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

Refer to:
OSB2002-0095-FEC

June 20, 2002

Lawrence C. Evans
U.S. Army Corps of Engineers
Environmental Resources Branch
P.O. Box 2946
Portland, OR 97208-2946

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation for Maintenance Dredging of the Willamette River at Port of Portland Terminal 4, Berths 410/411, Multnomah County, Oregon (Corps No. 2000-984).

Dear Mr. Evans:

Enclosed is a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of the Corps of Engineers' review and permitting of a proposed five-year maintenance dredging program in the Willamette River at the Port of Portland Terminal 4, Berths 410/411. In this Opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River chinook salmon, Columbia River chum salmon (*O. keta*), Upper Willamette River steelhead (*O. mykiss*), Lower Columbia River steelhead. As required by section 7 of the ESA, NMFS has included reasonable and prudent measures with non-discretionary terms and conditions that NMFS believes are necessary to minimize the impact of incidental take associated with this action.

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 implementing regulations at 50 CFR Part 600.

If you have any questions regarding this consultation, please contact Dr. Nancy Munn of my staff in the Oregon Habitat Branch at 503.231.6269.

Sincerely,

Russell M Strach for

D. Robert Lohn
Regional Administrator

cc. Bill Hall, Port of Portland

Endangered Species Act - Section 7 Consultation
&
Magnuson-Stevens Act Essential Fish Habitat Consultation

BIOLOGICAL OPINION

Maintenance Dredging at Port of Portland Terminal 4,
Berths 410 and 411, Willamette River,
Multnomah County, Oregon

Agency:	Army Corps of Engineers, Portland District
Consultation Conducted By:	National Marine Fisheries Service, Northwest Region
Date Issued:	June 20, 2002
Issued by:	Russell M Strach for _____ D. Robert Lohn Regional Administrator
Refer to:	**OSB2002 - 0095- FEC**

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1. ENDANGERED SPECIES ACT

1.1 Background

On May 1, 2002, the National Marine Fisheries Service (NMFS) received a letter from the Corps of Engineers (COE) requesting formal consultation on the issuance of a five-year permit to conduct maintenance dredging of sediments at the Port of Portland Marine Terminal 4, Berths 410 and 411, in the Willamette River, Oregon. The two berths are located in Slip 3, off the main channel of the river and are presently the only berths in use in Slip 3. The project applicant is the Port of Portland (Port). The Port has designed the project and will be responsible for project implementation and oversight of all contractors. The Federal nexus for the ESA consultation is the issuance of the COE permit under section 10 of the Rivers and Harbors Act.

In the May 1, 2002, letter, the COE determined that Upper Willamette River (UWR) chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River (LCR) chinook salmon, Columbia River chum salmon (*O. keta*), UWR steelhead (*O. mykiss*), and LCR steelhead, may occur within the project area and that the proposed action is "likely to adversely affect" the listed species. The objective of this biological opinion (Opinion) is to determine whether the actions included in the five-year maintenance dredging plan are likely to jeopardize the continued existence of the above-listed species. This Opinion was prepared based on information received from the COE and the Port, and the best available science. This consultation is conducted pursuant to section 7(a)(2) of the ESA and its implementing regulations, 50 CFR 402.

1.2 Proposed Action

Marine Terminal 4, Berths 410 and 411, are located on the east bank of the lower Willamette River at river mile (RM) 4.7 in Portland, Oregon. Berths 410 and 411 were constructed in 1955. The berthing areas in Slip 3 have historically been used for bulk cargo loading and unloading operations, handling pencil pitch, diesel oil, soda ash, talc, ores of iron, lead, zinc and copper, bentonite clay, and coke. Bulk off-loading no longer occurs, and handling of pencil pitch was discontinued in June of 1998.

The proposed action is five years of maintenance dredging and dredged material management activities at Terminal 4, Berths 410 and 411. The requested depth of this dredging is -40 feet Columbia River Datum (CRD), plus a two-foot allowable overdredge. The amount dredged will not exceed 15,000 cubic yards per year.

The Port conducts annual bathymetric surveys of the Terminal 4 berthing areas to assess the condition of the available navigational depths. The surveys are used to identify the specific locations where sediments have accumulated above the authorized navigational depths. In some instances, the surveys indicate the presence of large debris at a certain spot on the bottom of the berthing area. This can be submerged logs or other large items that can present a hazard to navigation in the berthing area. In those cases the Port will remove the debris with a floating crane as soon as possible to eliminate danger.

