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

Refer to:
2003/01255

February 11, 2004

Mr. Lawrence C. Evans
Regulatory Branch Chief
Department of the Army
Portland District, Corps of Engineers
P.O. Box 2946
Portland, OR 97208-2946

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Row River and Overflow Bridges Replacement Project, Lane County, Oregon (Corps No. 200300273)

Dear Mr. Evans:

Enclosed is the biological opinion (Opinion) prepared by the National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of the proposed Row River and Overflow Bridges Replacement Project in Lane County, Oregon. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*). As required by section 7 of the ESA, NOAA Fisheries has included reasonable and prudent measures with nondiscretionary terms and conditions that NOAA Fisheries believes are necessary to minimize the potential for incidental take associated with these actions.

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 (50 CFR part 600).

If you have any questions regarding this consultation, please contact Tom Loynes at 503.231.6892 of my staff in the Oregon State Habitat Office.

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

cc: Molly Cary, ODOT
Nick Testa, ODOT
Chris Hunter, ODOT
Jon Adkins, Mason, Bruce and Girard, Inc.

Endangered Species Act - Section 7 Consultation
Biological Opinion

&

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Row River and Overflow Bridges Replacement Project,
Lane County, Oregon
(Corps No. 200300273)

Agency: U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: February 11, 2004

Issued by: For Michael R Crouse
_____
D. Robert Lohn
Regional Administrator

Refer to: **2003/01255**

TABLE OF CONTENTS

1. ENDANGERED SPECIES ACT . . . 1
   - 1.1 Background . . . 1
   - 1.2 Proposed Actions . . . 1
     - 1.2.1 Row River Bridges . . . 2
     - 1.2.2 Overflow Bridges . . . 3
   - 1.3 Biological Information . . . 5
     - 1.3.1 Coast Fork Willamette River . . . 6

2. ENDANGERED SPECIES ACT . . . 6
   - 2.1 Biological Opinion . . . 6
     - 2.1.1 Evaluating Proposed Actions . . . 6
       - 2.1.1.1 Biological Requirements . . . 7
       - 2.1.1.2 Environmental Baseline . . . 7
     - 2.1.3 Analysis of Effects . . . 9
       - 2.1.3.1 Effects of Proposed Actions . . . 9
       - 2.1.3.2 Cumulative Effects . . . 17
     - 2.1.4 Conclusion . . . 17
     - 2.1.5 Reinitiation of Consultation . . . 17
   - 2.2 Incidental Take Statement . . . 18
     - 2.2.1 Amount and Extent of the Take . . . 18
     - 2.2.2 Reasonable and Prudent Measures . . . 18
     - 2.2.3 Terms and Conditions . . . 19

3. MAGNUSON - STEVENS ACT . . . 28
   - 3.1 Background . . . 28
   - 3.2 Magnuson-Stevens Fishery Conservation and Management Act . . . 28
   - 3.3 Identification of EFH . . . 29
   - 3.4 Proposed Actions . . . 29
   - 3.5 Effects of Proposed Action . . . 30
   - 3.6 Conclusion . . . 30
   - 3.7 EFH Conservation Recommendations . . . 30
   - 3.8 Statutory Response Requirement . . . 30
   - 3.9 Supplemental Consultation . . . 30

4. LITERATURE CITED . . . 31

1. ENDANGERED SPECIES ACT

1.1 Background

On September 29, 2003, the National Marine Fisheries Service (NOAA Fisheries) received a biological assessment (BA) and a request from the U.S. Army Corps of Engineers (COE) for Endangered Species Act (ESA) section 7 formal consultation for the permitting of the Row River and Overflow Bridges Replacement Project proposed by the Oregon Department of Transportation (ODOT). The Row River and Overflow Bridges Replacement Project will replace four multi-span bridges along the northbound and southbound lanes of Interstate Highway 5 (I-5). Recent inspections have revealed structural problems including beam cracks in the bridges' superstructures. The project site is on the northbound and southbound lanes of I-5 at the existing Row River Bridges and Overflow Channel Bridges between Mileposts (MP) 175.4 and 175.6, and is approximately 0.8 kilometer (km) north of the City of Cottage Grove.

The COE has determined that Upper Willamette River (UWR) chinook salmon (*Oncorhynchus tshawytscha*) are reasonably likely to occur within the project area of the Row River and Overflow Bridges Replacement Project. The UWR chinook salmon were listed as threatened under the ESA on March 24, 1999 (64 FR 14308), and protective regulations were issued under section 4(d) of the ESA on July 1, 2000 (65 FR 42422).

This biological opinion (Opinion) is based on the information presented in the BA and developed through correspondence to obtain additional information and clarity. The objective of this Opinion is to determine whether the actions to demolish and remove the existing structures and construct new structures are likely to jeopardize the continued existence of the UWR chinook salmon. This consultation is undertaken under section 7(a)(2) of the ESA, and its implementing regulations, 50 CFR Part 402. The COE, using methods described in *Making ESA Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NOAA Fisheries 1996), determined that the proposed actions are likely to adversely affect UWR chinook salmon.

1.2 Proposed Actions

The proposed actions analyzed in this Opinion are described in the Row River and Overflow Bridges Replacement Project BA. The following analysis conducted in this Opinion is based on the design proposed by ODOT.

ODOT has proposed restrictions to avoid and minimize environmental impacts at the project site. The BA outlines restrictions for the Row River and Overflow Bridges Replacement Project on pages 34-39. Some of the restrictions address environmental concerns related to the project site. These restrictions address concerns such as: Water quality, erosion and sediment control, stormwater, bridge removal, and temporary ground disturbance. The BA also contains conservation measures including: Erosion and sediment control, stormwater treatment, in-water work restrictions, and material and vehicle staging restrictions.

The proposed project will require three to four years for construction with in-water work occurring during the in-water work period for the Row River which is June 1 to October 31 (ODFW 2000). Replacement of the Overflow Channel Bridges will not be completed during the in-water work period, as these bridges do not span fluvial systems, and will be constructed totally in the dry. The overflow channels are historic features of the Row River and no longer receive flows from the river except in extreme flood events. Upstream flow regulation at Dorena Dam and a system of flow limiting levees constructed along the Row River limits flow to the overflow channels.

A temporary work bridge and a temporary detour bridge will be required to facilitate replacement of the Row River Bridges and maintain freeway traffic flow. A detour bridge at the Overflow Channel Bridges and small roadway crossovers will be constructed for shifting traffic during each phase of the proposed project. The anticipated construction schedule for the proposed project is as follows:

- June to October 2004. Construction of the southbound detour and work bridges, and removal of the existing southbound bridges.
- October to June 2005. Construction of the Southbound Overflow Channel Bridge and the Southbound Row River Bridge end bents.
- June to October 2005. Construction of the Southbound Row River Bridge and removal of the Northbound Row River Bridge.
- October to June 2006. Removal of the Northbound Overflow Channel Bridge and construction of the Northbound Overflow Channel Bridge.
- June to September 2006. Construction of the Northbound Row River Bridge and removal of the detour bridge.
- September to June 2007. Removal of the detour roadway, site rehabilitation, and planting.

1.2.1 Row River Bridges

Existing Structures

The existing Southbound Row River Bridge was constructed in 1956, on a horizontal tangent section of I-5 in the middle of a long vertical curve. It has a reinforced concrete deck girder, is approximately 103 meters (m) long, and is comprised of five spans with approximate span lengths of 12 m, 24 m, 31 m, 24 m, and 12 m.

The existing roadway width on the bridge is approximately 9.1 m, with a width of 10.6 m. The superstructure is founded on spread footings and reinforced concrete columns and the structure's end bents are founded on steel piling.

The overall bridge structure is rated as being functionally obsolete and structurally deficient. In 2000, the structure received a temporary external repair from Bent 2 to Bent 5 to stabilize girder

cracking and in 2001, the girder cracks where injected with epoxy in an attempt to seal the cracks.

The existing Northbound Row River Bridge was constructed in 1961, and is similar to the southbound structure. The two end spans are composed of reinforced concrete deck girders, with the rest of the deck consisting of box girder construction.

The latest bridge inspection report for the Northbound Row River Bridge resulted in a satisfactory rating for the structure; it was not rated as deficient or obsolete (ODOT 2002a). However, the reinforced girders are showing cracks, which has prompted ODOT to select this structure for replacement.

Proposed Structures

The proposed Southbound Row River Bridge and Northbound Row River Bridge consist of a three-span pre-stressed concrete deck girder structure with 1.9-m deep pre-stressed girders. The proposed structures are approximately 106 m long with spans of 33 m, 40 m, and 33 m, although the proposed structures will include fewer bents below the OHWE. The proposed width of the bridges is 12.6 m including shoulders and lanes.

