UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
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Seattle, WA 98115-0070

NMFS Tracking No.
2003/00574

September 5, 2003

Nancy Harney
Remedial Project Manager
U.S. Environmental Protection Agency
Region 10 ECL-111
1200 Sixth Avenue
Seattle, Washington 98101-1128

Re: Endangered Species Act Section 7 formal consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Fish Consultation for the Superfund Remedial Action in Middle Waterway, Commencement Bay Nearshore/Tideflats Superfund Site, Tacoma, WA

Dear Ms. Harney:

In accordance with section 7 of the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 *et seq.*) and the Magnuson Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, the attached document transmits NOAA's National Marine Fisheries Service (NOAA Fisheries) Biological Opinion (Opinion) and MSA consultation on the Superfund removal action in Middle Waterway in Commencement Bay, Pierce County, Washington. The U.S. Environmental Protection Agency (EPA) had determined that the proposed action may affect, and is likely to adversely affect, the Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit.

This Opinion reflects the results of a formal ESA consultation and contains an analysis of effects covering PS chinook in Commencement Bay, Washington. The Opinion is based on information provided in the Biological Assessment sent to NOAA Fisheries by the EPA, and additional information transmitted via meetings, telephone conversations, fax and electronic mail. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office. NOAA Fisheries concludes that implementation of the proposed project is not likely to jeopardize the continued existence of PS chinook. In your review, please note that the incidental take statement, which includes Reasonable and Prudent Measures and Terms and Conditions, were designed to minimize incidental take.

The MSA consultation concluded that the proposed project may adversely impact designated Essential Fish Habitat (EFH) for chinook and other estuarine species. The Reasonable and

Prudent Measures of the ESA consultation, and Terms and Conditions identified therein, would address the negative effects from the proposed EPA actions. Therefore, NOAA Fisheries recommends that they be incorporated as EFH conservation measures.

If you have any questions, please contact Robert Clark at (206) 526-4338 (robert.clark@noaa.gov).

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

Enclosure

Endangered Species Act - Section 7 Consultation
Biological Opinion

and

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

NMFS Tracking No.: 2003/00574

Middle Waterway Remediation Action
Commencement Bay Nearshore/Tideflats
Superfund Site, Tacoma, Washington

Agency: United States Environmental Protection Agency

Consultation Conducted By: NOAA's National Marine Fisheries Service
Northwest Region

Issued by: For Michael R Crouse Date: September 5, 2003

D. Robert Lohn
Regional Administrator

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1.0 INTRODUCTION

1.1 Background and Consultation History

On May 17, 2003, the NOAA's National Marine Fisheries Service (NOAA Fisheries) received a Biological Assessment Addendum (BA; July 2000), an Addendum for Areas A and B Middle Waterway Problem Area (BA Addendum; April 2003), and a request for Endangered Species Act (ESA) section 7 and Essential Fish Habitat (EFH) consultations from the United States Environmental Protection Agency (EPA). Formal ESA consultation was initiated on May 17, 2003, because the EPA concluded that, while it may be difficult to quantify demonstrable impacts to listed resources by this Action, the conservative position must be taken that the proposed dredging, capping, replacement of over-water structures, and habitat development activities are likely to adversely affect Puget Sound (PS) chinook in the short term.

The Middle Waterway Action Committee (MWAC), consisting of Foss Maritime Company (Foss), Marine Industries Northwest, Inc.(MINI), and Pioneer Industries, Inc., have agreed to remove and/or cap contaminated sediments in Area A and B of the Middle Waterway) and dispose of contaminated sediments in the Blair Waterway Slip 1 Nearshore Confined Disposal Facility (NCD). Offsetting mitigation for this proposed action involves removal of overwater structures, slope reconfiguration with fish-friendly substrates, placement of large woody debris, removal of creosote-treated timber piling, and riparian plantings. The purpose of this Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund") remedial action is to address unacceptable risks to the environment and public health from the contaminated sediments. The EPA's removal order to MWAC is considered a Federal action under ESA. The proposed action occurs within the PS chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) and the marine waters of Water Resources Inventory Area (WRIA) 10.

In this Superfund cleanup, the contaminated sediments are located in the mouth of Middle Waterway and have been divided into two segments, Area A and Area B, for operation purposes (Figure 1). The Middle Waterway, the site of the proposed contaminated sediment dredging project, and Blair Waterway Slip 1, the site of the proposed disposal site of the sediments, are located within the industrial tideflats area of Commencement Bay, Tacoma, Washington. The disposal activity in Slip 1 NCD Site has been the subject of a separate NOAA Fisheries ESA consultation (NMFS Tracking No.: 2003/00452) and will not be discussed further. The proposed action will replace highly contaminated intertidal and subtidal sediments with chemically-clean relic deltatic substrates or confining caps. NOAA Fisheries concurs with the EPA effect determination of Likely to Adversely Affect.

The objective of this Biological Opinion (Opinion) is to determine whether the proposed action is likely to jeopardize the continued existence of PS chinook. The standards for determining jeopardy are described in section 7(a)(2) of the ESA and further defined in 50 CFR 402.14.

This document also presents NOAA Fisheries' consultation covering EFH, pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and implementing regulations for EFH found at 50 CFR 600. In their EFH assessment included in the BA, the EPA concluded their actions will benefit EFH by the long-term removal or capping of contaminated sediments with only minor short-term construction impacts, when their proposed Conservation Measures are applied.

Both the Opinion and the EFH consultation are based on information provided in the original Commencement Bay Nearshore/Tideflats (CB/NT) Superfund BA (EPA 2000), the BA Addendum, meetings, mail correspondence, electronic mail (e-mail) correspondence, and phone conversations, which are contained in the Administrative Record.

The various remedial elements to occur as part of the proposed action and covered by this Opinion include dredging of contaminated sediments, backfilling, thick-layer capping, enhanced natural recovery through thin-layer capping, slope reconfigurations, the removal of timber piles, the reconstruction of operational facilities using state-of-the-art materials (Cook's Marine Pier, the Foss Float, and the MINI wharf), the removal of over-water structures, and habitat enhancements.

1.2 Description of the Proposed Action

The EPA proposes to issue an approval to MWAC to proceed, under Superfund authority, with the removal and/or capping of sediment in Middle Waterway. During the development of EPA's selected remedy for sediments in Middle Waterway that exceed the Sediment Quality Objectives (SQOs), the waterway was organized into 67 discrete Sediment Management Units (SMUs) distributed among three separate operational areas (A, B, & C) (Figure 2). The boundaries of Areas A, B, and C were defined on the characteristics and use of each area.

Area A is characterized by water-dependent uses requiring navigational depths to be maintained and the remediation needs to maintain the integrity of the existing structures and allow for future development in this portion of the active, industrialized waterway. In addition to their own property and that subleased to others, Foss leases aquatic lands from the State of Washington adjacent to the former Cook's Marine facility. Area B contains the central tideflat area of the waterway. Portions are included in the Washington State Department of Natural Resources aquatic reserve and the proposed St. Paul Waterway Nearshore Facility habitat plan area. Area C (tideflats to the south) activities will be addressed under a separate remedial process.
The EPA's Superfund remedial action consists of several discrete but integrated elements which are the subject of this Opinion and described in the following sections.

1.2.1 Dredging of Sediments

The subtidal bottom sediments consist of fine-grained materials (silts, clays, and fine sands). Chemical constituents exceeding SQOs criteria within this area include metals, semivolatile organics, and polychlorinated biphenyls.

