam formed near Auburn causing an avulsion of the White River from the Green/Duwamish River basin into the Puyallup River through the Stuck River. The White River was permanently diverted into the Puyallup basin in 1914 with the construction of a concrete diversion at RM 8.5. As a result Puyallup River flows were permanently increased by about 50 percent and the drainage area was approximately doubled (Kerwin 1999).

Shortly after the 1906 event, several project were undertaken within the basin to alleviate flooding problems including construction of debris barriers construction (discussed previously), gravel removal, and several revetment projects. Revetment projects performed by the ICRI in the early 1900s included the installation of concrete pylons and wing walls, timber pile walls and deflectors, concrete levees and rock riprap armoring of dikes and banks (WDFW *et al.* 1996). The revetment and levee system in the lower river extended from Commencement Bay to about RM 11 of the White River (Kerwin 1999).

From RM 11.3 to RM 23.3, the White River is largely unconfined and is free to meander and migrate in response to flow. Between RM 23.33 and 24.3 two sets of old bridge abutments, Tacoma's dam, and the PSE diversion tend to limit channel migration. The mainstem White River, from its confluence with the Puyallup River to the PSE diversion at Buckley (RM 24.3), has lost about 7.2 percent of its channel length, whereas the lower Puyallup River, from its confluence with the White River to its mouth, has lost about 15 percent of its channel length since 1894-95 (Kerwin 1999). Since Mud Mountain Dam was constructed active geomorphic surface area and length of side channels in the White River from RM 11.3 to 23.3 has been reduced by 56 percent and 35 percent, respectively (MITFD unpub. data; Ecocline 2000).

Additional efforts to control flood waters in the basin included the construction of Mud Mountain Dam, which was authorized by the Flood Control Act of 1936. The project was designed to attenuate flood flows through storage and metered release of upper White River flows. For nearly 50 years the project attenuated floods greater than 2,000 cfs until pool levels reached the second tunnel. Today, the project has a total outlet capacity of 17,600 cfs (ACOE 2001).

A little more than five miles downstream of Mud Mountain Dam is PSE's hydroelectric project at Buckley (RM 24.3), which diverts a significant portion of the river's flow from about 21 miles of the mainstem White River. The Buckley water diversion was constructed in 1911 and has drastically reduced flows in the bypass reach, which includes the action area. Water is diverted at RM 24.3 and conveyed through a series of canals and settling basins to the Lake Tapps reservoir, then to the Dieringer Powerhouse for power generation, and returned to the White River at RM 3.5. In 1910, PSE was required by a Pierce County Superior Court to maintain a minimum flow of 30 cfs since its completion, although low-flows in the bypass reach have ranged between 0 cfs and 130 cfs (WDFW *et al.* 1996; Kerwin 1999). In 1986 an agreement was adopted between PSE and the Muckleshoot Indian Tribe that the project would maintain a minimum of 130 cfs within the bypass reach (WDFW *et al.* 1996). More recently, an agreement between the resource agencies and PSE (effective July 2001) resulted in minimum flows increasing to 350 cfs in April and May, and 250 cfs from June through October. Flows during November through January remain at 130 cfs, and increase to 200 and 275 cfs in February and March, respectively. These recent flow increases should improve conditions for chinook salmon in the action area.

Operations of the diversion are restricted by license (the first of which was issued by the Federal Energy Regulatory Commission in 1997) for minimum flows (130 cfs), ramping rates and the timing of scheduled outages (WDFW 2000). These requirements are intended to minimize the impacts of PSE's operations on fish within the basin. For instance, periodically (usually annually) PSE shuts off the diversion for maintenance reasons, at which time the river flows naturally through the bypassed reach. Abrupt changes in river flows have stranded fish in the bypassed reach as power generation turbines are brought on and off-line (WDFW *et al.* 1996). Recently, PSE shut down the diversion for maintenance, which resulted in natural flows in the 21 miles of the bypass reach. Prior to the outage, flows in the bypass reach were about 275 cfs and during the outage ranged from 700 to 1,400 cfs (WDFW 2000). When the maintenance activities were complete and flows returned to the diversion, flows in the bypass reach fell sharply stranding fish. The most notable incident occurred in September 2000, at Tacoma's dam where over 750 fish were stranded. Together the change in flows and the conditions (scour pool) formed by the dam heightened the severity of this event. Nonetheless, hundreds of fish may have been stranded throughout the 21-mile bypass reach when this activity has occurred in the past. In 2001, before maintenance activities occurred, PSE dug an egress channel from the pool to the mainstem White River to ensure fish could move out of the pool with the declining flows.

In general, the White River basin is considered "over-appropriated" meaning there is not enough water to support users, maintain instream flows, and support healthy salmon runs (State of Washington 1999). Surface and groundwater withdrawals and an increase in impervious surfaces have significantly affected flows in the White River and its tributaries (WDOE *et al.*

1995; Kerwin 1999). These changes have reduced the quantity and quality of chinook salmon habitat and accessibility, and are believed responsible for altering chinook salmon migration timing (Ladley *et al.* 1999).

As a result of historical and persistent activities, and water withdrawals within the basin the peak/base flow indicator of the MPI is considered "not properly functioning". Although increases in flows since 1986, and more recently in 2001, have improved chinook salmon habitat within the action area, these modifications are not expected to change the peak/base flow indicator to "at risk" as the hydrology of the White River is still markedly different than an undisturbed or properly functioning condition (NMFS 1996; S. Fransen, pers. comm., 2001).

Habitat access is also severely hampered by the three run of the river dams located within about 6 miles of each other (Mud Mountain, PSE's Buckley diversion, and Tacoma's concrete slab dam), as a result habitat access is considered "not properly functioning." Mud Mountain Dam and PSE's dam are total barriers to upstream migration (Kerwin 1999). To mitigate the effect of these dams, a trap is located at PSE's diversion and fish captured there are hauled above Mud Mountain Dam. Tacoma's dam, however, is considered a partial barrier to the upstream migration of chinook salmon, but can be a total barrier to other species. The dam has remained an impediment to adult upstream migration for roughly 80 years, although the effect was likely variable. Recent telemetry studies indicate that mortality and significant delays in the upstream migration of chinook salmon occurs at Tacoma's dam (Ladley *et al.* 1999). The structure is also well-known to poachers, and carcasses are a common site during adult salmon upstream migrations.