Standard reinforced concrete bridge end panels will be installed at the end bents. Reinforced concrete wingwalls will also be constructed along the sides of the end bents to contain the approach fill. The end bents will be founded on 40.6-centimeter (cm) diameter driven steel pipe piling on reinforced concrete pile caps. The bridge's interior bents will be supported by 2.1 m diameter concrete drilled shafts, constructed approximately 15-m deep into the river channel bottom. The bridge girders will be embedded into the reinforced concrete crossbeams above the drilled shafts and columns to enhance structural integrity.

1.2.2 Overflow Bridges

Existing Structures

The existing Southbound Overflow Channel Bridge was constructed in 1956, on a long horizontal tangent. The 61-m long structure has 6 spans of 9 m, 12 m, 9 m, 9 m, 12 m, and 9 m and the bridge was constructed with a reinforced concrete deck girder.

The bridge width is identical to the Row River Bridges (9.1 m) and is supported by reinforced concrete columns on spread footings for the interior bents, and steel piling at the end bents. In the latest bridge inspection report, the substructure is rated as serious condition (ODOT 2002b) and is categorized as functionally obsolete.

The existing Northbound Overflow Channel Bridge was constructed in 1956, and is nearly identical to the southbound overflow structure. The 61-m long, six-span structure has the same span arrangement as the southbound structure, and was constructed with the same reinforced concrete deck girder superstructure as the southbound structure.

The existing bridge's roadway width is identical to the Southbound Overflow Channel structure. The bridge is supported by reinforced concrete columns on spread footings for the interior bents, and steel piling at the structure's end bents.

The latest bridge inspection report documents satisfactory condition (ODOT 2002c) and in 1984 the bridge's deck received a structural overlay.

Proposed Structures

The proposed Southbound Overflow Channel Bridge and Northbound Overflow Channel Bridge will consist of a 65-m, three-span, pre-stressed concrete girder structure with spans of 19.5 m, 26 m, and 19.5 m.

The roadway width at the bridge will be identical to the typical section of the Southbound Row River Bridge. In addition, reinforced concrete bridge end panels are proposed. Reinforced concrete wingwalls will be constructed at both sides of the end bents to contain the approach fill. Since construction access is readily available to the Overflow Channel structures, all bents will be founded on 40.6-cm diameter driven steel piling.

1.2.3 Stormwater Treatment

Roadway and bridge widening is required with the proposed bridges. The increased roadway width and taper from the bridges combined with the proposed bridge structures will result in an increase in impervious surface of approximately 0.6 hectares (ha). The proposed bridges will constitute approximately 0.44 ha of impervious surface for an increase of approximately 0.12 ha from the existing structures. In addition, approximately 1 ha of temporary impervious surface will be required within the action area for the detour roadway, detour bridges, and a proposed work bridge at the Row River crossing.

Stormwater runoff originating from the roadway between the two bridges discharges via sheet flow into vegetated roadside margins on the outside of the freeway lanes or into maintained vegetated roadside ditches within the freeway median before infiltration. Stormwater runoff south of the Row River Bridges drains to a catch basin inlet in the freeway median approximately 244 m south of the Row River Bridges where it flows under the northbound I-5 lanes to a vegetated roadside ditch. Stormwater generated from the freeway immediately north of the Overflow Channel Bridge drains to a catch basin inlet in the freeway median approximately 244 m north of the overflow bridges where it flows north of the project site to an area under bridges spanning an additional overflow channel of the Row River. Stormwater runoff associated with the existing bridges is discharged directly from the bridge decks to the Row River or Row River Overflow Channel via scuppers without treatment.

All of the proposed bridges will be curbed and will divert stormwater runoff to water quality inlets beside the bridges. In addition, a water quality manhole will be constructed at the north end of the Row River Bridges within the freeway median. The water quality manhole will be at least 3 m from the bridge ends, well outside of the river's ordinary high water elevation

(OHWE). The water quality manhole will provide treatment of stormwater runoff generated from the project site before the treated water is conveyed to an outlet flow spreader that outfalls under the north end of the bridges via storm pipes. The flow spreader will be designed to provide adequate infiltration of treated runoff while eliminating the potential for erosion at the discharge area. The area immediately downstream of the flow spreader outfalls will be seeded and mulched. Treated stormwater will not be discharged directly into the Row River.

Stormwater runoff originating from the freeway between the Overflow Channel and Row River Bridges will either sheet flow off of the freeway to the reconstructed median between the freeway travel lanes or to the maintained, vegetated right-of-way bordering the outside of the travel lanes. Given the existing lateral slope of the freeway, most of the stormwater generated from the freeway in this location sheet flows off of the freeway to the vegetated right-of-way. The right-of-way area outside of the freeway travel lanes will be regraded and seeded after project completion to ensure proper transport and infiltration of stormwater.

The freeway median will require reconstruction because of the use of this area for temporary roadway detour paving. A bioswale with 6:1 slopes will be constructed in these areas to provide processing and release of treated stormwater. The bioswale will be seeded with a mix of plant species conducive to erosion control and biochemical processing of nutrients according to ODOT standard specifications. The soils are permeable, therefore, the bioswale will be designed to treat, and infiltrate stormwater onsite to the maximum extent possible without causing flooding or erosion. The proposed treatment facilities have been designed to conform to site topography, soil conditions and the amount of impervious surface within the action area to remove debris, nutrients, sediments, and other pollutants likely to be present in the stormwater runoff.

Stormwater runoff generated on the freeway south of the Row River Bridges and north of the Overflow Channel Bridges will either be collected in the freeway median and conveyed through bioswales with 6:1 side slopes then to the existing stormwater inlets at either end or will sheet flow off of the freeway into the vegetated right-of-way area bordering the outside of the travel lanes. Stormwater runoff generated from the temporary detour roadway between the Row River and Overflow Channel bridges will sheet flow off of the freeway and will be collected in temporary inlets spaced approximately 91 m apart. The inlets will convey the runoff underneath the Row River Overflow Channel Bridge and infiltrate into vegetated terrain.

1.3 Biological Information

Based on migratory timing, listed salmon species are reasonably likely to be present in the action area during the proposed bridge replacement projects.

An action area is defined by NOAA Fisheries regulations (50 CFR Part 402) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." Direct affects occur at the project site and may 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 may occur throughout the river where actions described in this Opinion lead to additional activities or affect ecological functions contributing to habitat degradation.

Essential features of the adult and juvenile habitat for these species in the action area are: (1) Substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) cover/shelter, (6) riparian vegetation, (7) food, and (8) passage. The essential features that these proposed projects may affect are substrate, water quality, riparian vegetation, and food.

1.3.1 Coast Fork Willamette River/Row River

UWR chinook salmon enter the Columbia River in March or April, but do not ascend Willamette Falls until May or June. Spawning in the upper reaches of the Willamette River basin generally occurs in late August to early October, with spawning peaks in September. Most of the UWR chinook in the Upper Willamette River watershed migrate up the Middle Fork Willamette and McKenzie Rivers. The two rivers provide colder water temperatures which cause UWR chinook to favor them over the Coast Fork Willamette River. Juveniles spend from a few months to one year in fresh water before out-migrating. Due to warmer water temperatures the Coast Fork Willamette River is generally used by adult and juvenile chinook as a migration corridor, although some juvenile rearing does occur in this area. The Row River has chinook rearing and migration use for 11.9 km (Streamnet 2003).

2. ENDANGERED SPECIES ACT

2.1 Biological Opinion

2.1.1 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). NOAA Fisheries 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: (1) Definition of the biological requirements and current status of the listed species; and (2) evaluation of the relevance of the environmental baseline to the species' current status.

Subsequently, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries 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 measures for survival and recovery specific to the listed salmonid's life stages that occur beyond the action area. If NOAA Fisheries finds that the action is likely to jeopardize the listed species, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

For the proposed action, NOAA Fisheries' jeopardy analysis considers direct or indirect mortality of fish attributable to the action.

2.1.1.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed chinook salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries 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, NOAA Fisheries starts with the determinations made in its decision to list the UWR chinook salmon for ESA protection and also considers new available data that is relevant to the determinations.

The relevant biological requirements are those necessary for ESA-listed salmon to survive and recover to naturally-reproducing population levels, at which time protection under the ESA would become 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 environmental.

For this consultation, the biological requirements are improved habitat characteristics that function to support successful migration and rearing in the project area. The current status of the UWR chinook salmon, based upon their risk of extinction, has not significantly improved since the species was listed.

2.1.1.2 Environmental Baseline

The range-wide status of the UWR chinook salmon is described in Busby *et al.* (1996) and Myers *et al.* (1998). The identified actions will occur within the range of the UWR chinook salmon. The direct effects occur at the project site and may 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 may occur throughout the watershed where actions described in this Opinion lead to additional activities or affect ecological functions contributing to stream degradation. As such, the action area for the proposed activity includes the immediate watersheds where the bridge replacements will occur, the proposed mitigation sites and those areas upstream and downstream that may reasonably be affected, temporarily or in the long term. For the purposes of this Opinion, the action area is the Row River channel and overflow channels upstream of the bridges and downstream to a point 0.4 km below the bridges.