When the Port identifies a need for maintenance dredging, it begins design work and other project initiation tasks. The Port will develop contract documents including plans, specifications, and permit terms and conditions when available, in order to solicit bids from contractors qualified to perform the requisite maintenance dredging at Terminal 4. The selected contractor will remove sediment from the high spots as indicated on the bathymetric survey by use of a close-lipped bucket operated from a floating crane. The weight of the bucket allows it in open position to grab sediment from the bottom. A close-lipped bucket is specifically designed to reduce sediment resuspension into the overlying water column by forming a seal when the bucket is in the closed position and retrieved to the surface. The sediments will be placed in a barge, either a flat-deck barge with watertight side boards or a bin-barge with one or multiple cells. For safety reasons, the sideboards and walking surfaces of the barge would be washed as needed since personnel are working on the barge during these operations. Once the barge is full, it will be transported to an off-loading site.

At the off-loading site the barge will be emptied, and the dredged material will be loaded into trucks or railcars for transportation to a certified landfill. Depending on the water content of the sediments, and external factors such as weather, an additive may be added to the dredged material to absorb excess water. No sediments or water will be released from the barges, trucks, or railcars during transportation, and they will be lined and covered with plastic sheeting if necessary.

When the contractor estimates that all designated sediments have been removed from the berthing area, a post-dredge survey will be performed to verify that the authorized depths have been restored in all of the berthing areas. If the post-dredge survey shows that areas were missed, the contractor will remove those sediments with additional dredging. The final post-dredge survey will be used to calculate the actual river sediment quantities that were removed. The process of clamshell dredging is generally accurate to approximately 1 foot, a relatively precise value considering the process of maneuvering a large clamshell bucket from a floating crane through more than 40 feet of water.

Dredging will occur during the in-water work windows for the Willamette River which are July 1 though October 31, and December 1 through January 31.

Although the proposed action includes five years of maintenance dredging, with up to 15,000 cubic yards of sediment removed each year, it is likely that the amount of sediment removed each year will be less than that. The actual amount removed will depend on river flows, sediment transport, and deposition in the berths. For the dredging project of summer 2002, the Port expects to begin dredging in early July. Approximately 2,500 to 3,500 cubic yards will be removed from Berth 410. The actual number of in-water work days is expected to be limited to 14 days or fewer.

1.3 Biological Information

The action area is defined by NMFS regulations (50 CFR 402) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The action area for the proposed project is the Willamette River extending from a point 0.8 miles upstream of Terminal 4 (RM 5.5), downstream to the confluence of the Willamette River with the Columbia River, including the water column and substrate. This is based on the possible extent of a turbidity plume from dredging operations calculated from river flow and tidal flow.

The Willamette River within the action area serves as a migration area for all listed species under consideration in this Opinion, with the exception of chum salmon. It may also serve as a feeding and rearing area for juvenile steelhead and chinook salmon. Essential features of the area for the species are: substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions (50 CFR 226). The proposed action may affect the essential habitat features of water quality, substrate, and food.

References for further background on listing status and biological information can be found in Table 1. Information about Lower Columbia River/Southwest Washington coho salmon is provided in the table, but that ESU is not discussed in this Opinion because it remains on the candidate list. A discussion of the recent status of the ESUs can be found in the biological assessment (2002).

The LCR chinook salmon includes both fall-run and spring-run stocks. Adults migrating to the Clackamas River may be present in the lower Willamette River starting in August and continuing through November, with peak migration occurring in September and October. Juveniles in this ESU would be expected in the lower Willamette River starting in March, continuing through July, with the peak occurring in April, May, and June.

Adults from the UWR chinook salmon ESU migrate through the action area beginning in March, and complete their migration by the end of July, with the peak between late April and early June. It is also possible that some adults hold for periods of time within the Portland Harbor. Chinook smolts would typically pass through the action area from January through June, and from August through December. Juveniles would be expected in the lower Willamette River anytime from March through mid-December.

Adult chum salmon may occur near the mouth of the Willamette River during their upstream migration from late September through December. They do not spawn in the Willamette River or its tributaries. Chum salmon fry may move into the lower Willamette River during incoming tides and could feed on organisms within the action area for short periods during their downstream migration.

LCR steelhead move through the action area throughout the year. Peak movement is expected from late April through May. Juvenile steelhead migration peak in April and May. Most steelhead smolts move downriver through the action area in less than one day.

Table 1 References for Additional Background on Listing Status, Biological Information, and Protective Regulations for the ESA-Listed and Candidate Species Considered in this Consultation.