Although a fish ladder was incorporated into Tacoma's dam in the 1950s, bedload movement and irregular maintenance of the structure has made adult passage particularly perilous. Over time coarse sediment particles have pounded the structure and hastened its deterioration. As a result, rebar has become exposed, and the ends have sharpened to points. Fish captured at the Buckley trap have been observed with a number of fresh and bleeding wounds, many of which likely occurred as they passed Tacoma's dam. In 2001, Tacoma and others removed a large amount of the exposed rebar from the structure although some pieces were inaccessible at the time. Unfortunately, many of the pieces left behind were located within the ladder, and likely caused greater damage to fish migrating upstream than many pieces that were removed. Tacoma intended to go back to the structure a second time when flows were lower, so that they could better access the ladder and remove exposed rebar. Unfortunately, flows did not drop sufficiently to provide access to the ladder so no second attempt was made to remove rebar in the ladder. This maintenance activity was the first in more than 10 years, although it likely was the first time that exposed rebar was removed to promote safe fish passage (P. Hickey, pers. comm., 2002). In the past, maintenance was generally limited to extending the downstream apron to repair scour under the structure (P. Hickey, pers. comm., 2002).

Changes in flows in the White River have also reduced the efficiency of the ladder as it was built when low flows were only 30cfs. Today, low flows exceed 250 cfs and water sheet-flows across the concrete slabs around the sides of ladder providing insufficient depth to facilitate passage (R2 2000). Degradation of the channel below the structure has also reduced access to the fish ladder (R2 2000).

Water quality. Instream flows are only one of the water quality standards exceeded within the basin. The White River, listed as impaired under Section 303(d) of the Federal Clean Water Act, is in violation of the following standards within the action area: fecal coliform, mercury, copper, and instream flows (WDOE 2000). Boise Creek is listed as impaired for water temperatures (WDOE 2000). The basin, including the action area, ranges from "at risk" to "not properly functioning" for both the chemical contamination indicator and the temperature indicator of the MPI. High temperatures may increase the susceptibility of salmonids to infection, interfere with metabolism, and alter migration timing (Spence *et al.* 1996).

D. Effects of the Proposed Action

This section discusses the direct and indirect effects of the proposed action and its interrelated and interdependent activities. NMFS may use two approaches for assessing the effect of the proposed action (NMFS 1999). First, NMFS may consider the impact in terms of the number of Puget Sound chinook salmon that will be killed or injured during a particular life stage and gauge the effects on the population size and viability. Alternatively, NMFS may consider the effect of the proposed action on the freshwater biological requirements of the species, which is generally done in terms of the habitat indicators of the MPI.

In this analysis, the probable direct and indirect effects of the action on the chinook salmon and their critical habitat are identified. The ESA implementing regulations direct NMFS to do so "together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 C.F.R. §402.02)." Direct effects include those occurring at the project site and can extend upstream or downstream based on the potential for impairing fish passage, hydraulics, sediment and pollutant discharge, and the extent of riparian habitat modifications. Indirect effects are those effects that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Indirect effects can occur throughout the action area, and are used to help define the extent of the action area. Indirect effects may include changes in land use resulting from the construction of basic infrastructure needs that supports the development of undeveloped areas (WSDOT 2001).

The project has the potential to directly induce changes to the following components of chinook salmon habitat: habitat access, sediment transport, pool frequency and quality, off-channel habitat, large woody debris and riparian vegetation, streambank condition, and water quality. Although addressed separately, these changes may affect multiple indicators of functional chinook habitat. For example, changes in sediment transport within the action area would likely affect habitat access, water quality, streambank condition, off-channel habitat, and spawning and incubation success. These impacts could also be exacerbated by other adverse effects of the project on water quality, for example. Indirect effects of the project may include latent changes in sediment transport and habitat access. Development is not contingent upon the proposed project and therefore is not considered an indirect effect of the proposed project. The pipeline is currently used to transmit 113 cfs of water, which is withdrawn from the Green River under Tacoma Water's first diversion water right claim. While the new pipe section will be larger than the existing section, the amount of water withdrawn will not increase as Tacoma has agreed to voluntarily cap their first diversion water right claim at 113 cfs as part of their recent Habitat Conservation Plan with NMFS (R2 2001a).

In this analysis, the changes resulting from the proposed action are expressed in terms of whether it is likely to restore, maintain, or degrade an indicator of functional chinook salmon habitat. By examining the effects of the proposed action on the habitat portion of a species biological requirements, NMFS can gauge how the action will affect the population variables that constitute the rest of a species' biological requirements and, finally the effect of the action on the species's current and future health (NMFS 1999).

<u>1. Habitat access.</u>

The proposed project will likely affect short-term and long-term access in the White River and its tributary, Boise Creek. Short-term effects may range from beneficial to adverse. In the longer-term, the project will improve passage conditions in the White River, which are currently considered "not properly functioning". Changes in the elevation of the riverbed could adversely affect access into Boise Creek; however, such effects will be minimized through post project monitoring and responsive actions. Responsive actions to maintain temporary and long-term passage into Boise Creek will depend upon the specific conditions observed, and may include the construction of notched logs, boulder weirs, or the placement of a concrete Denil fish ladder. Necessary mitigative actions would be reviewed by NMFS, FWS, and the ACOE through reinitiation of this consultation.

Short-term effects. Construction activities will take place over about 11 weeks during the height of the upstream migration of White River chinook salmon. Roughly 70 percent of the run is expected to pass the project during construction. Construction activities may interrupt chinook salmon migration to upstream areas by increasing water velocity, channel gradient, and concentrations of suspended sediment, while reducing hydraulic complexity. Human activity could also induce behavior changes in migrants. The project contains several measures to reduce these potential effects

Construction activities (i.e., clearing, grading, vegetation removal, and excavation) could increase suspended sediment concentrations within the White River, and possibly Boise Creek. The effects of such loading would vary with the magnitude and duration of the event and could range from no adverse affect on migration, to migration delay or diversion (straying) of migrating fish (Bjornn and Reiser 1991; Spence et al. 1996). Particle angularity, size and toxicity are elements likely to affect the response of fish to sediment inputs, and these characteristics are easily altered by construction activities (Noggle 1978). Particulate materials have been documented to physically abrade and mechanically disrupt respiratory structures (fish gills) and respiratory epithelia of benthic macroinvertebrates (Rand and Petrocelli 1985 *in*

Spence et al. 1996). In glacial deposits particle shape is usually naturally rounded, however, compaction can fracture particles changing their shape to angular, thus increasing the risk of abrasion (Noggle 1978).

The coffer dam will minimize the risk of severe changes in suspended sediment concentrations resulting from excavation. Several other measures are included in the project that will further reduce the risk of increased turbidity on migrating fish. These include monitoring (water quality, fish passage, and sediment controls), routing turbid water within the work area to settling basins (Baker tanks), encircling all cleared areas with silt fences, and covering all disturbed areas that will be unworked for more than seven days with straw or mulch. Although such measures will significantly reduce the risk of increased sediment loading, such measures are not expected to fully eliminate this risk. For instance, initial construction activities (cutting the first bypass) will be done without a coffer dam, but the coffer dam or a silt fence could also fail during the project, and a sediment pulse could enter the White River. NMFS expects, however, that any problem with preventive measures (i.e., coffer dam or silt fences) would be quickly detected, and immediately rectified such that any resulting surge of sediment would attenuate to background levels relatively quickly.