The proposed project is within the upper reaches of the Willamette River basin, a tributary of the Lower Columbia River that drains an area of approximately 30,000 km^2. The mainstem Willamette River is formed by the confluence of the Coast and Middle Forks of the Willamette near Springfield, approximately 22.5 km north of the project site. Elevations in the basin range

from over 3,048 m in the Cascade Range to less than 3 m at the confluence with the Columbia River.

Salmonid and terrestrial wildlife habitat quality in the Willamette River basin has been severely reduced during the last century. Water quality has also suffered due to development. The lower Willamette River, from the mouth to Willamette Falls is listed on the Oregon Department of Environmental Quality (ODEQ) List of Water Quality Limited Waterbodies for toxics, bacteria, biological criteria, and temperature (ODEQ 2002).

The dominant land use in the Coast Fork Willamette River watershed is agriculture, timber harvest, and residential. Much of the Willamette Valley has been converted to agricultural use which has resulted in channelized streams and degraded riparian zones. Agricultural and livestock practices contribute to soil erosion, introduction of non-native vegetation and fertilizer/manure deposition into the stream systems (Myers *et al.*, 1998). The Coast Fork Willamette River is on the Oregon Department of Environmental Quality (ODEQ) 303(d) List of Water Quality Limited Water Bodies for toxins, bacteria, and temperature (ODEQ, 2002). In addition, the Cottage Grove Dam blocks about 20 km of anadromous fish habitat upstream of the proposed project.

The Row River is a 7th order stream and is the principal tributary of the Coast Fork Willamette River, draining approximately 970 m^2 (BLM 1997). The watershed is approximately 27.4 km in length with variations in width to a maximum of approximately 14.5 km. The Row River is primarily within the Cascade Range Physiographic Province, however, the lower reach of the basin is within the upper Willamette Valley. Elevations within the basin range from approximately 1,807 m in the Cascade Range (Fairview Peak) to approximately 168 m at the river's mouth.

Dorena Dam impounds Row River at river kilometer 12, forming Dorena Reservoir. Dorena Reservoir holds approximately 88,870,000 m^3 of water and covers approximately 708 ha when full (BLM 1997). The dam is an earthen structure constructed in 1949, and its primary purpose is to provide flood control for the Willamette River. Most of the tributaries in the watershed flow into, or above, Dorena Reservoir. The dam does not have fish passage structures.

The dominant vegetation community within upland areas of the watershed is a mixed conifer/hardwood community. Tree species within this community consist of Douglas-fir (*Pseudotsuga menziesii*), Western hemlock (*Tsuga heterophylla*), Oregon white oak (*Quercus garryana*), Western red cedar (*Thuja plicata*), bigleaf maple (*Acer macropyllum*), and madrone (*Arbutus menziesii*). The shrub layer of this community consists of hazelnut (*Corylus cornuta var. californica*), oceanspray (*Holodiscus dumosus*), vine maple (*Acer circinatum*), Oregon grape (*Berberis aquifolium*), salal (*Gaultheria shallon*), and poison oak (*Toxicodendron radicans*). Groundcover species of this community consists of various ferns (*Athyrium spp. and Polystichum spp.*), grass and forb species.

Fish communities within the Row River watershed have been altered by the changes in habitat and the introductions of non-native species. Aquatic habitat in the Row River has been significantly altered over the past 150 years (BLM 1997). Logging began in the late 1800s by removing the woody material once common in the river. Conversion of floodplain vegetation, water withdrawals, and confinement of the stream channel have all reduced the quality and quantity of potential fish habitat.

The physical and biological characteristics of the Row River's aquatic and riparian ecosystem were altered after the construction of Dorena Dam. The natural flow regime is controlled to the extent that periodic flushing and the associated deposition of sediment, rock, upstream nutrients and down woody debris is reduced. Water temperatures occasionally increase beyond lethal tolerances for some fish and amphibian species (BLM 1997). The aquatic system in the lower watershed before the building of the dam was likely a low-gradient basin characterized by wide floodplains, meandering channels punctuated with beaver dams, and periodic flood events.

Pollution accumulation in the Row River and the Willamette River has seriously impacted anadromous fish runs native to the watershed (BLM 1997). Until clean up efforts began in the 1960s, the Willamette River was subjected to extensive discharges of industrial and urban wastes that reduced or removed oxygen from the water. Summer water temperatures in the Willamette River still often climb to over 70º F. These conditions create hazardous conditions for both upstream and downstream migrants from the Row River. High temperatures, low oxygen levels, and pollution impacted both the resident and anadromous fish in the Row River watershed. The lower Row River, from the mouth to Dorena Reservoir, is listed on the Oregon Department of Environmental Quality (ODEQ) List of Water Quality Limited Waterbodies for toxics, bacteria, pH, sedimentation, biological criteria, and temperature (ODEQ 2002).

Based on the best available information regarding the current status of the UWR chinook salmon range-wide, the population status, trends, genetics, and the poor environmental baseline conditions within the action areas, NOAA Fisheries concludes that the biological requirements of the UWR chinook salmon are not being met. Degraded habitat resulting from agricultural practices, forestry practices, road building, and residential construction indicate many aquatic habitat indicators are not properly functioning within the Coast Fork Willamette and Row Rivers. Actions that do not maintain or restore properly functioning aquatic habitat conditions would be likely to jeopardize the continued existence of these species.

2.1.3 Analysis of Effects

2.1.3.1 Effects of Proposed Actions

Creeks and rivers are dynamic systems that naturally alter their courses in response to many physical processes. Roadways and other structures constructed along waterways are subject to flooding and undercutting as a result of these natural changes in the stream course. Structural hardening of embankments is the traditional means of protecting these structures along waterways. Hardened embankments simplify stream channels, alter hydraulic processes, and

prevent natural channel adjustments (Spence *et al.* 1996). Moreover, embankment hardening may shift the erosion point either upstream or downstream of the project and accelerate stream velocity. As amplified erosive forces attack different locations and landowners respond with more bank hardening, the river eventually attains a continuous fixed alignment lacking habitat complexity (COE 1977).

Fish habitats are enhanced by diversity of habitats at the land-water interface and adjacent bank (COE 1977). Streamside vegetation provides shade that reduces water temperature and stabilizes streambanks. Overhanging branches provide cover from predators. Insects and other invertebrates that fall from overhanging branches may be preyed upon by fish, or provide food sources for other prey organisms. Immersed vegetation, logs, and root wads provide points of attachment for aquatic prey organisms, shelter from swift currents during high flows, retain bed load sediment, create pools, and reduce flow velocity.

The combination of channel confinement within the existing bridge abutments and the legacy of large woody material removal within the system and specifically at roadway crossings has simplified the habitat within the action area and retarded the formation and maintenance of complex fish habitat within the project reach.

<u>Sediment</u>
The driving of the temporary pile bridge piers may temporarily increase releases of sediment. Transportation of sediments into the Row and Coast Fork of the Willamette River from upland construction activities is also possible. Upland excavation will expose and dislodge soils, increasing erosion and stream turbidity during rainfall. An increase in turbidity from suspension of fine sediments can adversely affect fish and filter-feeding macro-invertebrates downstream of the work site. At moderate levels, turbidity has the potential to reduce primary and secondary productivity; at higher levels, turbidity may interfere with feeding and may injure and even kill both juvenile and adult fish (Spence *et al.* 1996, Berg and Northcote 1985).

To minimize the potential for increased turbidity and disturbance of fish, the in-water work will occur during the preferred in-water work timing guideline. During this window, streamflows are typically low, fish presence is reduced, and rainfall is minimal. Erosion and sediment control devices will be deployed within 90 m of the stream and will stay in place until the project area is stabilized.

Potential sedimentation impacts to listed salmonids from the proposed actions include both direct and indirect effects. Potential direct effects include mortality from exposure to suspended sediments (turbidity) and contaminants resulting for construction. Potential indirect effects include behavioral changes resulting from elevated turbidity level (Sigler *et al.* 1984, Gregory 1988), during riverbank habitat alterations.

Suspended sediment and turbidity influences on fish reported in the literature range from beneficial to detrimental. Elevated total suspended solids (TSS) conditions have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival.

Elevated TSS conditions have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Of key importance in considering the detrimental effects of TSS on fish are the frequency and the duration of the exposure, not just the TSS concentration.

Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore *et al.* 1980, Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (Sigler *et al.* 1984, Lloyd 1987, Scannell 1988). Juvenile salmonids tend to avoid streams that are chronically turbid, such as glacial streams or those disturbed by human activities, unless the fish need to traverse these streams along migration routes (Lloyd *et al.* 1987). In addition, a potentially positive reported effect is providing refuge and cover from predation (Gregory and Levings 1998).