Species / ESU	Status	Protective Regulations	Biological Information
Chinook salmon (*O. tshawytscha*)			
Lower Columbia River	Threatened 3/24/00; 64 FR 14308	7/10/00; 65 FR 42422	Myers et al. 1998; Healey 1991
Upper Willamette River	Threatened 3/24/00; 64 FR 14308	7/10/00; 65 FR 42422	Myers et al. 1998; Healey 1991
Chum Salmon (*O. keta*)			
Columbia River	Threatened 3/25/99; 64 FR 14508	7/10/00; 65 FR 42422	Johnson et al. 1997; Salo 1991
Steelhead (*O. mykiss*)			
Lower Columbia River	Threatened 3/19/98; 63 FR 13347	7/10/00; 65 FR 42422	Busby et al. 1995; 1996
Upper Willamette River	Threatened 3/25/99; 64 FR 14517	7/10/00; 65 FR 42422	Busby et al. 1995; 1996
Coho salmon (*Oncorhynchus kisutch*)			
Lower Columbia River/ Southwest Washington	Candidate 7/25/95; 60 FR 38011	Not Applicable	Weitkamp et al. 1995, Sandercock 1991

UWR steelhead adults could be expected in the action area from January through mid-May. Smolts would be present from March through mid-July, with peak migration occurring in May.

Based on this information, adult and juvenile chinook salmon would be expected to present in the lower Willamette River during the summer in-water work window (July 1 - October 31). UWR chinook salmon juveniles may be present during the winter in-water work window (December 1 through January 31). Adult chum salmon may be present during the winter in-water work window. Adult UWR steelhead may be present in the action area during the winter in-water work period, and juvenile steelhead from both listed ESUs may be present during the beginning of the summer in-water work window.

1.4 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). NMFS must determine whether the action is likely to jeopardize the listed species. This analysis involves the initial steps of defining the biological requirements and current status of the listed species, evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS 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, NMFS must consider the estimated level of mortality attributable to: (1) Collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. If NMFS finds that the action is likely to jeopardize the listed species, NMFS must identify reasonable and prudent alternatives for the action.

Furthermore, NMFS evaluates whether the action is likely to result in habitat modifications that appreciably diminish the value of the habitat for both survival and recovery of the listed species. NMFS identifies those effects of the action that impair the function of habitat. If NMFS concludes that the action modifies habitat in a way that affects the survival and recovery of listed species, it must identify any reasonable and prudent measures available.

For the proposed action, a jeopardy analysis by NMFS considers direct or indirect mortality of fish attributable to the action. NMFS also considers the extent to which the proposed action impairs habitat to determine whether the action is likely to result in jeopardy.

1.4.1 Biological Requirements

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

The relevant biological requirements are those necessary for the listed species to survive and recover to a naturally-reproducing population level at which protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance its capacity to adapt to various environmental conditions, and allow it to become self-sustaining in the natural environment.

For this consultation, the biological requirements are improved habitat characteristics that function to support successful rearing and migration. The current status of the listed species, based upon their risk of extinction, has not significantly improved since the species were listed. Chum salmon returns began to decline in the 1950s, and have remained at a depressed level since 1965 (Muldoon et al. 2001). The five-year average adult escapement of native, late-run winter steelhead within both ESUs has been declining since 1971 (Foster 2001). LCR chinook salmon in the Willamette River basin are represented by a single, small population of fall-run fish that spawn primarily in the lower mainstem Clackamas River. Long-term trends of this ESU are declining. Trends in the UWR chinook salmon populations are declining as well. The North Santiam population currently does not meet the critical viability threshold for abundance and productivity (King 2001).

1.4.2 Environmental Baseline

Terminal 4 is within the lower Willamette River at RM 4 within the Portland Harbor. The Willamette River watershed covers approximately 11,500 square miles in northwest Oregon between the Coast and Cascade mountain ranges. The river travels 187 miles from its headwaters to its mouth at the Columbia River. Most of the rainfall occurs in the fall, winter, and spring, with little rainfall during June, July, and August. The lowest river flow occurs during late summer. The 13 COE dams on tributary systems largely regulate flows in the mainstem Willamette River.

Significant changes have occurred in the watershed since the arrival of Europeans in the 1800s. The watershed was mostly forested land prior to the arrival of white settlers. Now, about half the basin is still forested. One-third of the basin is used for agriculture, and about five percent is urbanized or is in residential use. The river receives direct inputs from treated municipal wastes and industrial effluents. Nonpoint source input from agricultural, silvicultural, residential, urban and industrial land uses are also significant, especially during rainfall runoff.