The coffer dam will also concentrate river flows along the margins of the channel, and according to the biological assessment will reduce the river cross-section up to 70 percent. The coffer dam will directly preclude access to the existing fish ladder. To maintain passage around the construction site, the project includes opening a corridor within the concrete dam, near the bank opposite of the coffer dam. The hydraulic conditions of the corridor would be monitored and a temporary fishway will be installed if a continuous hydraulic path with suitable velocities and water depth for chinook salmon passage cannot be maintained (R2 2000).

NMFS expects that it would be difficult to maintain adequate hydraulic conditions for passage as the river's energy will be constricted by the coffer dam, and would likely increase velocities through the site. As a result, NMFS expects that it will be necessary to install the temporary fish ladder early in the project to provide conditions passable by chinook and other fish. By design, the temporary Denil fish ladder would reduce water velocity and should maintain adequate hydraulic conditions for passage (Reeves *et al.* 1991). NMFS expects that after the temporary fish ladder is successfully installed, passage conditions will temporarily improve over baseline conditions as migrants will likely suffer fewer abrasions than they would passing through the existing ladder.

After construction is complete and the dam is removed, passage may also be temporarily impaired as a high gradient riffle will likely result in the project area (R2 2000). High flows are expected to redistribute sediments and reduce the gradient of the channel bed. Between the time construction is completed and the sediments are redistributed, passage would probably be impaired. However, the project proposes several measures to reduce this potential effect. First, Tacoma will ensure that the channel bed is smoothed to a gradual slope before the project is completed. According to R2 Resource Consultants (2000) this should reduce the risk that multiple shallow flow paths will develop. Second the project will be monitored weekly until the onset of high flows. If monitoring reveals passage problems, then Tacoma proposes to inform NMFS and other resource managers of the problem, then Tacoma will establish a passable channel through the area using hand tools.

Long-term effects. The proposed project will improve habitat access within the White River, while it is highly likely to further degrade access to Boise Creek. Removal of the dam will result in fewer wounds from passage, reduced poaching opportunity, reduced or eliminated migration delays, and will improve the functional processes that maintain chinook habitat (i.e., channel migration and LWD recruitment) in the White River. Yet the removal or maintenance of Tacoma's dam was not identified as a priority action in previous planning for the recovery of White River chinook salmon (WDFW et al. 1996). An average of five percent of the chinook tagged for a recent radio telemetry study died at Tacoma's dam (Ladley et al. 1999; Ladley, pers. comm., 2001 [Email 8/15/01]). Of the chinook salmon that pass the structure successfully, however, many have been observed at the Buckley trap with signs of fresh injuries that appeared to be caused by the rebar at Tacoma's dam. The proposed project will remove this source of injury, stress and mortality to chinook in the White River.

On the other hand, the proposed project will alter the existing longitudinal profile of the White River channel, which, in turn, is expected to increase the slope of lower Boise Creek (R2 2000). According to R2 (2000) lower Boise Creek presently has a gradient of about 1.52 percent, measured between its confluence with the White River and Mud Mountain Road (Madsen, pers. comm., 2002 [Email 01/14/02]). Removal of the dam is expected to result in the rapid lowering of the bed of the White River between 2 to 4 feet (R2 2000).

In evaluating the proposed action and formulating its biological opinion, NMFS must provide the benefit of the doubt to the species concerned (50 CFR 402.14). Therefore for the purposes of this analysis, NMFS assumes that the project would likely cause the bed of the White River to drop by 4 feet. As a result, and with no change in the upstream base level, then the gradient of Boise Creek would increase to 2.21 percent, potentially impeding fish access, particularly during low flow (R2 2000; Madsen, pers. comm., 2002 [Email 01/14/02]).

The rapidity of the channel bed changes would depend upon the magnitude and frequency of flood events that occur in the White River after the proposed project is completed. R2 (2000) expects that the bed will re-equilibrate within 5 to 25 years after the dam is removed, and that the Boise Creek channel will not degrade more than about 500 feet upstream of the White River to Mud Mountain Road bridge (R2 2000). However, Tacoma proposes to monitor Boise Creek for up to 25 years or until equilibrium is reestablished (whichever is shorter) because the response of the channels cannot be accurately predicted (R2 2000).

If monitoring reveals that the channel changes are degrading passage into Boise Creek then Tacoma will install a temporary fishway (i.e., notched logs, boulder weir, concrete Denil ladder) until the channel reestablishes equilibrium. Tacoma proposes to install a temporary fishway in Boise Creek if the gradient increases 12 percent over a 100-foot length or if fish are delayed at the mouth of the creek. If necessary, a permanent, final solution will be identified in consultation with NMFS and FWS (the Services), and State and Tribal agencies when the channel has reached equilibrium (R2 2000).

While Tacoma proposes to monitor the longitudinal profile of Boise Creek for 25 years or until the channel reestablished equilibrium, explicit evaluation criteria that would be used for determining that the channel has reestablished equilibrium have not been provided. As a result it is difficult to establish with certainty how long Boise Creek will be monitored or the trigger for a permanent solution, outside of the 25 year period of effects anticipated by R2 Resources.

Nearly 300 chinook salmon have spawned in Boise Creek each year for the last five years. The project could seriously restrict access to chinook salmon that would use Boise Creek for spawning and rearing. Installation of one of the proposed structures, however, should assist adult salmonids migrating upstream. In evaluating appropriate types of fishways, consideration should also be given to a structure that also maintains conditions adequate to pass upstream migrating juvenile salmonids. In other basins, side channels fed by clear groundwater and valley-wall runoff provide critical non-turbid (or low turbid) habitat and are extensively used by chinook fry (Murray and Rosenau 1989; Chamberlain *et al.* 1991; Scrivener *et al.* 1994). Studies suggest that even nonnatal clear-water tributaries are used by juvenile chinook salmon and that these habitat types provide juveniles an opportunity to maximize their growth and survival through increased feeding success (Murray and Rosenau 1989). Based on these studies, NMFS expects that juvenile chinook salmon from upstream areas may enter Boise Creek seeking refuge from high flows and high turbidity within the White River.

Excessive downcutting and fishways that prevent channel migration and natural processes could further impair already degraded channel conditions in lower Boise Creek where erosion and incision are evident. During this consultation, Tacoma has explicitly stated that it will not be responsible for funding rehabilitation actions designed to restore Boise Creek to conditions that would have been present before the construction of SR 410. Although, NMFS understands Tacoma's concern, it is also possible the most appropriate and cost effective long-term solution to restoring fish passage in Boise Creek is the construction of a lower gradient, sinuous channel, especially if juvenile passage is considered.