Fish that remain in turbid, or elevated TSS, waters experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998). In systems with intense predation pressure, this provides a beneficial trade off (*e.g.*, enhanced survival) to the cost of potential physical effects (*e.g.*, reduced growth). Turbidity levels of about 23 Nephalometric Turbidity Units (NTU) have been found to minimize bird and fish predation risks (Gregory 1993). Exposure duration is a critical determinant of the occurrence and importance of physical or behavioral effects (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids may be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjorn and Reiser 1991). However, research shows that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987, Lloyd 1987, Servizi and Martens 1991).

Newly-emerged salmonid fry may be vulnerable to even moderate amounts of turbidity (Bjornn and Reiser 1991). Other behavioral effects on fish, such as gill flaring and feeding changes, have been observed in response to pulses of suspended sediment (Berg and Northcote 1985). Fine redeposited sediments also have the potential to adversely affect primary and secondary productivity (Spence *et al.* 1996), and to reduce incubation success (Bell 1991) and cover for juvenile salmonids (Bjornn and Reiser 1991). Because the potential for turbidity should be localized and brief, the probability of direct mortality is negligible.

Construction related effects necessary to complete the proposed action will be minimized by implementation of effective erosion and pollution control measures and completing all work within the OHW during the ODFW recommended in-water work period. In addition, all work will be isolated from the wetted channel. No construction or construction equipment will enter the wetted channel, except for installation of coffer dams, as a result of the proposed action.

<u>Chemical Contamination</u>

As with all construction activities, accidental release of fuel, oil, and other contaminants may occur. Operation of the back-hoes, excavators, and other equipment requires the use of fuel,

lubricants, *etc.*, which, if spilled into the channel of a waterbody or into the adjacent riparian zone, can injure or kill aquatic organisms. Petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, contain poly-cyclic aromatic hydrocarbons (PAHs), which can be acutely toxic to salmonids at high levels of exposure and can also cause chronic lethal and acute and chronic sublethal effects to aquatic organisms (Neff 1985). Similarly, exposure to herbicides can have lethal and sublethal effects on salmonids, aquatic invertebrates, aquatic vegetation, and target and non target riparian vegetation (Spence *et al.* 1996).

To minimize the potential for chemical contamination and disturbance of fish, most in-water work will occur during the preferred in-water work timing guideline of June 1 through October 31. During this window, streamflow is typically low, fish presence is reduced, and rainfall is minimal. In-water work area isolation will allow the work to occur in the dry, thereby reducing indirect (chemical contaminants) from entering the actively flowing water and direct impacts to fish. Staging areas will be in areas that have already been previously disturbed. Equipment and vehicle staging and storage will be at least 45 m from the regulated work area. Fuels and other hazardous materials will be at least 90 m away from the regulated work area.

Riparian Vegetation

Woody riparian vegetation provides large wood to the stream, which encourages the creation of rearing and spawning areas. Riparian vegetation also provides water quality functions (*e.g.* temperature control and nutrient transformation), bank stability, detritus (insect and leaf input, small wood for substrate for insects, *etc.*), microclimate formation, floodplain sediment retention and vegetative filtering, and recharge of the stream hyporheic zone.

Some woody vegetation will be removed, but avoidance of vegetation will be an objective when gaining access or completing work near the river, streams or wetlands. Before any construction activities or significant earthwork, all clearing limits will be flagged for protection of critical riparian vegetation, wetlands and other sensitive sites that are nonessential to project construction and access.

During construction, erosion control measures and post-project riparian plantings will reduce erosion during construction and restore woody vegetation. All impacted areas will be restored to pre-work conditions. Damaged streambanks will be restored to a natural slope, pattern, and profile suitable for establishment of permanent woody vegetation. All exposed soil surfaces, including construction access roads and associated staging areas, will be stabilized mulch, native herbaceous seeding, and native woody vegetation. The riparian plantings will provide bank stabilization, shading, and increase the potential for insect production.

A Conceptual Mitigation and Restoration Plan has been prepared for the proposed project. The plan includes grading and planting activities that will improve the riparian area of the Row River within the immediate vicinity of the Row River Bridges

Vegetation removal carries many of the same potential effects as wetland loss. The majority of the vegetation proposed for removal as a result of the proposed project is composed of grass and

forb species. Construction of the proposed Row River Bridges will require removal of a small amount of riparian vegetation beside both bridges' ends. A total of 12 small, deciduous trees will be removed, 10 of which are less than 51 cm diameter at breast height (dbh) and two larger than 51 cm dbh. All tree removal will be mitigated by a 2:1 ratio of replacement.

The riparian habitat along the river is composed of deciduous tree species with an understory of herbaceous vegetation, largely composed of exotics (Himalayan blackberry and reed canarygrass). Immediately upstream and downstream of the project site the riparian corridor is largely intact, though it is narrow and periodically interrupted by rural and agricultural developments. The riparian reserves within the watershed are estimated to be predominately intact. The proposed project will not decrease the quality of the riparian habitat through the proposed removal of 12 small deciduous trees. These trees are on the freeway/bridge fill slopes and are not directly adjacent to the river's active channel. They provide limited shading and nutrient inputs to the system and do not constitute potential large woody debris. The proposed project will provide a localized, long-term increase in the quality of the riparian habitat at the project area through the proposed planting of native trees, shrubs, and grasses and removal of existing exotics (Himalayan blackberry and reed canarygrass).

Stream Hydraulics

The construction of the new temporary detour bridges over the Row River and overflow channels will decrease hydraulic constriction and improve general ecological connectivity such as sediment transport and large woody debris transport within the Upper Willamette and Coast Fork of the Willamette Rivers.

The placement of fill material below the OHWE would typically result in simplification of habitat and increased stream velocities under the structure. However, based on new design technologies allowing greater span lengths in bridges, the new bridges are likely to have fewer bents within the OHWE. Fewer bents within the OHWE would result in a net decrease of fill within the OHWE cross section. Bridge approach fill within the 100-year floodplain can result in a restriction of the floodway causing increased stream velocities during high flows. The increased velocities can facilitate stream degradation downstream to unknown distances. The degradation process begins with increased channel down-cutting and bank erosion. This can result in an increase of fine sediments within the channel substrate as well as a decrease in width to depth ratios. The instream habitat is simplified due to fewer pools and complex cover (Rosgen 1996). This will be helped by placing fewer bents below OHWE.

Work Area Isolation

Bridge bent construction and removal will likely require work area isolation from the flowing water. Fish removal activities would be in accordance with NOAA Fisheries fish handling guidelines (NOAA Fisheries 2000). Any listed fish removed from the isolated work areas would experience high stress with the possibility of up to a 5% delayed mortality rate depending on rescue method. Work area isolation can result in a loss of aquatic invertebrates due to dewatering areas within the wetted channel. In addition, sediment laden water created within

isolated work areas could escape, resulting in impacts to the aquatic environment downstream of the project site.

Water Quality Stormwater Effects

Due to an increase of new impervious surface, the potential exists for an increase in runoff from the proposed new impervious surface at the proposed project sites. However, the proposed stormwater runoff treatment criteria will more than offset any potential adverse effects to water quality as a result of the proposed action. The proposed stormwater treatment criteria would require all stormwater to be routed to the end of the bridges where it would be treated in a manner that would not result in a change in the hydraulic conditions or an increase of pollutants to the Row and Coast Fork Willamette Rivers.

Direct Harm Due to Steel Pile Driving

The project will require the installation of steel pipe piles for support on the work bridges. These piles will be wood or hollow steel and will be installed via a vibratory hammer or an impact hammer. It is anticipated that the majority of the piles will be hollow steel and installed with an impact hammer.

Biological effects to UWR chinook may result from the high sound pressures produced when driving piles with an impact hammer. Impact driving of steel piles can produce intense sound pressure waves that can injure and kill fishes. The injuries caused by such pressure waves are known as barotraumas, and include hemorrhage and rupture of internal organs, including the swimbladder and kidneys in fish, and damage to the auditory system. Death can be instantaneous, can occur within minutes after exposure, or can occur several days later. Fishes with swimbladders (including salmonids) are sensitive to underwater impulsive sounds, *i.e.*, sounds with a sharp sound pressure peak occurring in a short interval of time, because of swimbladder resonance which is believed to occur in the frequency band of most sensitive hearing (usually 200 to 800 Hz) (Caltrans 2002). As the pressure wave passes through a fish, the swimbladder is rapidly squeezed due to the high pressure and then rapidly expanded as the underpressure component of the wave passes through the fish. The pneumatic pounding may result in the rupture of capillaries in the internal organs as indicated by observed blood in the abdominal cavity, and maceration of the kidney tissues (Caltrans 2002).

Another mechanism of injury and death is “rectified diffusion”, which is the formation and growth of bubbles in tissue caused by regions of high sound pressure levels. Hastings (2002) expects little to no physical damage to aquatic animals for peak sound pressures below 190 decibels (dB) (re: 1 Pascal), the threshold for rectified diffusion. However, much uncertainty exists as to the level of adverse effects to fish exposed to sound between 180 and 190 dB_{peak} due to species-specific variables. Based on this information, NOAA Fisheries has established the threshold for physical harm at 180 dB_{peak} for this project.