The Willamette River, from its mouth to Willamette Falls, is currently on the 1998 Oregon Department of Environmental Quality (ODEQ) 303(d) list as water quality limited for the following parameters: Temperature (summer), bacteria, biological criteria (fish skeletal deformities), and toxics (mercury in fish tissue). Results from ODEQ ambient monitoring data indicate that 68 percent of the values at RM 7 and 61 percent of the values at RM 13.2 collected during the summer exceed the temperature standard of 68°C. Sediment conditions in the Willamette River watershed range from excellent in some of the upper tributaries to poor in much of the mainstem of the river (Altman et al. 1997). In the lower Willamette River, average turbidity levels tend to be higher in fall and winter. Monthly average turbidity ranges from four NTUs to 149 NTUs.

In 1997, ODEQ and the Environmental Protection Agency (EPA) took sediment samples within the Portland Harbor. The results of the study indicated that sediments in the harbor, including within the project area, contain concentrations of metals, polychorinated biphenyls (PCBs), pesticides, herbicides, dioxins/furans, tributyltin (TBT), and polycyclic aromatic hydrocarbons (PAHs) above EPA contaminant guidelines. Cleanup of the contaminated sediments is presently being addressed under the Federal Superfund process. In addition, the skeletal deformities in fish upstream of Willamette Falls suggests that there may also be chemical contamination upstream of the Portland Harbor area.

The Willamette River, from its mouth to Willamette Falls, is a free-flowing river. Historically, Willamette Falls was impassable to fall chinook salmon, coho salmon, chum salmon, and cutthroat trout. Only steelhead and some spring chinook salmon were known to ascend the falls. Fish passage facilities were constructed at the falls in the early 1900s, and were upgraded in 1971, however, the passage facilities are inefficient, and delay upstream migration.

Habitat conditions within the lower Willamette River are highly degraded. The streambanks have been channelized, off-channel areas removed, tributaries put into pipes, and the river has

been disconnected from its floodplain as the lower valley was urbanized. Silt loading to the lower Willamette River has increased over historic levels due to logging, agriculture, road building, and urban and suburban development within the watershed. The river in the vicinity of Terminal 4 has a soft bottom, with little or no aquatic vegetation. Limited opportunity exits for large wood recruitment to the lower Willamette River due to the paucity of mature trees along the shoreline, and the lack of relief along the shoreline to catch and hold the material. The banks of the river in the action area are heavily industrialized, with much of the bank hardened with riprap, vertical concrete walls, and docking facilities. Much of the historic off-channel habitat has been lost due to diking and filling of connected channels and wetlands. Columbia Slough, located downstream from Terminal 4, is the closest remaining off-channel habitat. Connections between the slough and the Columbia River have been cut off, and dikes have been constructed along much of the slough.

The main channel of the lower Willamette River in the action area is approximately 1,250 feet wide, and varies in depth from 30 to 75 feet. The side of the main channel are steeply sloped due to dredging. The COE maintains a 40-foot deep navigation channel in Portland Harbor, from the mouth of the river to RM 12.0. Shallow water habitat (less than 20 feet deep) is limited to narrow strips along the shoreline.

The Willamette River downstream of Willamette Falls, is used primarily as a migratory corridor by anadromous salmonids. Based on current research by ODFW, rearing of juvenile salmonids occurs in the Portland Harbor.

Remediation of pencil pitch-contaminated sediments along Berth 411 and part of Berth 410 was accomplished by dredging and confined aquatic disposal during the winter of 1994-1995. A small area in the vicinity of Berth 411 was excavated to elevation -49 feet CRD during these cleanup operations.

Accumulated sediments in the vicinity of Berth 410 were characterized and dredged in 1997. At that time, the sediment quality data indicated that PAHs and DDT concentrations in the dredge prism were above the Lower Columbia River Management Area (LCRMA) dredge material screening levels (SLs) and therefore were not suitable for open-water disposal without further biological testing. The Port disposed of these sediments in a confined cell in the Ross Island lagoon.

In July 1997, one bucket contained an estimated 50 to 1000 pounds of pencil pitch was spilled at Berth 411 during an unloading operation. A preliminary removal action was undertaken immediately, using a diver-assisted hydraulic dredge to remove pencil pitch from the site of the spill. This clean-up was not successful, and the sediments were dredged again in August 1998.