Overall, remedial dredging will occur in approximately 10 acres to remove approximately 94,000 cubic yards of sediment. Sediments will be dredged using a crane and mechanical eight to 12 cubic yard capacity clamshell bucket mounted on a barge. Dredged material will be loaded onto a split-hull barge for transport to the disposal site, and placed in the disposal facility or offloaded for upland disposal. Excavation is expected to be performed from shore in SMUs 3b, 4a, 5b, 31, 32, 37, and 53 using a land-based excavator, loader, or Gradall to dig the material, though the contractor may elect to do it from the waterside. A dump truck will haul the land-based excavated material to the designated disposal site. Excavations in the marine railway area will be performed within an oil boom. Any work performed "in the dry" will be covered with a minimum of one-foot of base cap material before the next incoming tide. To access contaminated sediments under piers and wharves, some structures will be partial dismantled (*e.g.,* decking, stringer, and possible pile caps), rebuilt following remediation (Cook's Marine Pier) or just demolished (Scow Shed).

All contaminated sediments exceeding SQOs will be removed from all identified SMUs through dredging except at SMUs 15b and 21, 30, 31, and 32. In these areas, it is not possible to dredge all contaminated sediments due to the presence of obstacles such as marine railway structures (SMUs 30, 31, and 32) and concerns with slope stability (SMUs 15b and 21). Therefore, these SMUs will have a thick-layer cap of clean sands placed over the dredged area to prevent exposure to contaminated sediments. In addition, the final surface layer in SMUs 15b and 21 will be riprap and in elevations higher than minus 10 feet mean lower low water (MLLW), surficial cap material will be placed over the riprap filling in the intersticial spaces. The final surface layer in SMUs 30, 31, and 32 will consist of surficial cap material, which meets the specifications provided by the National Oceanic and Atmospheric Administration (NOAA) and the Washington Department of Fish and Wildlife (WDFW) for "habitat mix" (Clark 2002).

Up to approximately 10 feet of material may be dredged in various locations to remove all sediments exceeding the SQOs. Subsurface cores collected during sediment characterization work (Foster Wheeler and Anchor 1999; Anchor Environmental and Foster Wheeler 2000) show SQO exceedances extending to a depth of 8.5 feet below the bottom. This quantity of material, including any debris encountered, can be readily removed with mechanical dredging equipment.

The dredging layout (planned area of dredging) extends below the known limit of contamination by up to two feet. This depth was calculated by 1) determining the physical elevations of known chemical exceedances by converting the depth below the bottom to a MLLW elevation, 2) rounding this value down to the next whole integer of elevation, and 3) adding a one-foot overdredge.

For example, the bottom elevation of sampling core MW114 is minus 16.7 feet MLLW and the depth of SQO exceedances is two feet. Therefore, the elevation of SQO exceedances is 18.7 feet below MLLW. That value is rounded down to minus 19 feet MLLW. Adding a one-foot overdredge results in a minimum dredge cut of minus 20 feet MLLW.

The main habitat conversions are occurring in SMUs 37, 41, and 42 in which shallow subtidal and low intertidal habitats will be converted to deep subtidal habitat. The area underneath the Scow Shed (SMU 46) does not go dry at low tide even though it is within the intertidal elevation range due to the presence of a berm in front of the Scow Shed. The berm's elevation is plus three feet MLLW and prevents water from flowing out of the Scow Shed at tides lower than this elevation. Therefore, this area is functionally subtidal and will remain subtidal (minus seven feet MLLW) post dredging. These areas of habitat conversion (SMUs 37, 41, and 42) account for the 0.29 acre loss of shallow water habitat and occur in front of and along the face of the MINI wharf, which functions as a shipyard.

1.2.2 Backfilling

In Area A, backfilling, thick-layer capping, and thin-layer capping techniques will all be used in various SMUs (Figure 2). The two different types of surface material include surficial cap material ("habitat mix") and riprap. Riprap in shallow water areas (shallower than minus 10 feet MLLW) will be covered with surficial cap material to fill in the intersticial spaces between pieces of riprap.

Clean material used for these purposes will be brought into the project area and placed either from the water using barges and a mechanical clamshell bucket or from land using a dump truck. Remediation activities occurring in all or portions of SMUs 3b, 5a, 5b, 31, and 32 may be performed from the land during low tides, allowing the operations to occur in the dry.

Converting littoral habitat to deep subtidal habitat through dredging may cause a loss of vegetated, shallow water nearshore habitat important to the survival of juvenile salmonids and may produce a shift in the composition of an area's flora and fauna. Backfilling is used to eliminate habitat loss or conversion, which is achieved by placing clean material that returns the dredge areas close to their original grade. Backfilling in Area A will occur in SMUs 3a, 3b, 4a, 4b, and 5b. All surface backfill will consist of surficial cap material ("habitat mix"). No backfilling will occur where the rubble berm will be removed in front of the Scow Shed or in other areas near the Scow Shed.

1.2.3 Thick-Layer Capping

Thick-layer caps are typically three feet or more in thickness. They are used to isolate problem sediments from the water column and the biologically active zone of the sediments. Palermo *et al.* (1998) have demonstrated that an isolation cap of clean silty sand at a thickness of 1.5 feet can isolate the majority of benthic organisms from contaminated sediments, prevent the bioaccumulation of contaminants, and effectively prevent contaminant flux over the long term.

Depending on the material's source, seeding of the benthic community and rapid recolonization are possible. Thick-layer capping will be conducted in Area A along the face of SMUs 15b and 21 over remaining contaminated sediments. This cap is expected to be approximately 15 to 20 feet in width. The surface material on top of this sand and gravel cap will consist of riprap with surficial cap material filling in the intersticial spaces between riprap pieces in elevations higher than minus 10 feet MLLW. Riprap was chosen as the appropriate material for this area of the waterway to withstand its expected use without compromising the cap or stability of the slope. Propwash is a major consideration in this location because Foss Maritime operates their Tacoma base at the mouth of the waterway. Additionally, a thick-layer cap will be placed over the remaining contaminated sediments after dredging in SMUs 30, 31, and 32. The surface layer in these SMUs will consist of surficial cap material ("habitat mix"). The thick-layer cap in these SMUs will restore the elevation to the original pre-dredge grade, preventing habitat loss due to conversion.

1.2.4 Enhanced Natural Recovery or Thin-Layer Capping

Thin-layer capping is recommended only in SMU 5a and in SMU 55, if required. Thin layer caps are used for enhanced natural recovery, which is the placement of clean material in areas with surface sediment concentrations that require low-level remedial action to accelerate natural recovery. Thin-layer caps, typically two to eight inches in thickness, are very effective in low-energy environments and with proper protection can also be effective in high-energy environments. Enhanced natural recovery has been demonstrated to be effective in the intertidal regions of Eagle Harbor (Bainbridge Island, Washington) and is expected to be similarly effective in Commencement Bay. The objective of thin-layer capping is not to isolate the surface sediments, but to augment the natural sedimentation rate by introducing clean sand. Natural processes, such as bioturbation, will mix the sand with the underlying material, reducing chemical concentrations in the biologically active zone with minimal disruption of the existing benthic community. In SMU 5a, the clean material will consist of six inches of sand with an overlay of six inches of surficial cap material ("habitat mix"). This material will be blended or feathered in with the adjacent Olympic View Resource Area (OVRA) cap, where possible.

Surficial cap material will be placed and spread from land in the dry. With this placement technique, the existing mudflat elevation and habitat function will not be appreciably changed, and the existing structure of the benthic community will be protected. Colonization of new material by existing benthic species is expected to be rapid.