2. Sediment transport

The proposed project will affect fine and coarse sediment transport within the action area. Tacoma's existing dam affects aggradation and degradation of the channel for 750 feet upstream and about 900 feet downstream (R2 2000). The total volume of materials stored behind the existing dam is estimated at approximately 11,850 cubic yards (R2 2000). Removal of the structure will release this sediment, which largely consists of coarse material. The base level of the channel is expected to drop upstream of the existing structure and may be noticeable as far upstream as the PSE diversion, whereas downstream degradation and any sediment plumes that may occur during construction are not expected to extend further than two miles downstream of the existing structure. Degradation of the channel upstream of the pipeline is not expected to affect access to either the White River hatchery or the Buckley fish ladders, which are located on the right and left banks, respectively (S. Madsen, pers. comm., 2002). However, as the channel redistributes sediments following dam removal, spawning and incubation success will be reduced in the action area. The speed of the channel readjustments will depend upon the magnitude and frequency of flood events within the action area. According to R2 (2000) it could take up to 25 years for the channel to readjust to the new (no dam) condition.

Fine sediment transport. The project has the potential to adversely alter fine sediment transport in the action area, both over the short-term and long-term. Short-term effects of increased fine sediments are also discussed under habitat access. The use of heavy equipment and earth moving activities have the potential to increase fine sediment delivery to the White River and Boise Creek during construction activities. Summer construction activities, use of a coffer dam, and the implementation of an erosion and sediment control plan will minimize these effects.

The effect that the project would have on fine sediment transport over the long term appears minimal. Erosion of the cleared and graded areas could continue beyond the project construction, although the project proposes to use sediment controls, revegetate, and use mulch to reduce surface erosion from the site. The banks in the project area, however, will be vulnerable to erosion, at least initially, because the proposed construction activities will alter soil characteristics and remove vegetation. As a result, lateral erosion of the banks is likely to occur as the channel reestablishes equilibrium. The project proposes to riprap the banks to reduce lateral erosion and limit increases in sediment transport from adjacent areas.

Removal of the dam is expected to largely affect coarse sediment transport in the action area. Excavation will likely leave small particles at the surface that will be mobilized relatively easily once the coffer dam is removed. Turbidity in the action area, however, should quickly attenuate to background levels after the coffer dam is removed.

Coarse sediment transport. The dam currently stores about 11,850 cubic yards of sediment, roughly 4 to 6 feet high. When the structure is removed this material will redistribute, resulting in the rapid lowering of the bed upstream of the dam and aggradation of the bed downstream of the dam. According to HDR (1999), the channel downstream of the dam would likely aggrade for a couple of years, but then the channel is expected to degrade at a rate equal to the reach upstream of the dam. During this period of aggradation the bed level downstream of the dam is expected to rise two to three feet (HDR 1999).

Degradation of the channel is expected to extend to the PSE diversion about 5,000 feet upstream of the pipeline (HDR 1999). Based upon the flow return interval at which coarse sediment is generally mobilized, R2 (2000) estimates that it will take between 5 to 25 years for the White River to re-equilibrate following removal of Tacoma’s dam. As a result, Tacoma expects that the spawning and incubation success of chinook salmon may be adversely affected in the action area for up to 25 years following removal of the dam (R2 2000).

Fine sediments mobilized by the project have the propensity to reduce incubation success through the filling of interstitial spaces within redds, which in turn could reduce intragravel flow, as well as act as a barrier to emergence (Spence *et al.*1996). Redds may also be scoured and filled within the action area as coarse sediment is mobilized. Eggs deposited in this three mile reach may be buried or dislodged as the bedload shifts, reducing survival rates of chinook salmon spawning in the action area.

Data on the average number of chinook that use the action area for spawning and rearing is limited. Surveys in the action area suggest very low redd densities for chinook (2 to 7 redds per mile). These data, however, probably severely underestimate the number of chinook that spawn in the lower White River (including the action area), because surveys below the PSE diversion have typically been conducted over extensive distances and were primarily limited to the mainstem White River. Surveys conducted in downstream reaches by the Muckleshoot Indian Tribe have established chinook salmon redd densities as high as 113 redds per mile in the mainstem and more than 250 redds per mile when side channel habitat was included (Malcom and Fritz 1999). Together these data illustrate the range of redd densities observed within the White River downstream of the PSE diversion. Although superficial observation of the habitat in the action area and the downstream reaches surveyed by the Muckleshoot Indian Tribe does not account for the wide range in redd densities between these two data sets, some of the disparity might be attributed to differences between the reaches in subsurface flows or upwelling (Healey 1991; Massmann 2001). Nevertheless, these data sets were examined as the best available information on chinook salmon spawning below the PSE diversion, including the action area.

Although the bedload may shift in the action area for up to an estimated 25 years, major shifts will occur with peak flood events. Flows capable of moving bedload occur roughly on a 2-year return interval (R2 2000). In any case, survival of chinook salmon that spawn in the action area will not unilaterally be affected throughout the entire action area. More likely, the redds in the most tenuous position will be those nearest the head-cut as it travels upstream. Mortality will likely be highest at this point and progressively diminish further upstream and downstream away from the head-cut. Mortality, as with the amount of material moved, will also vary by year and flow.

3. Pools and off-channel habitat

The existing dam affects channel morphological features through local flow dynamics, and the development of macro habitat units (ie., pools, glides, riffles) within the action area. Removal of the dam will result in reworking or shifting of habitat units, similar to that which might occur during a large flow event or mass wasting event. R2 (2000) suggests that the overall pool-riffle to braided channel morphology is not expected to change as the river reestablishes grade. This is primarily because valley and reach level morphology is influenced by climate and geology (Montgomery and Buffington 1993), not the project. Sediment transport processes within the action area are influenced by Tacoma's dam and its removal will alter the abundance and character of channel habitat units (the pool to riffle ratio) in the action area, as well as alter local hydraulic and current complexity (Spence et al. 1996). NMFS expects that in the short-term the project may degrade these indicators (pool quality, pool frequency, and off-channel habitat) of functional chinook salmon habitat. However, through the addition of wood from the project site, as well as recruitment of wood from lateral erosion as the channel adjusts to a new stable condition, the project is expected to maintain these indicators over the long term, and could incrementally improve these indicators.

R2 (2000) anticipates that aggradation is likely to expand the existing cobble bars immediately downstream of the project, and that the large right bank scour pool downstream of the dam will fill as sediment redistributes. This large pool is associated with the dam and has previously been a source of significant fish kills, as fish have been trapped within the pool when sudden changes in flows occurred as a result of upstream hydropower operations. Of the remaining pools surveyed below the Tacoma's dam, three are associated with fixed obstructions, such that infilling that occurs should be temporary or limited. For instance, R2 (2000) anticipates that substantial aggradation is likely to influence only the two pools formed by meander bends, roughly 1.0 and 1.5 miles below the dam. According to R2 (2000) these pools are formed by regular bedform oscillations, so that the wave of sediment is likely to have a temporary affect on pool volume. While temporary, the effect could last for several years depending upon flows (HDR 1999). Until sufficient flows scour the pools again, the abundance and quality of pool habitat may be significantly reduced in the action area.