As part of the Portland Harbor study, DEQ and EPA conducted a port-wide sediment characterization study that included several samples in Terminal 4, Slip 3 (Weston 1998). Seven surface sediment samples and one subsurface sample were collected. Analytical results for these samples showed elevated concentrations of PAHs and zinc (none of the samples were collected from the proposed dredge prism at Berths 410 and 411). More samples were collected in

October 1999, at part of a Remedial Investigation for the Port to evaluate levels of contamination due to past industrial and bulk handling operations. Sediments from Berth 411 exceeded LCRMA dredge material maximum levels for PAHs, as well as SLs for metals and a few organics.

Further testing of the sediments within and below the proposed dredge prism was conducted by Hart Crowser (2002). Several high molecular-weight PAHs exceeded the SLs in the composite sample. More contamination was found in the sediments below the dredge prism. Originally, the Port's target depth was -42 feet CRD for the 2002 project. Because of contamination of PAHs and PCBs to -44 feet CRD and SL exceedences of DDT isomers to at least -45 feet CRD, the Port modified their dredge depth to -40.5 feet with a dredging tolerance of approximately 0.5 feet. To avoid exposing the more contaminated historical deposits, approximately 1.0 to 1.5 feet of cleaner material will remain in the berthing area to cover the deeper contaminated sediments.

1.5 Analysis of Effects

1.5.1 Effects of Proposed Action

Potential impacts to listed salmonids from the proposed action include both direct and indirect effects. Potential direct effects include mortality from entrainment of juvenile fish (Dutta and Sookachoff 1975, Boyd 1975, Armstrong et al. 1982, Tutty 1976) and from exposure to suspended sediments (turbidity). Potential indirect effects include behavioral (Sigler et al. 1984, Berg and Northcote 1985, Whitman et al. 1982, Gregory 1988) and sub-lethal impacts from exposure to increased turbidity (Sigler et al. 1984, Kirn et al. 1986, Emmett et al. 1988, Servizi 1988); mortality from predatory species that benefit from activities associated with dredging; loss of benthic food sources resulting from dredging (Morton 1977); and cumulative effects of maintenance of the navigational channel along the river.

Changes in habitats can occur as well. Dredging alters the natural processes of sediment erosion, transportation and deposition. Dredging changes bottom topography with resultant changes in water circulation and changes the mechanical properties of the sediment at the dredge site. The significance of the effect is a function of the ratio of the size of the dredged area to the size of the bottom area and water volume (Morton 1977).

1.5.1.1 Entrainment

NMFS does not expect clamshell dredging to entrain juvenile salmonids. The pressure waves created as the bucket descends through the water column would alert any salmon present, and therefore give individuals ample time to avoid the bucket. Hydraulic suction dredging may entrain juvenile salmonids (Dutta 1976, Dutta and Sookachoff 1975), however, this method of dredging will not be used for the proposed action.

The Corps conducted extensive sampling within the Columbia River in 1985-88 (Larson and Moehl 1990) and again in 1997-98. In the 1985-88 study, no juvenile salmon were entrained, and the 1997-98 study resulted in entrainment of just two juvenile salmon. McGraw and

Armstrong's (1990) examination of fish entrainment rates in Grays Harbor from 1978 to 1989 resulted in only one juvenile salmon being entrained. Dredging was conducted outside peak migration times. Stickney (1973) also found no evidence of fish mortality while monitoring dredging activities along the Atlantic Intracoastal Waterway. However, entrainment of juvenile salmon can be difficult to observe because of the small size of the fish and the turbidity of the water associated with dredging operations.

Because juvenile and adult steelhead and chinook salmon can be present in the lower Willamette River during the in-water work windows, entrainment may occur. As stated above, evidence to date suggests that its occurrence would be limited. Juveniles would be more susceptible to entrainment than adult salmonids because of their weaker swimming abilities. Also, NMFS believes that juvenile steelhead and chinook salmon would have ample room to avoid dredges should they choose to do so. NMFS does not expect adult entrainment to occur.

1.5.1.2 Turbidity

The effects of suspended sediment and turbidity 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, Birtwell et al. 1984, Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (Sigler et al. 1984, Lloyd 1987, Scannell 1988, Servizi and Martens 1991). Juvenile salmonids 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).

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 tradeoff (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 magnitude 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 appear to 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).

NMFS anticipates that turbidity generated from clamshell dredging will be limited in both space and time and confined to the area close to the operation. NMFS does not expect direct lethal take to occur because of turbidity. The dredged material is fairly coarse, and is expected to settle quickly after suspension, thus limiting its time in suspension. NMFS expects that some individual chinook salmon and steelhead (both adult and juvenile) may be harassed by turbidity plumes but could easily avoid potential plumes. Indirect lethal take could occur if individual juvenile fish are forced (i.e., avoiding plumes) into an area where they may be preyed upon.