1.2.5 Slope Reconfigurations

Various side slopes in Areas A and B of the waterway will be reconfigured to provide improved stabilization. Side slopes within the waterway are generally cut at three feet of horizontal length to one-foot of vertical height; however, the toes of the slopes in SMUs 15b, 20, and 21 will be cut such that they have a short-term slope of 2.5 feet horizontal to one-foot vertical. Clean cap and bank protection material *(e.g.,* riprap) will be placed after these cuts have been made to provide greater stability to the bank and return the bank to a more gradual slope (three feet horizontal to one-foot vertical.

Slope reconfiguration will also occur along the existing wharf in SMUs 37 and 45. Prior to excavation, additional lateral support will be required along the wharf to prevent the existing bulkhead from failing. Therefore, approximately 655 lineal feet of braced frames with lagging will be placed waterward of the existing bulkhead along the wharf (MINI property). Each braced frame will consist of steel H-piles driven at the front and back of the wharf. A combination of mainly concrete lagging and minimal timber treated with ammoniacal copper zinc arsenate (ACZA) will span between the frames. All ACZA-treated wood used during construction will be produced and used according to the Western Wood Preserver's Best Management Practices (BMPs) for treated wood in the aquatic environment as revised in July 1996, and amended in April 2002. The lagging will be used to retain the soil between frames and transfer the load created by the soil to the frames. In addition, untreated timber fenders will be placed at every other bent along the new bulkhead, resulting in a total installation of 48 fenders. The banks along SMUs 37 and 45 will then be excavated to the existing slope of two feet horizontal to one-foot vertical, as will the area adjacent to and under the finger pier. Riprap will be placed on these slopes to protect the bank from further erosion, and surficial cap material will be placed in the spaces between the riprap to provide improved habitat conditions for salmonids.

In SMU 53 (Area B), bank material that exceeds SQOs will be removed and replaced with an engineered slope protection surface over the bank for stabilization (Figure 3). The existing bank in SMU 53 will be pulled back, and the resulting slope will be more gradual than existing conditions. The existing bank is composed of broken concrete and eroding bank material. The improved bank will be designed to be stable and will incorporate the smallest armoring material required to prevent erosion. The final substrate will be a two-foot layer of surficial cap material. In addition, debris along the bank between the Scow Shed and SMU 53 will be removed and replanted with native species. This will improve riparian conditions along an additional approximately 200-foot section of shoreline. Live willow stakes and cottonwood poles will be planted in the upland portion of this bank (plus 15 feet MLLW) and large logs with rootballs will be placed so that portions of the logs extend into the upper intertidal zone to further stabilize the slope and prevent bank erosion. As the willow trees grow, overhanging vegetation will create shading and cover along this section of the shoreline. The logs will also create structure along the shoreline and provide habitat for salmonid prey items.

The existing bulkhead along MINI's wharf does not have sufficient strength to withstand dredging. Therefore, a new bulkhead consisting of braced frames with lagging will be placed waterward of the existing one. The slope at the base of the existing bulkhead will be rebuilt and reengineered to a slope of two feet horizontal to one-foot vertical, so there will be no permanent dredging-related shoreline modification to this area.

At the OVRA site, dredging of the bank will be backfilled with clean material to limit long-term effects on habitat. Slope reconfiguration and shoreline riparian plantings will also occur in an area adjacent to SMU 5b as part of the OVRA. The City of Tacoma will complete the planting within six months of receipt of notification by Foss Maritime that remedial action in SMU 5b has been completed. These plantings will stabilize the bank soils in this area and improve the quality of adjacent littoral habitat for juvenile salmonids.

1.2.6 Removal and Installation of Timber Piles

As part of the construction activities associated with the selected remedy, a number of remnant creosote-treated timber piles will be removed from the project area, and functioning creosote-treated timber piles will be removed and replaced with either concrete or steel piles using vibratory equipment, to the extent possible. Fewer piles will need to be reinstalled to support the rebuilt wharf and bulkhead, because these materials have greater inherent strength.

In Area B, approximately 70 creosote-treated timber piles will be permanently removed along SMU 53.

1.2.7 Removal and Reconstruction of Over-Water Structures

The Scow Shed in SMU 46 will be removed "uncovering" 0.34 acre of shallow water habitat, including foundation structures, as necessary. Additional habitat benefits will be created through the removal of the Foss pier in SMU 4c covering 0.06 acre of shallow water habitat.

In Area A, timber piles will be removed and/or replaced as part of the reconstruction of the Cook's Marine Pier, the Foss Float, and the MINI wharf. The MWAC plans to rebuild the pier structure at the Cook's Marine facility within its current footprint as part of the remediation process; therefore, approximately 500 creosote-treated timber piles associated with the facility will be removed and replaced with a fewer number of concrete piles. Approximately 45 creosote-treated timber piles making up seven dolphins that support the Foss float will be removed and replaced with 32, 12-inch diameter hollow steel piles. Approximately 250 creosote-treated timber piles along the MINI wharf will be removed. The replacement bulkhead consisting of a mixture of mainly concrete and a minimum amount of ACZA-treated timber will utilize steel H-beam piles. None of the ACZA-treated timber will be submerged in the water. Approximately 48 untreated timber fenders will be installed as part of the new bulkhead. Much of the new pile installation can be accomplished "in the dry" or with the use of vibratory equipment.

1.2.8 Duration and Timing of Construction Activities

The in-water elements of EPA's selected remedy in Areas A and B of the Middle Waterway will take up to seven months to complete. To be protective of juvenile salmonids, NOAA Fisheries, USFWS, and the WDFW have specified in-water construction windows for Commencement Bay. In-water construction in Middle Waterway will be allowed July 16 through February 14, except for dredging or disposing of contaminated sediments, which will not start until August 16.

To prevent slope failure, the replacement bulkhead along the MINI wharf will need to be installed prior to any adjacent dredging. Furthermore, the sediments along the MINI wharf must be dredged first, because they contain the highest chemical concentrations. Therefore, in order to meet disposal deadlines for Blair Slip 1, work for installation of the replacement bulkhead will need to begin on or before July 16, 2003. Activities to be conducted prior to July 16, 2003, include deck removal, relocating utilities at the MINI wharf, site preparation, and other non-in-water activities. Demolition of the structures on the Cook's Marine Pier and removal of the pier (which will be rebuilt) will begin prior to July 16, 2003. However, work activities prior to July 16, 2003 will be done "in the dry" or will not involve in-water work. Dredging activities will begin August 16, 2003, and will be completed prior to February 14, 2003.

1.3 Description of the Action Area

The Action Area for the proposed action includes all portions of the Commencement Bay shoreline from midway between Brown's Point and Hylebos Waterway to the southern boundary of the ASARCO site at depths shallower than minus 60 feet MLLW and the Puyallup River downstream from the I-5 bridge. The Action Area corresponds to that which was used in the BA prepared for remediation of the entire CB/NT Superfund Site (EPA 2000). Section 4 of the CB/NT BA includes a detailed description of the historic and current conditions in the Action Area and should be referenced for this information. The Project Area is defined as those locations where the remedial activities occur, such as all SMUs in Figure 2, except those designated as No Action.

2.0 ENDANGERED SPECIES ACT BIOLOGICAL OPINION

2.1 Evaluating Proposed Actions

The purpose of consultation under ESA is to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of threatened or endangered species. Formal consultation concludes with the issuance of a Biological Opinion under section 7(b)(3) of the ESA.

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 habitat. This analysis involves the initial steps of: (1) defining the biological requirements and current status of the listed species; and (2) evaluating the relevance of the environmental baseline to the species' current status.