Generally early-run chinook frequent pools during their upstream migration and holding period. Deep pool habitat, which provides important resting areas to migrants and could provide some thermal relief from warm mainstem waters, is limited in the action area. Large pools are also particularly important to juvenile and adult chinook salmon. Pools provide deep areas to hide from predators, low velocity resting areas, and areas of thermal refugia (Reeves *et al.* 1991). In fact, pools are generally the most productive rearing habitat available to juvenile salmonids (Sedell and Everest 1991 *in* Spence et al. 1996). Pools also provide thermal and metabolic refugia for adult chinook prior to spawning (Bermann and Quinn 1991). Although Ladley *et al.* (1999) did not find White River chinook holding for extended periods within the bypass reach, this behavior may be an artifact of the degraded pool condition throughout the reach.

Removal of the dam is also expected to alter side channel habitat within the action area. According to R2 (2000), the four side channels identified downstream of the structure may transmit flows on a more frequent basis as a result of increases in water surface elevation from aggradation. Further, shifts in bedload may reduce the connectivity of side channels upstream of the dam (R2 2000). Evidence suggests that side channels are important for chinook salmon spawning and incubation in the White River, and that the density of chinook spawning in side channel habitat is significantly higher than the mainstem (Malcom and Fritz 1999). Increases in flows in side channels downstream of the dam could reduce the pool frequencies and quality, increase redd scour, and reduce the amount of habitat with water velocities suitable for juvenile chinook rearing. Conversely, disconnection of side channels upstream of the dam would result in the outright loss of suitable habitat for spawning and rearing.

NMFS expects that these effects will be minimized by the addition of trees from the project site. Although, much of the riparian forest slated for clearing is composed of fairly small deciduous trees, Tacoma has committed to pushing over trees to retain as much of the root wad intact, as possible (G. George, Tacoma, pers. comm., 2002). Large root wads will increase stability of the wood, as well as provide habitat complexity important for juvenile chinook salmon. Further, as channel adjustments occur erosion along the banks and instream gravel bars is likely, which could increase wood recruitment to the action area. Increased wood loading and temporary aggradation could also initiate formation of new side channel habitats (R2 2000; Bryant 1980). It is difficult to predict the net effect that the project will have on the complex interactions that govern pool frequency and quality, and off-channel habitat formation and stability. The addition of wood from the project site and replanting of the cleared areas will help alleviate the effects of sediment waves through the action area, and may overtime improve the frequency and quality of pool habitat. Thus, NMFS expects that short-term changes in these indicators may be adverse, but that over the long term the project will maintain, and possibly improve these indicators of functional chinook salmon habitat.

4. Large woody debris and riparian vegetation

Construction activities will result in the clearing of about 1.5 acres of floodplain wetland and riparian vegetation. As a result, the project will reduce the amount of recruitable wood from these areas over the short-term. Over the long-term, the floodplain wetland and riparian vegetation, both indicators of functional chinook salmon habitat, are expected to improve through the replanting of a variety of long-lived, large tree species, such as Douglas fir and western red cedar. Although there remains a temporal loss in the functions that the wetland and riparian vegetation provided, NMFS expects that these functions will continue to improve as the vegetation grows.

Performance standards for the restoration of the wetland and riparian vegetation are outlined in the BA. In general, Tacoma proposes to monitor plantings for 5 years following construction. If mortality exceeds 10 percent in year 1, 20 percent in year 3, or 50 percent in year 5 then the site will be replanted. This may, however, be insufficient to evaluate revegation. According to a recent publication by the National Research Council (2001) functional performance criteria for vegetation growth is frequently based on insufficient time frames (usually 5 years) to evaluate success. NRC suggested that longer-term management may be necessary, as it may take some sites up to 20 years to achieve functional goals.

To minimize the short-term effects of reduced opportunity for wood recruitment from cleared areas Tacoma proposes to place the trees cleared from the project site into the White River channel following construction (R2 2000). Although most of the trees are too small to be considered key LWD pieces and are not expected to remain in place, they may be recruited by downstream LWD jams, increasing the size and complexity of existing jams. Most of the trees cleared from the construction site consist of red alder. Alder has a relatively short life span in the channel compared to conifers (Cederholm et al. 1997) and thus any beneficial effect would likely be short-lived. However, the rapid decay of the alder could also temporarily boost aquatic insect production, potential prey for juvenile chinook salmon, in the action area. Despite its small size and short life span, the increase in wood in the action area may create pockets of hydraulic complexity, and could improve channel sinuosity or aid in the development of off-channel habitat (discussed previously). Shifts in the channel from the removal of the structure could also promote the recruitment of additional trees and further increase wood loading in the action area. Presumably some of these trees would qualify as LWD according to NMFS' MPI. Overall, NMFS expects that floodplain vegetation and LWD loading will incrementally improve over the long-term as a result of the proposed project.

5. Streambank condition

The project will alter at least 300 linear feet of stream bank on both sides of the White River through clearing and grading, and trench excavation. In the short-term, streambank condition will degrade through the loss of stabilizing features like tree roots, reduced soil porosity from compaction, and increased erosion. Over time NMFS expects that stream bank function would improve through the planting of riparian vegetation.

R2 (2001b) anticipates that the area with the highest potential for erosion is immediately upstream of the dam, where the redistribution of stored material is likely to lower the channel profile, which would indirectly undermine the banks. To reduce the erosion along the unstable banks, Tacoma proposes to install a rock toe key, below the riverbed elevation. The quantity and size of rock proposed would depend upon the maximum scour depth (R2 2001b), which will be modeled before construction. In addition to using rock, Tacoma proposes to install deflector logs no less than 2 feet in diameter, keyed into the bank below the ordinary high water mark, as well as geotextile fabric and willow stakes above the ordinary high water mark (R2 2001b).

While riprap should promote a stable bank condition that would accelerate the establishment of riparian vegetation, it can also interfere with river and floodplain interactions, reducing or interrupting the processes that promote and maintain functional chinook salmon habitat, such as channel migration and LWD recruitment (Beechie and Bolton 1999). As a result, fish use of the margin habitat could decline (Peters et al. 1998; Knudsen and Dilley 1987).

Finally, Tacoma has determined that if final bank stabilization is significantly reduced and the contractor operates a double shift when feasible, then the total time needed for instream construction could be reduced to about 6 weeks (R2 2001c). Doing so, would reduce the number of chinook salmon that would be in or passing through the site during construction from 70 percent of the run (discussed previously), to about 40 percent based upon Buckley trap returns (ACOE, Seattle District, *unpubl. data*).

6. Water quality

The proposed action will likely have an incremental adverse effect on the following water quality indicators: sediment/turbidity and chemical contamination. These indicators are currently degraded in the action area. NMFS believes that the proposed action minimizes these effects to the extent possible through monitoring and preventive measures.