1.5.1.3 Benthic Invertebrates

Benthic invertebrates in shallow water habitats are key food sources for juvenile salmonids during their outmigration (McCabe et al. 1996). The proposed maintenance dredging is conducted routinely, and therefore benthic production within the immediate areas of operation is likely suppressed. Maintenance dredging is not expected to affect benthic production outside the areas of operation, i.e., navigation channels, turning basins and mooring areas. While quantifying the impact this has on salmon populations is difficult, NMFS suspects that some impact on chinook and steelhead productivity may occur from suppression of benthic prey species.

1.5.1.4 Dredged Material Contaminants

Maintenance dredging will result in the localized temporary resuspension of sediment particles and associated contaminants and could potentially expose buried contaminants in the sediments even though dredging techniques are being modified to limit turbidity and exposure of contaminants. The greatest potential for affect comes from the elevated PAH concentrations. PAHs have been implicated in sub-lethal effects to juvenile salmonids in Puget Sound estuaries (McCain et al. 1990, Stein et al. 1995). Because fish metabolize PAHs, the parent compounds do not accumulate in tissues but are found in bile as metabolites (Varnanasi et al. 1989). Evidence for their presence in juvenile salmon is based on elevated concentrations of fluorescent aromatic compounds in bile samples, and high concentrations of PAHs in the stomach contents. Diet can serve as a pathway for contamination.

To evaluate the potential for contamination during dredging operations, the Port conducted a dredging elutriate test (DRET) which evaluates that toxicity of the sediment-associated water. A DRET test for a composite sediment sample from the proposed dredge prism was conducted and the results indicated contaminant releases to the water column during dredging should be below levels of concern relative to acute toxicity to fish or benthic organisms. However, it is possible that even the low concentrations of PAHs predicted by the DRET could result in a small increase in the levels of PAHs in benthic organisms within the sediment plume. PAHs can adhere to organic detritus particles that can be ingested by detritus-feeding organisms. Since it appears that consumption of contaminated benthos is a pathway for contamination, a small negative effect on juvenile salmonids at the sub-lethal level could result from the proposed action.

1.5.1.5 Increase in Port Activities

While beyond the scope of the COE and Port's current maintenance and operation activities, industrialization in the Portland Harbor is an indirect effect of maintaining the Federal navigation channels. In other words, maintaining the Federal navigation channels has and does facilitate industrial activity, and thus expansion of industrial activity can occur. This results in increases in dredging around dock facilities, alteration of riparian areas, loss of riparian areas, increased pollution, alteration and loss of shallow water habitat, and requests for deeper channels to enable ports to compete with other port facilities along the west coast. However, maintenance dredging is just that, maintaining the status quo in the subject waterways for existing commercial and private activities, and it is not conducted for industrial expansion.

1.5.2 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." Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate section 7 consultation processes. Therefore, these actions are not considered cumulative to the proposed action.

NMFS is not aware of any specific future non-federal activities within the action area that would cause greater impacts to listed species than presently occurs. NMFS assumes that future private and state actions will continue at similar intensities as in recent years**.**

1.6 Conclusion

NMFS believes that the proposed action would cause a minor, short-term degradation of anadromous salmonid habitat due to increased turbidity, possible reduction in benthic prey species, and potential for mortality due to entrainment. However, NMFS has determined, based on the available information, that the proposed action covered in this Opinion is not likely to jeopardize the continued existence of listed salmonids. NMFS used the best available scientific and commercial data to apply its jeopardy analysis. Our determination is based on these findings: (1) The entrainment of juveniles, if any occurs at all, would be limited to just a few individuals per year because the Port has committed to using a clamshell dredge; (2) turbidity generated by dredging would be limited in time and space, and would not cause long-term degradation of water quality; (3) there is limited exposure of contaminated sediments outside of the action area because the Port has committed to upland disposal of dredged sediments; and (4) while normal migration behavior could be disrupted, noise and vibration is not expected to impede adult or juvenile migration, as ample space is available for movement around the area being dredged.

1.7 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are *discretionary* measures suggested to minimize or avoid adverse effects of a proposed action on listed species, or to develop additional information. NMFS believes the following conservation recommendation is consistent with these obligations, and therefore should be carried out by the COE:

1. To the greatest extent possible, the COE should limit dredging to the period of mid-July to mid-September to avoid dredging during migration of juvenile chinook salmon and steelhead.