From that, 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 injury and 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 species' life stages that occur beyond the Action Area. A finding of jeopardy is appropriate if the action, together with the baseline conditions and cumulative effects, appreciably reduces the species' likelihood of survival or recovery by reducing the numbers, distribution, or reproduction of the species. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

For this specific action, NOAA Fisheries' analysis considers the extent to which the proposed action impairs or improves the function of habitat elements necessary for rearing, refugia, and migration of PS chinook salmon in view of the fact that the proposed action occurs within the PS chinook ESU. Middle Waterway, site of the proposed project, is one of several waterways located within the industrial area of the Puyallup River delta of Commencement Bay.

2.1.1 Status of the Species

Puget Sound chinook salmon was listed on March 24, 1999 (64 FR 14308). The species status review identified the high level of hatchery production which masks severe population depression in the ESU, as well as severe degradation of spawning and rearing habitats, and restriction or elimination of migratory access as causes for the range-wide decline in PS chinook salmon stocks (NOAA Fisheries 1998a, and 1998b). Within the Puyallup basin, virtually all salmon spawn in the Puyallup River, upstream of Commencement Bay. The naturally spawning chinook population in the Puyallup River is comprised of an unknown mixture of natural and hatchery origin fish.

Juvenile chinook migrating through the Puyallup River delta and Commencement Bay originate from three basic stocks (Wash. SASSI, 1992): White (Puyallup) River spring; White River summer/fall; and Puyallup River fall. Juvenile salmon use estuaries for physiological adaption, foraging, and refuge. As described by Simenstad (2000), some aspects of the early life history of juveniles in estuaries are obligatory, such as the physiological requirement to adapt from freshwater to saltwater. Generalized habitat requirements of juvenile chinook in estuaries include shallow water, typically low gradient habitats with fine unconsolidated substrates and aquatic, emergent vegetation; areas of low current and wave energy; and concentrations of small epibenthic invertebrates (Simenstad *et al.* 1985).

Artificial propagation programs likely provide most of the numbers of chinook in the Puyallup River. The White River spring chinook population which is considered critical by state and tribal fisheries managers depends largely on artificial production (Wash. SASSI 1992). The White River spring chinook have lately experienced a tenuous rebound as escapement gradually has increased from the historic lows of the 1980s. In 2000, non-tagged returns of adults was 1,732 individuals, the largest return in 30 years. This increase is consistent with larger numbers of chinook in the Columbia River during 2000, indicating good ocean survival (NOAA Fisheries 2001).

The White River summer/fall chinook stock is considered wild and classified by the co-managers as distinct based on geographic distribution. The glacial melt waters, typical of the Puyallup River, cause poor visibility during spawning season. Due to this, the stock status is unknown (Wash. SASSI 1992).

Numbers of Puyallup fall chinook have recently been compiled by the Puyallup Tribe of Indians for the Washington State Shared Strategy indicating the current number of spawners at 2,400. The Washington Shared Strategy is a voluntary and collaborative effort that is developing goals for recovery planning ranges and targets building on existing efforts of local governments, watershed groups, and various state, Federal, and tribal entities to produce a viable recovery plan. Targets relating the quality and capacity of chinook habitat to population response associated with recovered habitat indicated a range of 5,300 to 18,000 spawners necessary for a recovered system (Puyallup Tribe 2002).

Field observations of PS chinook in the action area revealed that habitat use differed between the mouth and the head of waterways and also between the locations of the waterways in relation to the Puyallup River. The Puyallup Tribe of Indians conducted beach seine sampling between the years 1980-1995 (however, no data were available in 1988, 1989, and 1990). Duker *et al.* (1989) conducted an extensive beach seine juvenile sampling effort in 1983 at many of the same beach seine sampling locations as the tribe's efforts plus tow net sampling to investigate distribution in the open water habitats of Commencement Bay. In addition, sampling of salmonid distribution has been conducted at a number of sites during the course of impact assessment and/or mitigation site planning. Some general conclusions from these studies indicated that: juvenile chinook are present in low numbers in March, peak in late May or early June and drop to low numbers again by July 1; the progeny of naturally spawned chinook arrive in the estuary throughout this period at a variety of lengths; offshore catches of chinook peak about two weeks later than shoreline catches; and all shorelines are used but catches are typically higher near the mouths of the waterways than near the heads (Kerwin 1999). Hooper (in USFWS 2001) compiled catch per unit effort of chinook salmon at sites close to and further away from the Puyallup River. This data found that the catch per unit effort averaged 20.4 in the Milwaukee Waterway, 2.93 in the Blair Waterway and 1.99 in the Hylebos Waterway. The catch per unit was higher in the waterways closest to the river (USFWS 2001).

2.1.2 Biological Requirements

The first step NOAA Fisheries uses when conducting the ESA section 7(a)(2) analysis is to define the species' biological requirements within the Action Area. NOAA Fisheries then considers the current status of the listed species taking into account species information, *e.g.*, 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 for ESA protection the ESUs considered in this Opinion and also considers any new data that are relevant to the determination.

Biological requirements are those necessary for the listed ESU's to survive and recover to naturally reproducing population sizes at which protection under the ESA would become unnecessary. This will occur when populations are large enough to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. The biological requirements for PS chinook include adequate food (energy) source, flow regime, water quality, habitat structure, passage conditions (migratory access to and from potential spawning and rearing areas), and biotic interactions (Spence *et al.* 1996). The specific biological requirements for PS chinook that are influenced by the action considered in this Opinion include food, water quality, habitat structure, and biotic interactions.

2.1.3 Environmental Baseline

The environmental baseline represents the current conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process" (50 CFR 402.02).

Numerous activities affect the present environmental baseline conditions in the Action Area including expanding urban development, railroads, shipping, logging, agriculture, and other industries. The present port area of Tacoma was created during the late 1800s and early part of the 1900s by filling the tidal marsh that had developed on the shelf of the Puyallup River delta. Continuing habitat alterations such as dredging, relocation and diking of the Puyallup River, dredging/construction of the waterways for purposes of navigation and commerce, steepening and hardening formerly sloping and/or soft shorelines with a variety of materials, and the ongoing development of the Port of Tacoma and other entities has resulted in substantial habitat loss (Sherwood *et al.* 1990, Simenstad *et al.* 1993).

Historically, this area comprised the estuarine delta of the Puyallup River. With the growth and development of Tacoma, its port, and the surrounding region, the delta has been subjected to dramatic environmental changes, primarily from dredging and filling to create the waterways. Past development activities along the shorelines of Commencement Bay have affected the habitat and the fish that use it (Duker *et al.* 1989). It has been estimated that of the original 2,100 acres of historical intertidal mudflat, approximately 180 acres remain today (COE *et al.* 1993). Fifty-five acres of the 180 acres of low gradient habitat is located near the mouth of the Puyallup River, twenty acres is the Milwaukee habitat area, 18 acres is located bayward of the East Eleventh Street Bridge in the Hylebos Waterway, 54 acres are located in the rest of the Hylebos Waterway, 46 acres is present along the shoreline from the mouth of the Hylebos to Browns Point, and eight acres are located in the Blair Waterway (Pacific International Engineering 2001b). Graeber (1999) states that 70% of Commencement Bay estuarine wetlands and over 98% of the historic Puyallup River estuary wetlands have been lost over the past 125 years.

The historical migration routes of anadromous salmonids into off-channel distributary channels and sloughs have largely been eliminated and historical saltwater transition zones are lacking (Kerwin 1999). Additionally, the chemical contamination of sediments, in certain areas of the Bay, has compromised the effectiveness of the habitat (COE *et al.* 1993, USFWS and NOAA 1997).