Sound pressure levels expressed as “root-mean-squared” (rms) values are commonly used in behavioral studies. Sound pressure levels in excess of 150 dB_{rms} are expected to cause temporary behavioral changes such as elicitation of a startle response or behavior associated with stress.

These sound pressure levels are not expected to cause direct permanent injury, but as discussed above, may decrease a fish's ability to avoid predators. Observations by Feist, *et al.* (1992) suggest that sound levels in this range may disrupt normal migratory behavior of juvenile salmon. They also noted that when exposed to the sounds from pile driving, juvenile pink and chum salmon were less likely to startle and flee when approached by an observer than were those that were shielded from the sounds. Based on this information, NOAA Fisheries has established the threshold for behavioral disruption at 150 dB_{rms} for this project.

Driving hollow steel piles of the size proposed for this project can produce sound pressure levels measured at 10m from the pile, over 180 dB_{peak} and 150 rms (Stadler 2003, pers. comm.). Clearly, these sound pressure levels are sufficiently high to present a lethal threat to fishes, as evidenced by the number of species, including salmonids, killed during impact driving of 24, 36-inch diameter steel piles (Stadler, pers. obs. 2002; Desjardin, pers. comm. 2003). Vibratory hammers produce peak pressures that are approximately 17 dB lower than those from impact hammers (Nedwell and Edwards 2002) yielding an estimated peak sound pressure level of 193 dB for the piles used in this project. While this is above the threshold for physical injury (180 dB), no fish-kills have been linked to the use of vibratory hammers. The lack of evidence does not mean that vibratory hammers are harmless, but they are likely less harmful than impact hammers.

The sounds from the two types of hammer differ not only in intensity, but also in frequency and impulse energy (the rate at which the pressure rises) as well. Most of the sound energy of impact hammers is concentrated between 100 and 800 Hz, the frequencies thought to be most harmful to fishes, while the sound energy from the vibratory hammer is concentrated around 20 to 30 Hz.

Just as these two sounds are different, so are the behavioral responses of fishes to them. Most of the energy in the sounds produced by vibratory hammers is at the frequency of vibration, around 20 to 30 Hz, very near the range of infrasound (less than 20 Hz). The response to impact hammers is, however, quite different. Fishes may react to the first few strikes of an impact hammer with a "startle" response. After these initial strikes, the startle response wanes and the fishes may remain within the field of a potentially harmful sound (NOAA Fisheries 2001). Thus, impact hammers may be more harmful than vibratory hammers for two reasons: first they produce pressure waves with greater potential to harm fishes and second, the sounds produced do not elicit an avoidance response in fishes, which will expose them for longer periods to those harmful pressures.

Most reports of fish-kills associated with pile driving are limited to those fishes that were immediately killed and floated to the surface. However, physical harm to juvenile salmonids is not always expected to result in immediate, mortal injury – death may occur several hours or days later, while other injuries may be sublethal.

Small fishes that are subjected to high sound pressure levels may also be more vulnerable to predation, and the predators, themselves, may be drawn into the potentially harmful field of sound by following injured prey. The California Department of Transportation (cited in NOAA

Fisheries 2003) reported that the stomach of a striped bass killed by pile driving contained several freshly consumed juvenile herring. It appears this striped bass was feeding heavily on killed, injured, or stunned herring as it, too, swam into the zone of lethal sound pressure. Due to their piscivorous nature, adult salmonids may be drawn to an area of dangerously high sound pressure level by the smaller fishes that are injured or killed.

Not all fishes killed by pile driving float to the surface. With few exceptions, fish-kills are reported only when dead and injured fishes are observed at the surface. Thus, the frequency and magnitude of such kills may be underestimated.

The effects to fishes of the high sound pressure levels produced by impact driving of steel piles depend on several factors, including the size and species of fish. At Bremerton, WA, approximately 100 surf perches (*Cymatogaster aggregata* and *Embiotoca lateralis*) were killed during impact driving of 30-inch diameter steel pilings (Stadler, pers. obs. 2003). The size of these fish ranged from 70 millimeters (mm) to 175 mm fork length. Dissections revealed that the swimbladders of the smallest of the fishes (80 mm fork length) were completely destroyed, while those of the largest individual (170 mm fork length) were nearly intact. Damage to the swimbladder of *C. aggregata* was more was more severe than to similar sized *E. lateralis*. These results indicate size and species-specific differences.

The potential for injury to fishes from pile driving depends on the type and intensity of the sounds produced. These are greatly influenced by a variety of factors, including the type of hammer, the type of substrate and the depth of the water. Firmer substrates require more energy to drive piles into, and produce more intense sound pressures.

To minimize the potential risk to juvenile UWR chinook and adults, ODOT will need to implement a bubble curtain to attenuate the sound pressure waves. The efficacy of a bubble curtain is dependent upon the current regime where they are used. Currents above 1.6 kts can disperse the bubbles downstream, away from the pile. Stream currents are likely to be below the 1.6 kts, however, if they are above that threshold a confined bubble curtain will be used. Deployment of a bubble curtain is expected to attenuate the peak sound pressure levels by approximately 20 dB (a 90% reduction in sound energy). However, a bubble curtain may not bring the peak and rms sound pressure levels below the established thresholds, and some low level of take may still occur.

Any fish in the area that are not buffered by the sound attenuation devices will be affected. The expected low numbers of the smallest, UWR chinook, based on discussions with ODFW, at the time of pile driving and the assumption that larger juvenile and adult UWR chinook are less affected by the behavioral changes brought by pile driving, leads NOAA Fisheries to believe that this activity will have minimal adverse effect to listed salmonids with sound attenuation devices in place.

2.1.3.2 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." The action area for the Row River and Overflow Bridges Replacement Project has been defined as the Row River channel and overflow channels upstream of the bridges and downstream to a point 0.4 km below the bridges. Many actions occur within the Coast Fork Willamette River watershed, within which the action area is found.

Non-federal activities within the action areas are expected to increase with a projected 37.5% increase in human population over the next 25 years in Lane County (EPA 2003). Thus NOAA Fisheries assumes that future private and state actions will continue within the action areas, but at increasingly higher levels as population density increases. NOAA Fisheries assumes that future COE permitted projects in the Coast Fork Willamette River watershed will be reviewed through separate section 7 consultation processes and therefore are not considered cumulative effects.

2.1.4 Conclusion

NOAA Fisheries has determined that, when the effects of the COE's proposed actions (permitting the replacement of the Row River Bridge and Overflow Bridges) are added to the environmental baselines and cumulative effects occurring in the action areas, they are not likely to jeopardize the continued existence of the UWR chinook salmon.

The conclusion was based on the following considerations: (1) All in-water work and other construction activities within the OHWE will take place according to Oregon guidelines for timing of in-water work to protect fish and wildlife resources; (2) work area isolation (including use of NOAA Fisheries' guidelines for proper fish handling) and the conservation measures outlined in the BA will be in place to avoid or minimize adverse affects to water quality; (3) potential flow effects of increased impervious area will be avoided or minimized by water quality treatment and detention before being released into any waterway; (4) trees cleared for construction of the new bridge will be replaced with new riparian plantings; (5) streambanks and riparian areas disturbed by new construction and uncovered by removal of the old bridges will be planted with native woody vegetation; (6) full containment of demolition debris will keep construction material out of the wetted channel; and (7) the proposed action is not likely to impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale.

2.1.5 Reinitiation of Consultation

As provided in 50 CFR 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 is designated that may be affected by the action. In instances where the amount or extent of authorized incidental take is exceeded, any operations causing such take must cease pending reinitiation of consultation.

2.2 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 behavioral patterns such as breeding, feeding, and sheltering. Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, 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.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

2.2.1 Amount and Extent of the Take

NOAA Fisheries anticipates that the actions covered by this Opinion is reasonably certain to result in incidental take of UWR chinook salmon because of detrimental effects from sediment pulses, sound pressure waves, increased temperature levels (non-lethal) and the slight possibility of juvenile presence in the vicinity of the project site during in-water work. NOAA Fisheries expects the possibility exists for incidental take of up to 20 juvenile UWR chinook salmon during work area isolation and handling of fish. Take resulting from the effects of other project actions covered by this Opinion is largely unquantifiable in the short term and not expected to be measureable in the long term. The extent of take is limited to the action areas.

2.2.2 Reasonable and Prudent Measures

The measures described below are non-discretionary. They must be implemented so that they become binding conditions in order for the exemption in section 7(a)(2) to apply. The COE has the continuing duty to regulate the activities covered in this incidental take statement. If the

COE fails to adhere to the terms and conditions of the incidental take statement through enforceable terms added to the document authorizing this action, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

NOAA Fisheries believes that the following reasonable and prudent measures along with conservation measures described in the BA are necessary and appropriate to minimize the likelihood of take of listed fish resulting from implementation of this Opinion.