Water quality could be adversely affected through the remobilization of fine sediment stored in the channel and erosion of cleared and graded areas (R2 2000). Although, Tacoma proposes to monitor turbidity daily at the site to ensure increases remain below state standards, NMFS has not yet determined the adequacy of those standards for avoiding jeopardy and adverse modification of chinook salmon habitat. Even in a glacial system like the White River increases in sediment yield can have adverse effects. Evidence suggests that fish density is naturally lower in glacial systems than would be expected in clear water systems, indirectly resulting from sediment concentrations and duration (Newcombe and Jensen 1996). Activities that increase the natural loading of sediment can indirectly influence productivity, incite changes in migratory behavior, reduce light penetration and the reactive distance of foraging fish, and reduce survival and emergence of alevin (Spence et al. 1996). However, the project contains several measures aimed at reducing this potential adverse effect, such that NMFS does not expect prolonged or extensive changes in turbidity during construction.

The use of heavy equipment in the channel also has the potential to increase pollutants through fuel spills or leaks. Tacoma proposes to steam clean and inspect equipment to minimize potential adverse effects on water quality from fuel leaks. NMFS expects that this will minimize the effects of the proposed action on chinook salmon and their critical habitat. As a general matter, when pollutants (e.g., metals, PAHs and other pollutants) enter streams, water quality degrades and biological oxygen demand is increased. As a result, lethal or sublethal effects may occur (NRC 1996). While NMFS does not expect episodes of acute exposure, NMFS believes it is possible some juvenile chinook in the action area may be exposed to small amounts of pollutants (e.g., ionic copper, or PAHs), which could increase susceptibility to infection and possibly predation (NRC 1996).

E. Cumulative Effects

Cumulative effects are defined as those effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area considered in this Opinion (FWS and NMFS 1998; 50 C.F.R. 402.02). Future Federal actions, including the ongoing operation of hatcheries and hydropower dams, that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Activities and land uses within the action area are generally rural and agricultural. The cities of Buckley and Enumclaw are south and north of the action area, respectively, and are linked by Highway 410. According to the biological assessment, residential development and agriculture are generally restricted to the bluffs above the river (R2 2000). Little development exists on the floodplain of the action area. Immediately adjacent to the project on the north bank is a residential home.

During the course of this consultation, the residential property became available for purchase. King County had identified the property as candidate for a potential flood buy-out in the 1993 King County Flood Hazard Reduction Plan because of its flood risk (J. Stypula, King Co., pers. comm., [Email 01/11/02]). King County has a signed purchase agreement with contingencies, which is expected to close in February 2002. King County intends to purchase the property to preserve it as open space and passive uses in conjunction with the Enumclaw Plateau trail (J. Stypula, pers. comm. [Email 01/15/02]). NMFS expects that gradual improvements in habitat conditions for salmonids will occur as a result of this shift in land ownership. For instance, in time King County may remove the building and replant riparian vegetation.

F. Conclusion

Puget Sound chinook salmon exist as 21 distinct populations; one of which includes chinook in the White River basin. White River chinook salmon are biologically and genetically unique, as they are they only spring run within south Puget Sound. Actions that would result in the extinction of this population would risk permanent loss of unique genetic and life history information that may be critical to the survival and recovery of the Puget Sound ESU. For these reasons, this population has been the focus of intense recovery efforts and artificial reproduction since the 1970s as a result of the downward trend in escapement. Recently, NMFS listed the hatchery stock as one of only five hatchery stocks essential to the recovery of Puget Sound chinook salmon (64 Fed. Reg. 14308, March 1999). Population declines in the 1980s were precipitous, such that in 1986 only 8 fish were passed above the White River dams. In the last 10 years, however, the population has been experiencing an upward trend in the number of chinook being passed above the dams. The trend is considered largely a result of artificial propagation and outplanting efforts, and reductions in harvest. NMFS is not aware of information to suggest that habitat conditions have improved such that the trends could be attributed solely to increases in natural spawning.

Tacoma's dam, intended to protect pipeline number 1, has impeded the upstream migration of White River chinook salmon for roughly 80 years. The structure affects White River chinook salmon through migration delays, significant injury, and mortality. Presumably, these effects have persisted for the life of the structure, albeit the extent of these effects have likely varied annually depending upon the condition of the structure and annual flows. Changes in instream flows since 1986 have rendered the structure less efficient at passing chinook and other salmonids. Further, high bedload within the White River and a lack of maintenance has created particularly treacherous conditions as fish are injured or killed by exposed and sharpened rebar. Based on two years of radio telemetry data, it appears that an average of 5 percent of adult White River chinook salmon may die at the structure before spawning (Ladley et al. 1999). Countless others may experience significantly decreased reproductive capacity on the spawning grounds, or die from stress and infection of open wounds before spawning. Unfortunately, no data are available to suggest the extent of these latent effects on chinook salmon.

Clearly, removal of the structure would improve passage conditions for chinook salmon and other salmonids, and reduce present levels of injury, mortality, delay and other forms of harm and harassment. As a result it is unclear to NMFS why maintenance or removal of Tacoma's dam was not identified as a priority corrective action under the White River chinook salmon recovery plan (WDFW et al. 1996). Where feasible, dams and other man-made barriers to migration are often recommended for removal as the potential for beneficially affecting fish populations is usually high (Spence et al. 1996; Orsborn 1986). NMFS expects that the proposed project similarly has a high potential for beneficially affecting fish populations in the White River, although the benefits will vary among species.

After reviewing the current status of Puget Sound chinook salmon, the environmental baseline for the action area, issuance of the 404 permit and the subsequent construction of the proposed action, and the cumulative effects in the action area, it is NMFS' biological opinion that the action is not likely to jeopardize the continued existence of Puget Sound chinook salmon and will not result in the destruction or adverse modification of designated critical habitat. The structure presently has a measurable effect on the White River chinook salmon population. Therefore, in making this determination of no jeopardy, NMFS considered whether the effect of the proposed action will increase the extent, duration, or frequency of the take which presently occurs. Although the effects of the dam removal will adversely affect reproduction and incubation success within the action area for up to 25 years, NMFS does not anticipate this loss will exceed the loss resulting from the existing structure. Even though the White River chinook salmon population has been improving in recent years, despite the presence of the degraded dam, NMFS expects that returns would be higher in response to removal of this obstruction.

The effects of the proposed project are minimized through the proposed mitigation measures. Further, monitoring and reporting requirements will provide critical information to assess the extent to which these measures are successful and allow for meaningful responses. In arriving at a non-jeopardy conclusion for this action, these minimization measures were important to consider against the effects of the proposed action. NMFS expects, as described in the preceding sections, that these measures will reduce the degree and likelihood of adverse effects on chinook salmon and their habitat. Further, the project will improve other habitat indicators (i.e., riparian vegetation) that are degraded in the basin, which, over time, would indirectly improve other indicators of functional chinook habitat (e.g., increased LWD loads and higher pool frequencies). It is NMFS' opinion, that the negative effects associated with the project are minimized or eliminated through adherence to the project design and conservation measures.