1.8 Reinitiation of Consultation

This concludes formal consultation on these actions in accordance with 50 CFR 402.14(b)(1). Reinitiation of consultation is required: (1) If the amount or extent of incidental take is exceeded; (2) if the action is modified in a way that causes an effect on the listed species that was not previously considered in the biological assessment and this biological opinion; (3) new information or project monitoring reveals effects of the action that may affect the listed species in a way not previously considered; or (4) a new species is listed that may be affected by the action; or (5) new critical habitat rulemaking results in the designation of critical habitat that may be affected by the action (50 CFR 402.16). The COE must reinitiate consultation for maintenance dredging at Terminal 4 within five years of the date of issuance of this Opinion.

2. INCIDENTAL TAKE STATEMENT

Section 4 (d) and Section 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 (64 FR 60727; November 8, 1999). 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 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 in order to implement the reasonable and prudent measures.

2.1 Amount or Extent of the Take

The NMFS anticipates that the action covered by this Opinion is reasonably certain to result in incidental take of listed salmonids because of detrimental effects from increased turbidity levels (non-lethal) from dredging, and the potential for direct incidental take from entrainment (lethal) of a few individual chinook or steelhead salmon each year. Effects of actions such as the one covered by this Opinion are largely unquantifiable in the short term, and are not expected to be measurable as long-term effects on habitat or population levels. Therefore, even though NMFS expects some low level incidental take to occur due to the action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of non-lethal incidental take to the species itself. In instances such as these, the NMFS designates the expected level of non-lethal take as "unquantifiable." In addition, based on research, NMFS expects that if lethal take does occur due to entrainment, it would likely be less than 10 juvenile chinook salmon or steelhead per year. The extent of take is limited to the project area.

2.2 Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures are necessary and appropriate to avoid or minimize take of listed salmonid species resulting from the action covered by this Opinion. The COE shall:

1. Minimize the potential for incidental take of juvenile and steelhead and chinook salmon.

2. Minimize the potential for the release of hazardous materials into the water or riparian area.

3. Minimize the potential for introducing contaminated sediment into the water column and reaches of the Willamette River outside of the project area.

4. Complete a comprehensive monitoring and reporting program to ensure measures provided in this Opinion are effective in minimizing the likelihood of take from permitted activities.

5. This consultation shall have a sunset date of not more than five years from date of issuance.

2.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the COE and/or their contractors must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure #1 (potential for incidental take), the COE shall ensure that:

a. In-water work. All work within the active channel of all anadromous fish-bearing streams, or in systems which could potentially contribute sediment or toxicants to downstream fish-bearing systems, will be completed within the ODFW approved in-water work period of July 1 through October 31 or December 1 through January 31.
    i. Work period extensions. Extensions of the in-water work period, including those for work outside the wetted perimeter of the stream but below the ordinary high water mark, must be approved by biologists from NMFS.
b. A close-lipped clamshell bucket that allows the bucket to seal around its edges must be used for all dredging activities to minimize the potential for entrainment and minimize turbidity.
c. Turbidity. The Water Quality Management Plan (Port of Portland 2002) will be fully implemented. The Plan outlines turbidity requirements and sets turbidity thresholds for the summer and winter in-water work windows.
d. Pollution control plan. A Pollution Control Plan (PCP) will be developed for each authorized project to prevent point-source pollution related to construction operations. The PCP will contain the pertinent elements listed below and meet requirements of all applicable laws and regulations:
    i. Methods that will be used to prevent erosion and sedimentation associated with equipment and the removal action.
    ii. A description of the hazardous products or materials that will be used, including inventory, storage, handling, and monitoring.
    iii. 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 will be available on site, proposed methods for disposal of spilled materials, and employee training for spill containment.
    iv. Measures that will be taken to prevent debris from falling into any aquatic habitat. Any material that falls into a stream during construction operations will be removed in a manner that has a minimum impact on the streambed and water quality.
e. Waste management. All contaminated waste generated will be disposed of off-site at the appropriate facility.

2. To implement reasonable and prudent measure #2 (release of hazardous materials), the COE shall ensure that:
    a. If oil or other unknown substance appears on the water surface or in dredged material while dredges are being operated, the captain or crew shall cease operation immediately to identify the source of the contaminant.