The COE shall:

1. Minimize incidental take from general construction by excluding unauthorized permit actions and applying permit conditions that avoid or minimize adverse effects to riparian and aquatic systems.

2. Ensure completion of a comprehensive monitoring and reporting program to confirm this Opinion is meeting its objective of minimizing take from permitted activities.

2.2.3 Terms and Conditions

1. To implement reasonable and prudent measure #1 (general conditions for construction, operation and maintenance), the COE shall ensure that:

    a. Timing of in-water work. Work within the active channel will be completed during the period of June 1 to October 31. All work must be completed within this date unless otherwise approved in writing by NOAA Fisheries.
    b. Minimum Area. Confine construction impacts to the minimum area necessary to complete the project.
    c. Cessation of work. Project operations will cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.
    d. Fish screens. All water intakes used for a project, including pumps used to isolate an in-water work area, will have a fish screen installed, operated and maintained according to NOAA Fisheries' fish screen criteria.[1]
    e. Fish passage. Passage will be provided for any adult or juvenile salmonid species present in the project area during construction, and after construction for the life of the project. Upstream passage is not required during construction if it did not previously exist.

[1] National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm).

f. Pollution and Erosion Control Plan. A pollution and erosion control plan will be prepared and carried out to prevent pollution related to construction operations. The plan must be available for inspection on request by COE or NOAA Fisheries.

i. Plan Contents. The pollution and erosion control plan must contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.

(1) Practices to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.

(2) Practices to confine, remove and dispose of excess concrete, cement and other mortars or bonding agents, including measures for washout facilities.

(3) A description of any hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

(4) A spill containment and control plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

(5) Practices to prevent construction debris from dropping into any stream or waterbody, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

ii. Inspection of erosion controls. During construction, all erosion controls must be inspected daily during the rainy season and weekly during the dry season to ensure they are working adequately.[2]

(1) If inspection shows that the erosion controls are ineffective, work crews must be mobilized immediately to make repairs, install replacements, or install additional controls as necessary.

(2) Sediment must be removed from erosion controls once it has reached 1/3 of the exposed height of the control.

g. Construction discharge water. All discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water) will be treated as follows:

i. Water quality. Facilities must be designed, built and maintained to collect and treat all construction discharge water using the best available technology applicable to site conditions. The treatment must remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.

[2] "Working adequately" means no turbidity plumes are evident during any part of the year.

ii. Discharge velocity. If construction discharge water is released using an outfall or diffuser port, velocities must not exceed 4 feet per second.

iii. Spawning areas, marine submerged vegetation. No construction discharge water may be released within 300 feet upstream of active spawning areas or areas with marine submerged vegetation.

h. Preconstruction activity. Before significant[3] alteration of the project area, the following actions must be completed:

i. Marking. Flag the boundaries of clearing limits associated with site access and construction to prevent ground disturbance of critical riparian vegetation, wetlands and other sensitive sites beyond the flagged boundary.

ii. Emergency erosion controls. Ensure that the following materials for emergency erosion control are onsite:

(1) A supply of sediment control materials (*e.g.*, silt fence, straw bales[4]).

(2) An oil-absorbing, floating boom whenever surface water is present.

iii. Temporary erosion controls. All temporary erosion controls must be in-place and appropriately installed downslope of project activity within the riparian area until site restoration is complete.

i. Temporary access roads.

i. Existing ways. Existing roadways or travel paths must be used whenever possible, unless construction of a new way would result in less habitat take.

ii. Steep slopes. Temporary roads built mid-slope or on slopes steeper than 30% are not authorized.

iii. Minimizing soil disturbance and compaction. When a new temporary road is necessary within 150 feet[5] of a stream, waterbody or wetland, soil disturbance and compaction must be minimized by clearing vegetation to ground level and placing clean gravel over geotextile fabric, unless otherwise approved in writing by NOAA Fisheries.

iv. Temporary stream crossings.

(1) The number of temporary stream crossings must be minimized.

(2) Temporary road crossings must be designed as follows:

---

[3] "Significant" means an effect can be meaningfully measured, detected or evaluated.

[4] When available, certified weed-free straw or hay bales must be used to prevent introduction of noxious weeds.

[5] Distances from a stream or waterbody are measured horizontally from, and perpendicular to, the bankfull elevation, the edge of the channel migration zone, or the edge of any associated wetland, whichever is greater. "Channel migration zone" means the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years, e.g., alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams.

(a) A survey must identify and map any potential spawning habitat within 300 feet downstream of a proposed crossing.

(b) No stream crossing may occur at known or suspected spawning areas, or within 300 feet upstream of such areas if spawning areas may be affected.

(c) The crossing design must provide for foreseeable risks (*e.g.*, flooding and associated bedload and debris) to prevent the diversion of streamflow out of the channel and down the road if the crossing fails.

(d) Vehicles and machinery must cross riparian areas and streams at right angles to the main channel wherever possible.

v. Obliteration. When the project is completed, all temporary access roads and work bridges must be obliterated, the soil must be stabilized, and the site must be revegetated. Temporary roads in wet or flooded areas must be abandoned and restored as necessary by the end of the in-water work period.

j. Heavy Equipment. Use of heavy equipment will be restricted as follows:

i. Choice of equipment. When heavy equipment must be used, the equipment selected must have the least adverse effects on the environment (*e.g.*, minimally-sized, rubber-tired).

ii. Vehicle staging. Vehicles must be fueled, operated, maintained and stored as follows:

(1) Vehicle staging, cleaning, maintenance, refueling, and fuel storage must take place in a vehicle staging area placed 150 feet or more from any stream, waterbody or wetland.

(2) All vehicles operated within 150 feet of any stream, waterbody or wetland must be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected must be repaired in the vehicle staging area before the vehicle resumes operation. Inspections must be documented in a record that is available for review on request by COE or NOAA Fisheries.

(3) All equipment operated instream must be cleaned before beginning operations below the bankfull elevation to remove all external oil, grease, dirt, and mud.

(4) The temporary work bridges shall be constructed to ensure full containment of any spills and/or leaks.

iii. Stationary power equipment. Stationary power equipment (*e.g.*, generators, cranes) operated within 150 feet of any stream, waterbody or wetland must be diapered to prevent leaks, unless otherwise approved in writing by NOAA Fisheries.

k. Site preparation. Native materials will be conserved for site restoration.

i. If possible, native materials must be left where they are found.

ii. Materials that are moved, damaged or destroyed must be replaced with a functional equivalent during site restoration.

iii. Any large wood,[6] native vegetation, weed-free topsoil, and native channel material displaced by construction must be stockpiled for use during site restoration.

l. Isolation of in-water work area. If adult or juvenile fish are reasonably certain to be present, the work area will be well isolated from the active flowing stream using inflatable bags, sandbags, sheet pilings, or similar materials. The work area will also be isolated if in-water work may occur within 300 feet upstream of spawning habitats.

m. Capture and release. Before and intermittently during pumping to isolate an in-water work area, an attempt must be made to capture and release fish from the isolated area using trapping, seining, electrofishing, or other methods as are prudent to minimize risk of injury.

i. A fishery biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish must conduct or supervise the entire capture and release operation.

ii. If electrofishing equipment is used to capture fish, the capture team must comply with NOAA Fisheries' electrofishing guidelines.[7]

iii. The capture team must handle ESA-listed fish with extreme care, keeping fish in water to the maximum extent possible during seining and transfer procedures to prevent the added stress of out-of-water handling.

iv. Captured fish must be released as near as possible to capture sites.

v. ESA-listed fish may not be transferred to anyone except NOAA Fisheries personnel, unless otherwise approved in writing by NOAA Fisheries.

vi. Other Federal, state, and local permits necessary to conduct the capture and release activity must be obtained.

vii. NOAA Fisheries or its designated representative must be allowed to accompany the capture team during the capture and release activity, and must be allowed to inspect the team's capture and release records and facilities.

n. Earthwork. Earthwork (including drilling, excavation, dredging, filling and compacting) will be completed as quickly as possible.

i. Site stabilization. All disturbed areas must be stabilized, including obliteration of temporary roads, within 12 hours of any break in work

---

[6] For purposes of this Opinion only, "large wood" means a tree, log, or rootwad big enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull width of the stream in which the wood occurs. See, Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (www.odf.state.or.us/FP/RefLibrary/LargeWoodPlacemntGuide5-95.doc).