In 1981, the EPA listed Commencement Bay as a Federal Superfund site. As a result of this, the clean up of contaminants has been a high priority and has resulted in 63 of 70 sites remediated (Kerwin 1999). In 1993-1995, the entire Blair Waterway navigation channel was dredged as part of the Sitcum Waterway Remediation Project. Contaminated sediments were removed and capped in the Milwaukee Waterway nearshore confined disposal site. After the completion of the dredging, the EPA deleted the Blair Waterway and all lands that drain to the Blair Waterway from the National Priorities List (Pacific International Engineering 2001a).

The shorelines of Commencement Bay have been highly altered by the use of riprap and other materials to provide bank protection. Bulkheads cover 71% of the length of the Commencement Bay shoreline. Based on shoreline surveys and aerial photo interpretation of the area, approximately five miles, or 20% of the Commencement Bay shoreline, is covered by wide over-water structures (Kerwin 1999). These highly modified habitats generally provide poor habitat for juvenile salmon (Spence *et al.* 1996).

From 1917 to 1927, most of the habitat alteration (162 acres of mudflat, 72 acres of marsh) resulted from dredging the various waterways and from filling to build uplands for piers, wharves, and warehouses (USFWS and NOAA 1996). Presently, natural aquatic habitats are highly fragmented and dispersed across the delta and Bay with few natural corridors linking them. Fish prefer shallow water areas, and have been documented in mitigation and restoration sites both north and south of the river mouth, although perhaps tending more to the north (Miyamoto *et al.* 1980, Duker *et al.* 1989, Pacific International Engineering 1999, Simenstad 2000). Commencement Bay is a documented rearing and migration corridor for chinook salmon (Simenstad *et al.* 1982, Duker *et al.* 1989, Wash. SASSI 1992, Pacific International Engineering 1999, Simenstad 2000). Some modified and relic habitats and most mitigation habitats along the delta front and in the waterways still support juvenile salmon by providing attributes such as food and refuge. However, negative impacts to salmon from their migration through and residence in the delta-Bay system has not been quantified (Simenstad 2000).

The environmental baseline is substantially degraded. Ninety-eight percent of historically available intertidal marsh and mudflat habitat, necessary for estuarine lifestage (smoltification) of juvenile salmonids, has been lost due to the above described human activities. The remaining two percent of estuarine habitat is seriously degraded by the presence of toxic and hazardous contaminants in the sediments, which is the habitat for the prey organisms of juvenile salmonids. The baseline conditions of the Action Area are major factor in the current depressed status of PS chinook.

At present, salmonid habitat within Commencement Bay shorelines is gradually increasing in acreage because of habitat restoration projects and natural processes. Approximately 50 acres of intertidal and shallow subtidal habitat have been created through previous restoration actions.

2.1.4 Effects of the Proposed Action

NOAA Fisheries must consider the estimated level of injury and mortality from the effects of the proposed action. The ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02). "Indirect effects" are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

2.1.4.1 Direct Effects

Direct effects are the immediate effects of the proposed action on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not a direct, interdependent, or interrelated, effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated (50 CFR 402.02).

The direct effects of the proposed action derive from the nature, extent, and duration of the construction activities in the water and whether the fish are migrating and rearing at that time. Direct effects of the proposed action also include immediate habitat modifications resulting from the remedial and construction activities. In the proposed action, immediate positive effects include the removal of highly contaminated materials from the intertidal area used by juvenile salmonids. The construction of enhanced intertidal structure near Cook's Marine and in front of General Construction will provide direct long-term beneficial effects. Adverse effects might occur during various construction activities, including the dredging of highly contaminated sediments, capping, and the disposal of the sediments. However, these effects are of limited duration.

2.1.4.1.1 Dredging. The dredging element area is about 10 acres of an approximately 10.5 acre active remediation site. Dredging will remove sediments exceeding SQO criteria in the Middle Waterway, exposing native sediments that were not subject to historical contamination. Where dredging does not reach native sediment depths, the underlying contaminated bottom surface will be covered with a clean, chemically-confining capping.

The potential mechanisms by which turbidity could affect salmonids include direct mortality, injury by entrainment, sublethal effects (stress, gill damage, and increased susceptibility to disease), and behavioral responses (disruptions to feeding or migration) (Pacific International Engineering 2001b). Long-term ecosystem effects of dredging generally include changes in the volume and area of habitat, periodic changes to primary and secondary production (food web effects), and changes in hydrodynamics and sedimentology (Nightingale and Simenstad 2001).

Biological effects on PS chinook salmon may result from: 1) temporary reduction in water quality and increased noise disturbance associated with dredging that potentially could exclude salmonids from their estuarine sediment substrates; 2) seasonal loss of benthic organisms and other prey due to disturbance of the sediment substrates; 3) short-term alteration to nearshore habitats; and 4) potential exposure to contaminated sediments or water.

Sediment plumes are often associated with dredging. Dredging activities disturb and suspend sediment creating discoloration of the water, reducing light penetration and visibility, and changing the chemical characteristics of the water. The size of the sediment particles and tidal currents are typically correlated with the duration of sediment suspension in the water column. Larger particles, such as sand and gravel, settle rapidly, but silt and very fine sediment may be suspended for several hours. LaSalle (1990) described a downstream plume that extended 900 feet at the surface and 1500 feet at the bottom. LaSalle (1990) also noted an increase in sediment levels upwards of 70% from the effect of the pressure wave created by the dredge bucket as it descended through the water.

The effects on water quality (suspended sediments and chemical composition) from dredging can have a detrimental effect on salmonids. Suspended sediments can have an adverse effect on migratory and social behavior as well as foraging opportunities (Bisson and Bilby 1982; Sigler *et al.* 1984; Berg and Northcote 1985). Servizi (1988) observed an increase in sensitive biochemical stress indicators and an increase in gill flaring when salmonids were exposed to high levels of turbidity (gill flaring allows the fish to create sudden changes in buccal cavity pressure, which manifests similar to coughing).

Chemical composition of the water with suspended sediments is also affected by dredging activities. Estuarine sediments are typically anaerobic (without oxygen) and create an oxygen demand when suspended in the water column, and in turn would decrease Dissolved Oxygen (DO) levels (Hicks *et al.* 1991; Morton 1976). A review of the processes associated with DO reduction (Lunz and LaSalle 1986; Lunz *et al.* 1988) suggested that DO demand of suspended sediment is a function of the amount of material placed into the water, the oxygen demand of the sediment, and the duration of suspension. Dissolved Oxygen reductions appear to be most severe lower in the water column and usually the condition reverses with adequate tidal flushing (LaSalle 1990). Most of the research reported to date indicated that dredging-induced DO reductions are a short-term phenomena and do not cause problems in most estuarine systems (Slotta *et al.* 1974; Smith *et al.* 1976; Markey and Putnam 1976). DO will be monitored during dredging; operational changes will be implemented as necessary to comply with water quality criteria at the mixing zone boundary.

Decreases in DO levels have been shown to affect swimming performance levels in salmonids (Bjornn and Reiser 1991). The decrease of swimming performance due to decreases in DO could directly affect the chinook salmon's ability to escape potential predation or could affect their ability to forage on motile fish. Smith *et al.* (1976) found DO levels up to 2.9 milligrams per liter (mg/l) during dredging activities in Grays Harbor. Hicks (1999) observed salmon avoidance reactions when DO levels dropped below 5.5 mg/l. Dredging fine sediments such as those found in the Middle Waterway could create a sediment plume that may not disperse rapidly because of tidal fluctuations, especially during incoming tides. This could create poor water quality (*i.e.*, decreased DO levels) that might impede chinook salmon from immigrating into the Middle Waterway to gain access to foraging, rearing, and/or refugia habitats.