G. Incidental Take Statement

Sections 4 (d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including spawning, rearing, feeding, migrating, and sheltering. Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the ACOE so that they become binding conditions of the 404 permit, as appropriate, for the exemption in section 7(o)(2) to apply. The ACOE has a continuing duty to regulate the activity covered by this incidental take statement. If the ACOE fails to (1) assume and implement the terms and conditions, (2) require Tacoma to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the 404 permit, or (3) if Tacoma fails to adhere to the terms and conditions, the protective coverage of section 7(o)(2) would terminate. This take statement also provides reasonable and prudent measures that are necessary to minimize the adverse effects of the proposed action and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures. The ACOE or Tacoma must report the progress of the action and its effect on the species to the NMFS as specified in the incidental take statement [50 C.F.R. §402.14(i)(3)].

1. Amount or Extent of the Take

NMFS considers the proposed action "likely to adversely affect" because it is reasonably certain to result in the incidental take of Puget Sound chinook salmon and it has the potential to hinder the attainment of relevant properly functioning indicators (NMFS 1996, 1999). Incidental take is reasonably certain to occur as a result of adverse effects on chinook salmon habitat parameters (e.g., habitat access, water quality, habitat elements, and channel condition and dynamics) that directly affect the life history of aquatic species. Adverse effects from the construction activities of the proposed project could impair essential behavioral patterns including feeding, rearing, migrating, sheltering, and spawning. These effects have been discussed qualitatively in the preceding sections. The actual number of individual fish taken as a result of the project is not possible to determine. While direct injury or death may unintentionally result during construction activities, harm is more likely to accrue by exposure of fish to the identified degradation of habitat affecting all life stages. The timing, duration, and extent of such exposure will vary over time.

NMFS anticipates that incidental take is reasonably certain to occur through short and long-term changes in habitat access, riparian vegetation, substrate, and streambank condition. NMFS expects that some of these stressors have more than a negligible likelihood of resulting in the incidental take of Puget Sound chinook salmon. As part of the existing baseline, the project already exhibits a level of adverse effect measurable at the population level. NMFS has determined that construction of the proposed project will result in reduced levels of injury, mortality, delay and other forms of harm that presently occurs at the structure. The following reasonable and prudent measures will further reduce the level of incidental take anticipated with the proposed action.

2. Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of chinook salmon. The ACOE shall ensure that Tacoma:

1. Avoids or limits adverse effects on chinook salmon in or migrating through the action area during construction activities.

2. Avoids or limits adverse changes to habitat access, riparian vegetation and large woody debris, substrate, and other indicators of functional chinook habitat in the White River and Boise Creek.

3. Monitors implementation and effectiveness of all conservation measures described in the biological assessment, as well as the aforementioned Reasonable and Prudent Measures and their accompanying Terms and Conditions.

3. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the ACOE and Tacoma must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure 1 the ACOE will ensure that:

    a. The duration of proposed construction is compressed using multiple work shifts and reducing the extent of bank stabilization. Tacoma estimates these action could reduce the project construction time by 5 weeks (R2 2001c). To ensure work is completed on a compressed schedule Tacoma shall establish a penalty under contract with the construction firm for each day the project exceeds the anticipated 6 week schedule. If the duration of instream activities can be further reduced from the initial proposal, then every effort must be made to minimize the overlap of construction activities with the upstream migration of chinook salmon. Conversely, if construction activities exceed the 6 week estimate and penalty funds are collected, Tacoma shall establish a dedicated escrow account with the funds. Collected funds shall be dedicated to future actions needed to restore properly functioning conditions for chinook salmon within the action area, such as reestablishing a more sinuous channel in lower Boise Creek.

    b. Tacoma revises the fish removal plan to minimize potential injury and stress to fish trapped within dewatered work area as follows: Fish trapped in the work area shall be removed using seines, nets, and by hand. Electroshocking shall not be used for fish collection. As the work area is dewatered, numerous rescuers will gather fish trapped in the work area using hands, nets, and buckets. Captured fish will to be returned to the mainstem White River upstream of the project area. If signs of stress are observed during dewatering and handling, fish must be provided a quiescent resting period in buckets filled with river water before returning to the mainstem river. A supplemental oxygen source must be provided to fish held temporarily in buckets or other clean containers.

    c. Pump screens shall be checked at regular intervals to ensure that they are functioning properly, clear of debris and are not entraining fish. Should fish become entrained, then the pump shall be turned off immediately, and actions must be taken to reduce the potential for entrainment, such as moving the screen further away from the pump.

d. The Denil fish ladder shall be installed immediately upon completing the corridor through the dam to minimize the risk that the project will create adverse hydraulic conditions that could impede fish migrating upstream of the action area. The Denil fish ladder will remain in the channel for the duration of construction activity below the OHWM or as long as the dam remains in place.

e. Tacoma prepares a fish passage monitoring and contingency plan for reference on site during construction activities. The plan shall include, at a minimum, provisions for the following: (1) monitoring fish passage at the site during construction activities, (2) using trap returns at Buckley and the White River hatchery as an indicator to determine the success of passage beyond the project; (3) proposed contingencies (response measures) if the Buckley trap returns are unusually low or other passage problems are observed during construction activities. The plan will explicitly state criteria for evaluating passage at the site based upon suitable habitat/passage conditions established in scientific literature, and observations of fish behavior. Contingency measures should provide flexibility to respond to a range of conditions, but should at a minimum include provisions for halting project activities if fish activity is significantly diminished at the Buckley trap. Thresholds for determining responses must be explicit within the plan. The plan shall be developed in coordination with, and approved by NMFS and FWS. The plan shall be submitted to the Services no later than 60 days from receipt of a signed Opinion.

f. To reduce the potential for adverse effects on water quality, Tacoma shall commit to the following provisions: (1) all heavy construction equipment must be clean prior to operation in or near the White River, Boise Creek and associated wetlands; (2) hydraulic machinery shall use non-toxic hydraulic fluids when operated in or near the White River, Boise Creek and associated wetlands; (3) all refueling areas will be located in a previously approved location or otherwise 300 feet or more from all sensitive aquatic areas, including the White River, Boise Creek, and their associated wetlands; and (4) refueling areas must be diked and lined to prevent spillage into sensitive areas.