[7] National Marine Fisheries Service, *Backpack Electrofishing Guidelines* (December 1998) (http://www.nwr.noaa.gov/1salmon/salmesa/pubs/electrog.pdf).

unless construction will resume work within 7 days between June 1 and September 30, or within 2 days between October 1 and May 31.

ii. Source of materials. Boulders, rock, woody materials and other natural construction materials used for the project must be obtained outside the riparian area.

o. Site restoration. All streambanks, soils and vegetation disturbed by the project are cleaned up and restored as follows:

i. Restoration goal. The goal of site restoration is renewal of habitat access, water quality, production of habitat elements (such as large woody debris), channel conditions, flows, watershed conditions and other ecosystem processes that form and maintain productive fish habitats.

ii. Streambank shaping. Damaged streambanks must be restored to a natural slope, pattern and profile suitable for establishment of permanent woody vegetation.

iii. Revegetation. Areas requiring revegetation must be replanted before the first April 15 following construction with a diverse assemblage of species that are native to the project area or region, including grasses, forbs, shrubs and trees.

iv. Pesticides. No pesticide application is allowed, although mechanical or other methods may be used to control weeds and unwanted vegetation.

v. Fertilizer. No surface application of fertilizer may occur within 50-feet of any stream channel.

vi. Fencing. Fencing must be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

p. Treated wood.

i. Projects using treated wood[8] that may contact flowing water or that will be placed over water where it will be exposed to mechanical abrasion or where leachate may enter flowing water are not authorized, except for pilings installed following NOAA Fisheries' guidelines.[9] Treated wood pilings must incorporate design features to minimize abrasion of the treated wood from vessels, floats or other objects that may cause abrasion of the piling.

ii. Projects that require removal of treated wood will use the following precautions:

---

[8] 'Treated wood' means lumber, pilings, and other wood products preserved with alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), ammoniacal copper zinc arsenate (ACZA), copper naphthenate, chromated copper arsenate (CCA), pentachlorophenol, or creosote.

[9] Letter from Steve Morris, National Marine Fisheries Service, to W.B. Paynter, Portland District, U.S. Army Corps of Engineers (December 9, 1998) (transmitting a document titled *Position Document for the Use of Treated Wood in Areas within Oregon Occupied by Endangered Species Act Proposed and Listed Anadromous Fish Species, National Marine Fisheries Service, December 1998*).

(1) Treated wood debris. Take care to ensure that no treated wood debris falls into the water. If treated wood debris does fall into the water, remove it immediately.

(2) Disposal of treated wood debris. Dispose of all treated wood debris removed during a project, including treated wood pilings, at an upland facility approved for hazardous materials of this classification. Do not leave a treated wood piling in the water or stacked on the streambank.

q. Pile Driving.

i. The number and diameter of the pilings are minimized, as appropriate, without reducing the structural integrity.

ii. The COE shall ensure that, providing substrate conditions are appropriate, vibratory hammers are used to drive piles when possible. If substrate conditions are not appropriate, impact hammers may be used. Impact hammers will require the use of a bubble curtain.

iii. Drive each piling as follows to minimize the use of force and resulting sound pressure.

(1) When impact drivers will be used to install a pile, use the smallest driver and the minimum force necessary to complete the job. Use a drop hammer or a hydraulic impact hammer, whenever feasible and set the drop height to the minimum necessary to drive the piling.

(2) When using an impact hammer to drive or proof steel piles, one of the following sound attenuation devices will be used to reduce sound pressure levels by 20 dB.

(3) Place a block of wood or other sound dampening material between the hammer and the piling being driven.

(4) If currents are 1.7 miles per hour or less, surround the piling being driven by an unconfined bubble curtain that will distribute small air bubbles around 100% of the piling perimeter for the full depth of the water column.[10]

(5) If currents greater than 1.7 miles per hour, surround the piling being driven by a confined bubble curtain (*e.g.*, a bubble ring surrounded by a fabric or metal sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.

---

[10] For guidance on how to deploy an effective, economical bubble curtain, see, Longmuir, C. and T. Lively, *Bubble Curtain Systems for Use During Marine Pile Driving*, Fraser River Pile and Dredge LTD, 1830 River Drive, New Westminster, British Columbia, V3M 2A8, Canada. Recommended components include a high volume air compressor that can supply more than 100 pounds per square inch at 150 cubic feet per minute to a distribution manifold with 1/16 inch diameter air release holes spaced every 3/4 inch along its length. An additional distribution manifold is needed for each 35 feet of water depth.

(6) Other sound attenuation devices as approved in writing by NOAA Fisheries.

iv. Piling removal. If a temporary or permanent piling will be removed, the following conditions apply:

(1) Dislodge the piling with a vibratory hammer.

(2) Once loose, place the piling onto the construction barge or other appropriate dry storage site.

(3) If a treated wood piling breaks during removal, either remove the stump by breaking or cutting 3 feet below the sediment surface or push the stump in to that depth, then cover it with a cap of clean substrate appropriate for the site, filling the holes left by each piling with clean, native sediments, whenever feasible.

2. To implement reasonable and prudent measure #3 (monitoring), the COE shall:

a. Implementation monitoring. Ensure that the permittee submits a monitoring report to the COE within 120 days of project completion describing the permittee's success meeting permit conditions. The monitoring report will include the following information:

i. Project identification

(1) Permittee name, permit number, and project name.

(2) Project location, including any compensatory mitigation site(s), by 5th field HUC and by latitude and longitude as determined from the appropriate USGS 7-minute quadrangle map.

(3) COE contact person.

(4) Starting and ending dates for work completed.

ii. Photo documentation. Photo of habitat conditions at the project and any compensation site(s), before, during, and after project completion.[11]

(1) Include general views and close-ups showing details of the project and project area, including pre and post construction.

(2) Label each photo with date, time, project name, photographer's name, and a comment about the subject.

iii. Other data. Additional project-specific data, as appropriate for individual projects.

(1) Work cessation. Dates work cessation was required due to high flows.

(2) Fish screen. Compliance with NOAA Fisheries' fish screen criteria.

[11] Relevant habitat conditions may include characteristics of channels, eroding and stable streambanks in the project area, riparian vegetation, water quality, flows at base, bankfull and over-bankfull stages, and other visually discernable environmental conditions at the project area, and upstream and downstream of the project.

(3) A summary of pollution and erosion control inspections, including any erosion control failure, hazardous material spill, and correction effort.

(4) Site preparation.
- (a) Total cleared area – riparian and upland.
- (b) Total new impervious area.

(5) Isolation of in-water work area, capture and release.
- (a) Supervisory fish biologist – name and address.
- (b) Methods of work area isolation and take minimization.
- (c) Stream conditions before, during and within one week after completion of work area isolation.
- (d) Means of fish capture.
- (e) Number of fish captured by species.
- (f) Location and condition of all fish released.
- (g) Any incidence of observed injury or mortality.

(6) Site restoration.
- (a) Finished grade slopes and elevations.
- (b) Log and rock structure elevations, orientation, and anchoring (if any).
- (c) Planting composition and density.
- (d) A five-year plan to:
  - (i) Inspect and, if necessary, replace failed plantings to achieve 100% survival at the end of the first year, and 80% survival or 80% coverage after five years (including both plantings and natural recruitment).
  - (ii) Control invasive non-native vegetation.
- (iii) Protect plantings from wildlife damage and other harm.

iv. Reporting. On an annual basis for five years after completing the project, the COE shall ensure submital of a monitoring report to NOAA Fisheries describing the applicant's success in meeting their habitat restoration goals of any riparian plantings. This report will consist of the following information:

(1) Project identification.
- (a) Project name.
- (b) Starting and ending dates of work completed for this project.
- (c) The COE contact person.

(2) Riparian restoration. Documentation of the following conditions:
- (a) Any changes in planting composition and density.
- (b) A plan to inspect and, if necessary, replace failed plantings and structures.

v. Monitoring reports will be submitted to:

NOAA Fisheries
Oregon State Habitat Office
Attn: 2003/01255
525 NE Oregon Street, Suite 500
Portland, OR 97232-2778

b. NOTICE. If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify the Vancouver Field Office of NOAA Fisheries Law Enforcement at 360.418.4246. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

3. MAGNUSON - STEVENS ACT

3.1 Background

The objective of the essential fish habitat (EFH) consultation is to determine whether the proposed action may adversely affect designated EFH for relevant species, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of essential fish habitat: '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 (50CFR600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;

- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall 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 NOAA Fisheries, the Federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. 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 NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

3.3 Identification of EFH

The Pacific Fisheries Management Council (PFMC) has designated EFH for three species of 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 waterbodies 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 potential adverse effects to these species' EFH from the proposed action is based on this information.

3.4 Proposed Actions

The proposed actions are detailed in section 1.2, Proposed Action. The action areas are defined as the channels and adjacent riparian areas from about 400 meters upstream of the project sites and downstream 400 meters to the extent of visable turbidity. These areas have been designated as EFH for various life stages of coho and chinook salmon.

3.5 Effects of Proposed Action

As described in detail in section 2.1.3, Analysis of Effects, the proposed activities may result in detrimental short-term adverse effects to a variety of habitat parameters. These impacts include: Increases in turbidity, disturbance of the beds and banks of the river, removal of riparian vegetation, and the potential for pollutants to enter the water.