Based on the EPA's analysis of the effects of increased suspended sediment concentrations on salmonid species (see section 7.1 of the CB/NT BA) and the results of dredged material modeling in the BA Addendum, the dredging of this proposed action would not produce suspended sediment concentrations dangerous to salmonids. In addition, the contractor will be responsible for submitting a Construction Control Plan, which will present the system through which the contractor assures compliance with the proposed action's Water Quality Standards. Further, turbidity will be monitored in the vicinity of dredging operations during and for specific times before and after construction. If exceedance of Water Quality Criteria occurs at the compliance boundary the contractor will be required to modify the operations. Such modifications may include slowing the dredging rate.

Disruption of the channel bottom and entrainment by dredging has a generally negative effect on benthic biota and forage fish. Filter feeding benthic organisms can suffer from clogged feeding structures, reduced feeding efficiency, and increased stress levels (Hynes 1970). Dredging may also suppress the ability of some benthic species to colonize in the dredged area, thus creating a loss of benthic diversity and food source for the chinook salmon prey species. Dredging will temporarily eliminate littoral and shallow subtidal habitat for chinook salmon and will likely reduce foraging opportunities, which may cause them to migrate into deeper waters where there is greater vulnerability to predation and less foraging opportunities. Also, due to the level of contamination and the physical quality of the existing substrate, the subtidal benthic community in the project area is already seriously depressed. Therefore, the normal short-term reduction in benthic habitat and prey from this type of dredging will probably not be measurable in the Action Area.

Middle Waterway sediments would be dredged using a clamshell bucket. Clamshell dredges have a bucket of hinged steel with a "clamshell" shape that is suspended from a crane. The bucket, with its jaws open, is lowered to the bottom surface. When the force of the bucket weight hits the bottom, the clamp grabs a section of sediments (Nightingale and Simenstad 2001). Because the jaws are open during descent, a clamshell is less likely to entrap or contain fish (Pacific International Engineering 2001a). Dredging with a mechanical clamshell bucket would increase suspended sediment concentrations throughout the entire depth of the water column at the point of dredging. Resuspension of sediment would occur during clamshell impact, closure, withdrawal, and lift to the haul barge. Clamshell dredging causes very limited, short-term and localized turbidity; no long-term effects should result from this turbidity.

In summary, the EPA will minimize the effects of dredging on listed fish by working under timing restrictions to minimize fish presence. The EPA will also monitor the chemical constituents, turbidity, DO and other in-water parameters, and will modify the dredging practices if any of the parameters exceed Clean Water Act water quality criteria.

2.1.4.1.2 Capping. In Area A, backfilling, thick layer capping, and thin-layer capping techniques will all be used in various SMUs (Figure 2). The two different types of surface material include surficial cap material ("habitat mix") and riprap. Riprap in littoral area (depth depths less than minus 10 feet MLLW) will be covered with surficial cap material to fill in the intersticial spaces between pieces of riprap.

Capping will be designed so that existing elevations are not altered. Capping material will be slightly coarser than the existing substrate, but is expected to approach pre-remediation conditions in a relatively short time through natural deposition and resuspension. Additionally, side slopes are designed to be as steep as or less steep than existing conditions. These shoreline protection measures have been specifically designed to improve salmonid habitat function, while maintaining the existing level of erosion protection. Capping associated with the project will occur during a period of several months over the duration of the Project and will result in a temporary and localized increase in suspended sediment concentrations as the clean capping material descends through the water column. There is also the potential that existing surface sediment would be suspended at the point of impact as the cap material comes in contact with the bottom (Pequegnat 1983, Truitt 1986). The new substrates will typically consist of riprap overlain with gravel and cobble sized particles. As an additional conservation measure, habitat substrate ("habitat mix,"a two-inch minus rounded pit run material) will be placed in the interstices of the riprap to enhance the productivity of the habitat. Over time, fine-grained sediment deposition in more quiescent areas of the waterway will partially fill the interstices among the riprap, quarry spalls, and habitat substrate, further enhancing epibenthic and infaunal productivity. All capped or backfilled slopes will be graded at an equal or lesser slope.

The cap material will consist of an assortment of clean, oxygenated gravelly sand, gravel-sized rounded rock, and sand with low organic content, and thus are not expected to result in a change in sediment oxygen demand (and resulting DO reduction) during transport through the water column. The coarse nature of the cap materials will produce lower turbidity for a shorter period of time in comparison to turbidity caused during dredging operations. Research by MEC Analytical (1997) indicates that fine sand and larger particles sank to the bottom within minutes. In addition, capping will take place in less than 35 feet of water and material will be placed in a controlled manner to minimize the free fall distance. All capping material will settle out quickly, with the majority of the material being contained on the overall cap footprint.

The potential for re-suspension of sediment during cap placement will vary, based on the placement technique. Data collected after the placement of a sand cap over very fine, unconsolidated material at the Bellingham Log Pond restoration site and the Simpson restoration site using a low-energy delivery system showed that little or no sediment was entrained in the clean cap (Parametrix 1989; EPA 2000; Anchor 2001). Based on this analysis, the potential for re-suspension of bottom sediment during cap placement should be minimal.

Minimization measures to reduce the concentration of suspended sediment during cap placement will be employed during Project construction. These measures include placing capping material at low tides, placing material in a controlled manner and minimizing the free fall distance of the capping materials. Further, due to the construction schedule, Project construction will occur when juvenile chinook salmon are not present in appreciable numbers in the Action Area, and turbidity caused by capping will have little or no adverse effects on these species. With the control of upland sources of water and sediment chemistry, the EPA expects that these sediments would not become re-contaminated after placement or in the foreseeable future.

The subtidal benthic community would experience reduced productivity for periods lasting up to two to three years following placement of materials (Wilson and Romberg 1996). Capping in littoral areas would smother the existing epibenthic community leading to a short-term change in the epibenthic community. As with littoral areas disturbed by dredging, recolonization by epibenthic organisms is expected to occur rapidly (within months) after placement of materials. Based on the construction schedule (temporary cessation of in-water construction by mid-February of each year) and the expected rapid recolonization by epibenthic prey, littoral habitat would not experience a significant loss of function that would affect juvenile salmonids. However, it is acknowledged that minor temporal lags (months) in recovery of productivity of disturbed littoral habitat could temporarily reduce feeding opportunities for small numbers of early migrating juvenile chinook salmon.

Capping of this site will occur within an approved work window to minimize fish presence at that time and will be conducted in-the-dry, where feasible. The EPA will use Best Management Practices to reduce turbidity and its effects at that time. Therefore, short-term, negative effects of capping will be minimized, and the long-term effect of the capping will be beneficial.

2.1.4.1.3 Slope Reconfiguration. Slope modifications will temporarily disrupt habitat accessibility in the affected areas. The elevations of several areas will change as a result of this project, with a net decrease of 0.31 acre of high intertidal (plus four to plus 12 feet MLLW), a net decrease of 0.09 acre of low intertidal (minus four to plus 4 feet MLLW), a net increase of 0.11 acre of shallow subtidal (minus 10 to minus four feet MLLW), and a net increase of 0.29 acre of deep subtidal (deeper than minus 10 feet MLLW). These calculations do not include the area underneath the Scow Shed (SMU 46) as an area of habitat conversion because functionally the habitat is subtidal although the elevation is in the intertidal range. The area underneath the Scow Shed always has water. Even at low tide, the berm prevents water from flowing out of the area.

The loss of 0.29 acres of shallow water habitat to deep water water habitat will occur in front of and along the MINI wharf, which is a functioning shipyard and experiences a high volume of ship traffic. However, the removal of the Scow Shed and the Foss pier will result in "unshading" 0.40 acre of shallow water habitat. These removals are important for juvenile salmon using the waterway because they improve migration pathways, increase prey production and availability, and decrease predation opportunities.