3. To implement reasonable and prudent measure #3 (contaminated sediment), the COE shall ensure that:
    a. A close-lipped clamshell bucket will be used to minimize the amount of sediment that re-enters the water column.

b. Chemical testing of the sediments will be conducted prior to each dredging event. The testing will be conducted according to the Lower Columbia River Management Area guidelines and screening levels.

c. Frequent bathymetric surveys will be conducted to ensure that sediment removal only occurs in areas that are shallower than 40 feet.

d. All dredged sediments will be disposed of at an appropriate upland site.

e. A bin-barge or flat-deck barge with watertight sideboards to enclose dredged material will be used to transport the dredged material to the shore. No material will be allowed to leak from the bins or overtop the walls. Measures discussed in Section 7 of the biological assessment will be fully implemented to minimize the leakage of sediment or water during the barging, barge offloading and transportation phases of each project.

4. To implement reasonable and prudent measure #4 (monitoring and reporting), the COE shall ensure that:

a. Monitoring. Within 30 days of completing each dredging project, the COE will submit a monitoring report to NMFS describing the success meeting these terms and conditions. This report will consist of the following information.

i. Project identification.

(1) Project name;

(2) starting and ending dates of work completed for this project; and

(3) the name and address of the supervisor(s).

ii. A narrative assessment of the project's effects on natural river function.

iii. Photographic documentation of environmental conditions at the project site before, during and after project completion. Photographs will include general project location views and close-ups showing details of the project area and project, including pre and post construction. Each photograph will be labeled with the date, time, photo point, project name, the name of the photographer, and a comment describing the photograph's subject.

iv. Results of the turbidity monitoring.

b. The Port of Portland will work with NMFS to develop a sediment sampling plan for determining the exposure of listed salmonids following dredging activities.

c. If a dead, injured, or sick endangered or threatened species specimen is located, initial notification must be made to the National Marine Fishery Service Law Enforcement Office, located at Vancouver Field Office, 600 Maritime, Suite 130, Vancouver, Washington 98661; telephone: 360/418-4246. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered and threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

d. Monitoring reports will be submitted to:

National Marine Fisheries Service
Oregon Habitat Branch
Attn: OSB2002-0095-FEC
525 NE Oregon Street
Portland, OR 97232

5. To implement reasonable and prudent measure #5 (sunset date), the COE shall ensure that:
   a. The COE shall reinitiate ESA consultation for maintenance dredging at Terminal 4 within five years of the date of issuance of this Opinion.

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 NMFS 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 NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NMFS 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 NMFS provide a detailed response in writing to NMFS 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 NMFS, 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 NMFS 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 federally-managed fisheries within the waters of Washington, Oregon, and California. The designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km)(PFMC 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years)(PFMC 1999). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border.

Detailed descriptions and identifications of EFH for the groundfish species are found in the Final Environmental Assessment/Regulatory Impact Review for Amendment 11 to The Pacific Coast Groundfish Management Plan (PFMC 1998a) and the NMFS Essential Fish Habitat for West Coast Groundfish Appendix (Casillas *et al.* 1998). Detailed descriptions and identifications of EFH for the coastal pelagic species are found in Amendment 8 to the Coastal Pelagic Species Fishery Management Plan (PFMC 1998b). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the potential adverse effects to these species' EFH from the proposed action is based on this information.

3.4 Proposed Actions

The proposed action is detailed above in section 1.2. This area has been designated as EFH for various life stages of chinook and coho salmon, and starry flounder (*Platyichthys stellatus*).

3.5 Effects of Proposed Action

As described in detail in section 1.5, the proposed activities may result in detrimental short-term adverse effects to certain habitat parameters. These impacts include:

1. Short-term increases in turbidity during dredging.

2. Regular disturbance of substrate where starry flounder and invertebrate prey are found.

3.6 Conclusion

NMFS believes that the proposed action may adversely affect the EFH for starry flounder and Pacific salmon species (chinook and coho salmon). Conservation measures proposed by the COE and the Port such as upland disposal of dredged sediments and the conservation measures and terms and conditions provided in this Opinion will minimize impacts to EFH.

3.7 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the Magnuson-Stevens Act, NMFS 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 and all of the Reasonable and Prudent Measures and the Terms and Conditions contained in Sections 2.2 and 2.3 are applicable to EFH. Therefore, NMFS incorporates each of those measures here as EFH conservation recommendations.

3.8 Statutory Response Requirement

Please note that the Magnuson-Stevens Act (section 305(b)) and 50 CFR 600.920(j) requires the Federal agency to provide a written response to NMFS after receiving EFH conservation recommendations within 30 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 NMFS, the agency must explain its reasons for not following the recommendation.

3.9 Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the action is substantially revised or new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920). In addition, as required in the terms and conditions listed above, the COE shall reinitiate consultation within five years of issuance of this Opinion.

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