2. To implement reasonable and prudent measure 2 the ACOE will ensure that:

a. Barrier fences are installed along the clearing limits to delineate protected areas. Fences must be located outside of the drip line of any mature trees to be retained on site.

b. Where disturbance or vegetation removal is necessary, then Tacoma will ensure that trees are pushed over or dug-out to retain as much of the root structure as possible. Trees greater than 8 inches and longer than 36 feet will be distributed as follows: Two-thirds of the wood will be distributed as proposed in the biological assessment, and one-third will be distributed within 50 feet of the banks to be recruited over time as shifts in the channel occur.

c. If planted areas are not meeting performance criteria for vegetation growth, the monitoring and replacement regime will be continued for another 5 years, or until performance criteria are met.

d. Tacoma will limit disturbance to the large woody debris dam located on the right (north) bank immediately downstream of the existing dam. At a minimum, Tacoma shall establish a penalty, under contract with the construction firm/persons, for disturbing the jam. If the large woody debris jam cannot be fully avoided during construction activities, then: Tacoma shall, in coordination with NMFS, investigate and implement ways to partially protect the jam or rebuild the debris jam. If removal and reconstruction is necessary, then Tacoma will provide the NMFS with a drawing of the proposed debris jam, for prompt review and approval. Every effort must be taken to preserve sizeable pieces and rootwads intact.

e. Tacoma minimizes the amount of rock used to stabilize streambanks and maximizes bioengeenering bank stabilization techniques. When using rock for bank stabilization, Tacoma must first use appropriate native rock material, such as any large material removed from the trench, and then if necessary, Tacoma may supplement this source with rock from an outside source. Final bank stabilization must provide stability for riparian conditions to improve, but must not be designed to prevent a range of natural channel changes.

f. Tacoma shall install 4 paired and cabled X-logs to catch sediment and add hydraulic complexity in the action area. A conceptual plan for wood placement will be provided to the Services no later than 60 days after a signed Opinion is received. A final plan must be submitted for the Services approval prior to installing the wood structures.

g. Tacoma prepares a plan for monitoring short and long-term changes in channel profile and fish passage in Boise Creek and the White River. At a minium the plan shall include explicit criteria for determining when the White River and Boise Creek have reached equilibrium. Monitoring activities and potential response will be clearly detailed in the report, and submitted to NMFS for approval. If necessary, Tacoma will provide fish passage into Boise Creek after construction and before the White River reaches equilibrium. When the White River in the vicinity of the confluence of Boise Creek has reached an agreed upon definition of equilibrium, then Tacoma may discontinue monitoring of the White River. Monitoring of Boise Creek would continue until Boise Creek is determined to have reached equilibrium or for 25 years, whichever is greater. If temporary changes in Boise Creek are identified as interfering with fish passage, Tacoma will reinitiate consultation and develop a plan to provide temporary fish passage until Boise Creek reaches equilibrium. At the end of the 25 year monitoring period or when monitoring indicates that Boise Creek has stabilized, a more permanent or long-term passage solution would be designed and implemented, if passage remains impeded.

h. Short and long-term fish passage in Boise Creek shall be evaluated for all relevant life history stages of chinook salmon, including upstream migrating juveniles. If monitoring reveals passage problems then Tacoma shall develop plans in coordination with NMFS to restore passage. Plans to restore fish passage must be submitted to NMFS for review prior being submitted to the ACOE. This Opinion does not authorize the incidental take of chinook salmon or their critical habitat for the implementation or installation of passage facilities on Boise Creek. Permit applications for installing structures intended to restore fish passage in Boise Creek would trigger one or more of the general conditions for reinitiating this consultation.

3. To implement reasonable and prudent measure 3 the ACOE will ensure that:

a. A report is prepared describing the implementation and effectiveness of the terms and conditions (50 C.F.R. §402.14(i)(3)). The report shall a) confirm the implementation of each term and condition; and b) describe the effectiveness of the terms and conditions.

b. Provide implementation and monitoring reports for all conservation measures described in this Opinion. Where long-term monitoring will occur (Boise Creek, wetlands, and riparian vegetation) annual reports shall be submitted to NMFS no later than December 31 of each year.

c. In addition, NMFS is to be notified within three (3) working days upon locating any dead, injured, or sick chinook salmon. Care should be taken in handling dead specimens to preserve biological materials in the best possible state for later analysis. In conjunction with the care of sick or injured chinook salmon, or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Initial notification must be made to NMFS's Law Enforcement Office at (800) 853-1963. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. The NMFS Habitat Conservation Division should also be notified at (206) 526-6146.

H. Reinitiation Notice

This concludes formal consultation on the Tacoma pipeline replacement and dam removal action outlined in the ACOE November 9, 2000 request for consultation. As provided in 50 C.F.R. §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

III. ESSENTIAL FISH HABITAT CONSULTATION

A. Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));

- NMFS must provide conservation recommendations for any Federal or State activity that may adversely affect EFH (§305(b)(4)(A));

- Federal agencies must within 30 days after receiving conservation recommendations from NMFS provide a detailed response in writing to NMFS regarding the conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NMFS, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NMFS is required by Federal agencies regarding any activity that may adversely affect EFH, regardless of its location.

The objective of this EFH consultation is to determine whether the proposed action may adversely affect designated EFH, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse impacts to EFH resulting from the proposed action.

B. Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the impacts to these species' EFH from the proposed action is based on these descriptions and information provided by the ACOE.

C. Proposed Actions

The proposed action and action area are detailed above in *Section I-B*, *Description of the Proposed Action* and in *Section II, Endangered Species Act* of this document. The action area includes habitats that have been designated as EFH for various life-stages of chinook, coho, and Puget Sound pink salmon.

D. Effects of Proposed Action

As described in *Section II-D,* these activities may result in detrimental, as well as beneficial, short- and long-term effects on the designated EFH for Pacific salmon. The proposed project would adversely affect spawning and incubation habitat, while improving habitat access and other essential features of Pacific salmon habitat. The action would:

- Affect short-term and long-term habitat access in the White River and its tributary Boise Creek. Short-term effects may include changes in water velocity, channel gradient, suspended sediment concentrations, and hydraulic complexity. Long-term effects may include changes in hydraulic complexity and the longitudinal profile in the White River and Boise Creek that inhibit fish passage.

- Affect sediment transport which may in turn adversely affect water quality, spawning and incubation success, the distribution of habitat elements including pool frequency and quality, off-channel habitat, and streambank condition.
- Affect large woody debris and riparian vegetation within the action area through construction activities and indirectly as the channel reestablishes equilibrium.
- Affect streambank condition through construction activities and indirectly as the channel reestablishes equilibrium.
- Adversely affect water quality during construction activities through chemical contamination and changes in suspended sediment concentrations.

E. Conclusion

NMFS believes that the proposed action may adversely affect designated EFH for Pacific salmon.

F. EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. While NMFS acknowledges that the conservation measures described in the biological opinion will be implemented by the ACOE, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. Consequently, NMFS has the following EFH conservation recommendations that, if implemented, will minimize the potential adverse impacts of the proposed project and conserve EFH:

- Adopt, as described in *Section II-G* of this document, Reasonable and Prudent Measures 1 and Terms and Conditions 1d and 1f for the implementation of Reasonable and Prudent Measure 1.
- Adopt Reasonable and Prudent Measure 2 and all of the associated Terms and Conditions.

Where these Terms and Conditions are written to apply only to chinook, NMFS recommends that they be extended to both coho and Puget Sound pink salmon.

G. Statutory Response Requirement

Pursuant to the MSA (§305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity. 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.

H. Supplemental Consultation

The ACOE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(k)).

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