2.1.4.1.4 Demolition and Reconstruction of Structures. Two overwater structures will be removed from the waterway as mitigation for the loss of shallow water habitat. Removing overwater structure is important for improving migration pathways for juvenile salmonids, increasing prey production and availability, and decreasing predation opportunities. Overwater structures limit the amount of light available for growth and production of photosynthetic autotrophs important for juvenile salmonid feeding in nearshore environments. Overwater structures may also effect fish migratory behavior by creating sharp underwater light contrasts. Daytime light reduction from pier shading may pose a risk of delaying migration, and driving juvenile migration into deeper waters during daylight hours. Juveniles in deep water areas are exposed to increased risks of predation by larger predators.

The removal of 108 creosote-treated timber pilings will restore some pieces of habitat in SMUs 4a, 4b, and 53. In addition, the riparian plantings will also increase the function of the fish habitat in the waterway.

The proposed remedial activities will have no effect on the presence, number, or configuration of remaining overwater structures, nor will they have any effect on the extent of existing armored shorelines. Both concrete and steel piling will be used which will have none of the chemical concerns associated with creosote-treated timber piles. Pile driving could temporarily increase the turbidity of surrounding waters, but much less so than the dredging activities. In addition, pile driving of hollow steel pipe piles will temporarily increase the noise within the Project Area and potentially create overpressure waves adjacent to the pile driving activity. While a vibratory hammer will routinely be used, it may be necessary to test 5-10% of the steel piles with an impact hammer to determine bearing capacity (referred to as "proofing" in the industry). Biological effects on PS chinook may result from the high sound pressures produced when driving hollow steel piles with an impact hammer.

2.1.4.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur (50 CFR 402.02). Indirect effects may occur outside the area directly effected by the action. Indirect effects from this project are those effects that would result from the future use of the rebuilt Cooks Marine Pier. This facility will have a footprint identical to the existing albeit disintegrating structure but will be constructed of concrete piles and deck panels. No potential use has been proposed for this flat-deck structure other than to retain its existence.

All existing intertidal and shallow subtidal bottom contours will be maintained after remediation without dredging and water depths vary along the waterway face from minus four feet MLLW at the shoreward end to approximately minus 14 feet where the seaward end of the pier approaches the Inner Harbor Line; depths along the bayward face vary from minus 12 feet MLLW to plus two feet (KFPP 2002). A portion of the waterway face is obstructed by the repositioned Foss Float so physical constraints on the pier would probably limit substantial future waterborne industrial uses without limiting constructing a building above the pier. Substantial changes in waterborne uses would undoubtedly trigger Federal permitting requirements and the accompanying ESA.

The proposed action should not result in substantial changes in other waterborne industrial activities presently being conducted by Foss, MINI, or Pioneer Industries on Middle Waterway. The proposed action does not change water depths or structures such that increased uses could occur without requiring Federal permitting and the accompanying ESA consultative effort.

2.1.5 Cumulative Effects

Cumulative effects are defined as "those effects of future state or private activities, not involving Federal activities, that are reasonable certain to occur within the Action Area of the Federal action subject to consultation" (50 CFR 402.02). The proposed action involves action within a portion of the Middle Waterway, which has been previously altered by dredging, filling and other anthropogenic activities. However, future Federal actions that will effect the Action Area, such as navigational dredging and other activities permitted under section 404 of the Clean Water Act or section 10 of the Rivers and Harbors Act, will be reviewed under separate section 7 consultations, and cannot be considered cumulative effects.

Other effects in the Action Area are those from restoration actions taking place as a part of Commencement Bay Natural Resource Damage Assessment pursuant to CERCLA (USFWS and NOAA, 1997; Kerwin 1999). Landscape and watershed scale restoration sites have also been identified to increase connectivity between important salmon habitat transition regions (Simenstad 2000). It is particularly difficult to detect, with confidence, the effects of habitat improvements based on observed run size trends. It has been estimated that, because of inherent variability, it would take 30 years to detect a 50% improvement in average production, if we were to use adult run size as the response variable (Lichatowich and Cramer 1979, Mobrand Biometrics 2001).

2.1.6 Conclusion

NOAA Fisheries evaluated the collective effects of the proposed action, the environmental baseline, and the biological requirements of PS chinook. NOAA Fisheries finds that the proposed action is likely to cause short-term adverse effects on chinook salmon from in-water work activities. Using the pathways and indicators of habitat functional condition described in NOAA Fisheries 1996, four will be maintained, six will be able to improve over time (water quality, sediment quality, area-diversity- accessibility, shoreline modification, benthic prey, and forage fish), and one will temporarily degrade but will not be prevented from returning to properly functioning condition (benthic prey). Measures to avoid work in the juvenile salmonid migration period, and engineering controls, will help minimize adverse short-term effects on salmonids.

Over the long-term, removal of highly contaminated sediments and creosote-treated timber piling is a beneficial aspect of the Project that will restore the baseline condition for water quality. NOAA Fisheries agrees with the EPA's conclusions that the remedial action will address risks to the environment and public health, reduce the levels of chemical constituents in sediment and thereby help improve and restore salmon habitat in Commencement Bay.

Based on the foregoing, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS chinook. In arriving at a non-jeopardy conclusion for this action, the minimization elements of the proposed action and the establishment of clean substrates to support increased benthic diversity and productivity were important. NOAA Fisheries finds that short-term adverse effects associated with the actual construction activities are expected to be minimized or eliminated through the adherence to the project design objectives and conservation measures. As such, the proposed action is unlikely to reduce the numbers, distribution, or reproduction of PS chinook.

2.1.7 Reinitiation of Consultation

This concludes formal consultation on this proposed action in accordance with 50 CFR 402.14(b)(1). The EPA must reinitate this ESA consultation if: (1) new information reveals effects of the action that may affect listed species in a way not previously considered; (2) new information reveals the action causes an effect to listed species that was not previously considered; or (3) a new species is listed or critical habitat designated that may be affected by the identified actions. In instances where the amount or extent of authorized incidental take is exceeded, any operation causing such take must cease pending conclusion of the reinitiated consultation.

2.2 Incidental Take Statement

The ESA at section 9 [16 U.S.C. 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." [16 U.S.C. 1532(19)]. Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." [50 CFR 222.102]. Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." [50 CFR 17.3]

Incidental take is defined as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." [50 CFR 17.3]. The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement.

2.2.1 Amount or Extent of Take Anticipated

The in-water dredging, capping, disposal, and habitat construction activities of the proposed action are scheduled to occur during a period of time (July 16 - February 14) when few individuals of the listed species are expected to be present. However, PS chinook use the Action

Area in a way that they are highly likely to experience the various environmental effects of the activities that will be carried out under the proposed action. Therefore, the incidental take of PS chinook is reasonably certain to occur.

Incidental take is likely in the form of harm, or habitat modification that kills or injures fish by impairing certain normal behavioral patterns (feeding, rearing, migrating, etc.). Because in-water work is timed to reduce the exposure of PS chinook to projects effects on the fewest individuals possible, and because incidental take is likely mainly from habitat modification, NOAA Fisheries cannot quantify the precise number of individual fish that might be taken. In such circumstances, NOAA Fisheries characterizes the take as unquantifiable and uses a surrogate to estimate the extent of take. The extent of habitat affected by an action can be a surrogate measure for take.

In this action, the amount of habitat modification anticipated can be assigned by the construction activity based on the amount of change or activity in the littoral zone where juvenile chinook salmon can be found. Dredging, capping, shoreline modifications, and habitat enhancements occur in approximately 10.5 acres of aquatic habitat, 3.5 acres being in the littoral zone.