3.6 Conclusion

After reviewing the current status of the listed species, the environmental baseline for the action areas, the effects of the proposed bridge replacements, and cumulative effects, NOAA Fisheries has determined that the Row River Bridges and Overflow Bridges Replacement Project, as proposed, will adversely affect EFH for Pacific salmon.

3.7 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that would adversely affect EFH. The conservation measures proposed for the project by the COE in the BA and all of the Reasonable and Prudent Measures and the Terms and Conditions contained in Sections 2.2.2 and 2.2.3 of this Opinionare applicable to salmon EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

3.8 Statutory Response Requirement

Please note that the MSA (section 305(b)) and 50 CFR 600.920(j) requires the Federal agency to provide a written response to NOAA Fisheries after receiving EFH conservation recommendations within 90 days of its receipt of this letter. This response must include a description of measures proposed by the agency to avoid, minimize, mitigate or offset the adverse impacts of the activity on EFH. If the response is inconsistent with a conservation recommendation from NOAA Fisheries, the agency must explain its reasons for not following the recommendation.

3.9 Supplemental Consultation

The COE must reinitiate EFH consultation with NOAA Fisheries if either the action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

4. LITERATURE CITED

Section 7(a)(2) of the ESA requires biological opinions to be based on "the best scientific and commercial data available." This section identifies the data used in developing this Opinion.

Bell, M.C. 1991. Fisheries handbook of Engineering requirements and biological criteria. Fish Passage Development and Evaluation Program. U.S. Army Corps of Engineers. North Pacific Division.

Berg, L. and T.G. Northcote. 1985. "Changes In Territorial, Gill-Flaring, and Feeding Behavior in Juvenile Coho Salmon (Oncorhynchus kisutch) Following Short-Term Pulses of Suspended Sediment." Canadian Journal of Fisheries and Aquatic Sciences 42: 1410-1417.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 *in* W.R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19:83-138.

Bureau of Land Management (BLM). 1997. Row River Watershed Analysis. Eugene, Oregon.URL:http://www.edo.or.blm.gov/planning/watershed_analysis/row_river/httoc.htm. (February 12, 2003).

Busby, P., S. Grabowski, R. Iwanoto, C. Mahnken, G. Matthews, M. Schiewe, T. Wainwright, R. Waples, J. Williams, C. Wingert, and R. Resenbichler. 1995. Review of the status of steelhead (*Oncorhychus mykiss*) from Washington, Idaho, Oregon, and California under the U.S. Endangered Species Act. 102 p. plus 3 appendices.

Busby, P., T. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, and I.V. Lagomarisino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California.

Caltrans. 2002. Biological Assessment for the Benicia Martinez New Bridge Project for NOAA Fisheries. Prepared by Caltrans for U.S. Department of Transportation. October 2002. 37 pp.

Desjardin, Darrell. 2003. Port of Vancouver, B.C.. Personal Communication. E-mail

DeVore, P. W., L. T. Brooke, and W. A. Swenson. 1980. "The Effects of Red Clay Turbidity and Sedimentation on Aquatic Life In the Nemadji River System. Impact of Nonpoint Pollution Control on Western Lake Superior." S. C. Andrews, R. G. Christensen, and C. D. Wilson. Washington, D.C., U.S. Environmental Protection Agency. EPA Report 905/9-79-002-B.

EPA. 2003. Surf Your Watershed. County statistics. http://quickfacts.census.gov/qfd/states/41/41039.html

Feist, B.E., Anderson, J.J., and R. Miyamota. 1992. Potential impacts of pile driving on juvenile pink *(Oncorhynchus gorbuscha)* and chum *(O. keta)* salmon behavior and distribution. Fisheries Research Institute, School of Fisheries, University of Washington. Seattle, Washington.

Hastings, M.C. 2002. Clarification of the meaning of sound pressure levels and the known effects of sound on fish. August 26, 2002; revised August 27, 2002. pp 8.

Gregory, R. S. 1988. Effects of Turbidity on benthic foraging and predation risk in juvenile chinook salmon. Pages 64-73 *In:* C. A. Simenstad (ed.) Effects of dredging on anadromous Pacific coast fishes. Washington Sea Grant Program. Washington State University. Seattle, Washington.

Gregory, R.S. 1993. Effect of turbidity on the predator avoidance behavior of juvenile chinook salmon (Oncorhynchus tshawytcha). Canadian J. Fish. Aquatic Sciences 50:241-246.

Gregory, R. S., and C. D. Levings. 1998. "Turbidity Reduces Predation on Migrating Juvenile Pacific Salmon." Transactions of the American Fisheries Society 127: 275-285.

Lloyd, D. S. 1987. Turbidity as a Water Quality Standard for Salmonid Habitats in Alaska. North American Journal of Fisheries Management 7:34-45.

Myers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples, 1998. Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memo. NOAA Fisheries-NWFWC-35, 443 p.

Nedwell, J. and B. Edwards. 2002. Measurements of underwater noise in the Arun River during piling at County Warf, Littlehampton. Report by Subacoustech, Ltd to David Wilson Homes, Ltd.

Neff, J.M. 1985. Polycyclic aromatic hydrocarbons. Pages 416-454 in G.M. Rand and S.R. Petrocelli. Fundamentals of aquatic toxicology,. Hemisphere Publishing, Washington, D.C.

Newcombe, C. P., and D. D. MacDonald. 1991. "Effects of Suspended Sediments on Aquatic Ecosystems." North American Journal of Fisheries Management 11: 72-82.

NOAA Fisheries. 2003. Biological Opinion for the Benicia-Martinez New Bridge Project. Southwest Region, Santa Rosa, California. Admin. Rec. 151422SWR02SR6292.

NOAA Fisheries. 2001. Biological Opinion for the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project. Southwest Region, Santa Rosa, California. Admin. Rec. 151422SWR99SR190.

NOAA Fisheries (National Marine Fisheries Service). Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act. 2000. Protected Resources Division, Portland, Oregon, 5 pp.

NOAA Fisheries (National Marine Fisheries Service). 1996. Making Endangered Species Act determinations of effect for individual and grouped actions at the watershed scale. Habitat Conservation Program, Portland, Oregon, 32 p.

ODEQ. 2002. 303(d) List of Water Quality Limited Water Bodies, EPA-approved list. http://www.deq.state.or.us/wq/303dlist/303dpage.htm

Oregon Department of Fish and Wildlife. 2000. Oregon Guidelines for Timing of In-water Work to Protect Fish and Wildlife Resources. Portland, Oregon.

Oregon Department of Transportation (ODOT). 2002a. Structure and Inventory Appraisal Report for the Row River (NB) Bridge #07829A. Oregon Department of Transportation, Salem, Oregon.

Oregon Department of Transportation (ODOT). 2002b. Structure and Inventory Appraisal Report for the Row River (SB) Overflow Channel Bridge #07871B. Oregon Department of Transportation, Salem, Oregon.

Oregon Department of Transportation (ODOT). 2002c. Structure and Inventory Appraisal Report for the Row River (NB) Overflow Channel Bridge #07871A. Oregon Department of Transportation, Salem, Oregon.

Oregon Department of Transportation (ODOT). 2002d. Oregon Standard Specifications for Highway Construction. Oregon Department of Transportation, Salem, Oregon.

PFMC (Pacific Fishery Management Council). 1999. *Amendment 14 to the Pacific Coast Salmon Plan*. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.

Redding, J. M., C. B. Schreck, and F. H. Everest. 1987. "Physiological Effects on Coho Salmon and Steelhead of Exposure to Suspended Solids." Transactions of the American Fisheries Society 116: 737-744.

Rosgen, Dave. 1996. "Applied River Morphology". Wildland Hydrology. Chapter 6, pp. 26-32.

Scannell, P.O. 1988. Effects of Elevated Sediment Levels from Placer Mining on Survival and Behavior of Immature Arctic Grayling. Alaska Cooperative Fishery Unit, University of Alaska. Unit Contribution 27.

Servizi, J. A., and Martens, D. W. 1991. "Effects of Temperature, Season, and Fish Size on Acute Lethality of Suspended Sediments to Coho Salmon". Canadian Journal of Fisheries and Aquatic Sciences 49:1389-1395.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An Ecosystem Approach to Salmonid Conservation. TR-4501-96-6057.

Stadler, John. 2003. NOAA Fisheries. Personal communication. Phone conference, June 4, 2003

Streamnet. 2003. Row River chinook distribution. http://query.streamnet.org/ Request.cfm?Cmd=BuildQuery&ID=1230436438208&DataCategory=23&Species=1&County=120&NewQuery=BuildCriteria#

USACE (United States Army Corps of Engineers). 1977. Nehalem Wetlands Review: A Comprehensive Assessment of the Nehalem Bay and River (Oregon). U.S. Army Engineer District, Portland, Oregon. [Page count unknown].