Harm is also likely from exposure of fish to pile-driving and other in-water operations. In this proposed action, juvenile chinook salmon are reasonably certain to be harmed throughout the 10.5 acres of the project footprint but with different levels of potential harm. NOAA Fisheries anticipates, and would exempt from the take prohibition a 25% exceedance of the open water dredging area (2.6 acres), a 10% exceedance of areas dredged or capped above minus 10 feet MLLW (0.35 acres), a three-piling increase above the 32 hollow steel pilings proposed, or a one-piling increase to test ("proof") the piling with an impact hammer, if driven in-water without monitoring and/or a bubble curtain, but no less than 0.40 acre of over-water structures permanently removed, or no less than the proposed approximately 900 creosote-treated piling permanently removed from Middle Waterway. Any amount of dredging over 25% in open water, dredging or capping above minus 10 feet MLLW over 10%, more than 35 hollow steel piles driven in-water, more than three hollow steel piles requiring testing with an impact hammer, less than 0.40 acres overwater coverage, or less than approximately 900 creosote-treated timber piles permanently removed would exceed the authorized incidental take and require reinitiating the consultation.

2.2.2 Reasonable and Prudent Measures

The following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize the take of PS chinook. The RPMs are integrated into the BA Addendum for the proposed action. NOAA Fisheries has included them here to provide further detail as to their implementation.

1. The EPA will minimize incidental take from the adverse effects of dredging activities on PS chinook salmon.

2. The EPA will minimize incidental take from the adverse effects of capping activities on PS chinook salmon.

3. The EPA will minimize incidental take from the adverse effects of demolition/reconstruction activities on PS chinook salmon.

4. The EPA will minimize incidental take during habitat development activities.

2.2.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the EPA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms are non-discretionary. The EPA should include these terms and conditions as remedial requirements under Superfund orders to the MWAC.

1. To implement RPM No. 1:

   a) The EPA shall comply with the in-water work window of August 15 through February 14 when the chance of encountering chinook salmon is minimal.
   b) The EPA shall comply with all conservation measures appropriate for dredging from section 9.1.1 of the BA Addendum.

2. To implement RPM No. 2:

   a) The EPA shall comply with the in-water work window of July 16 through February 14 when the chance of encountering chinook salmon is minimal.

   b) The EPA shall comply with all the conservation measures appropriate for capping from section 9.1.1 of the BA Addendum.

3. To implement RPM No. 3:

   a) The EPA shall comply with the in-water work window of July 16 through February 14, with limited work outside the designated in-water work window in accordance with the Construction Schedule section 3.3, when the chance of encountering chinook salmon is minimal.

   b) The EPA shall comply with all the conservation measures appropriate for disposal from section 9.1.1 of the BA Addendum.

   c) The EPA shall ensure that, providing substrate conditions are appropriate, vibratory hammers are used to drive all piles. If substrate conditions are not appropriate, impact hammers may be used. Impact hammers will require hydroacoustic monitoring and use of a bubble curtain if the pressure thresholds are exceeded, as described below, or the automatic use of a bubble curtain without monitoring.

d) The EPA will have MWAC's contractor develop an acceptable design for a bubble curtain to be used only if in-water driving of hollow steel piles with an impact hammer is planned, equivalent or better than that described by Longmuir and Lively (2001).

e) The EPA will have MWAC develop and implement an hydroacoustic monitoring plan if impact hammers are used but bubble curtains are not used. The plan should monitor for peak and rms sound pressure level generated during the impact driving of steel piles. The plan shall be reviewed and approved by NOAA Fisheries. No monitoring or sound attenuation measures will be required for piles driven in the dry beach at low tide, vibratory driving of any type of pile, or impact driving concrete piles. During hydroacoustic monitoring, the hydrophone shall be positioned at mid-depths, 10 meters distant from the pile being driven.

i) If sound pressure levels exceed 150 dB_{rms} (re: 1 μPa) (0.032 KPa) for fewer than 50% of the impacts and never exceed 180 dB_{peak} (re: 1 μPa. at 1 meter) (1 KPa), pile driving may proceed without further restriction; or

ii) If rms sound pressure levels exceed 150 dB for 50% or more of the impacts, or peak pressures ever exceed 180 dB, pile driving may continue, but only with the use of a bubble curtain.

iii) If an unconfined bubble curtain is used, monitoring must show that it functions at all tidal stages. If it does not, then a confined bubble curtain must be utilized. If a confined bubble curtain is used, no other sound attenuation measures will be required, regardless of the attenuation it provides, or the tidal conditions during use.

iv) Within 60 days of completing the hydroacoustic monitoring, a report shall be submitted to NOAA Fisheries, Washington Habitat Branch, Lacey, Washington (Attn. Dr. John Stadler; john.stadler@noaa.gov). The report shall include a description of the monitoring equipment and for each pile monitored, the peak and rms sound pressure levels with and without a bubble curtain, the size of pile, the size of hammer and the impact force used to drive the pile, the depth the pile was driven, the depth of the water, the distance between hydrophone and pile, and the depth of the hydrophone.

f) The EPA shall have a fisheries-qualified biologist observing and sampling for serious fish impacts during the testing of any steel piles (take allowance of two piles) with an impact hammer. Should any chinook salmon demonstrate mortality or obvious stress, piling driving will cease and the EPA will notify NOAA Fisheries (Attn. Dr. Robert Clark, 206-526-4338 or robert.clark@noaa.gov)

4. To implement RPM No. 4:

a) The EPA shall comply with the in-water work window of July 16 through February 14 when the chance of encountering chinook salmon is minimal.

b) The EPA shall comply with all the conservation measures appropriate for habitat development from section 9.1.1 of the BA Addendum.

c) The EPA shall implement the habitat enhancement measures set forth in section 9.1.2 of the BA Addendum.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

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

- 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 (section 305(b)(2));

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affects EFH (section 305(b)(4)(A));

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

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

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

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

3.2 Identification of Essential Fish Habitat

Pursuant to the MSA 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 United States 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 kilometers) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border.

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (Casillas *et al.* 1998, PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999). Assessment of the effects on these species' EFH from the proposed action is based on these descriptions and information provided by the EPA.

3.3 Proposed Action

The proposed action is detailed above in section 1 of this document, are within the marine waters of Commencement Bay, and include habitats which have been designated as EFH for various life stages of 46 species of groundfish, four coastal pelagic species, and three species of Pacific salmon (Table 1).

Table 1. Species of fishes with designated EFH of Puget Sound.

Groundfish Species	redstripe rockfish *S. proriger*	Dover sole *Microstomus pacificus*
spiny dogfish *Squalus acanthias*	rosethorn rockfish *S. helvomaculatus*	English sole *Parophrys vetulus*
big skate *Raja binoculata*	rosy rockfish *S. rosaceus*	flathead sole *Hippoglossoides elassodon*
California skate *Raja inornata*	rougheye rockfish *S. aleutianus*	petrale sole *Eopsetta jordani*
longnose skate *Raja rhina*	sharpchin rockfish *S. zacentrus*	rex sole *Glyptocephalus zachirus*
ratfish *Hydrolagus colliei*	splitnose rockfish *S. diploproa*	rock sole *Lepidopsetta bilineata*
Pacific cod *Gadus macrocephalus*	striptail rockfish *S. saxicola*	sand sole *Psettichthys melanostictus*
Pacific whiting (hake) *Merluccius productus*	tiger rockfish *S. nigrocinctus*	starry flounder *Platichthys stellatus*
black rockfish *Sebastes melanops*	vermilion rockfish *S. miniatus*	arrowtooth flounder *Atheresthes stomias*
bocaccio *S. paucispinis*	yelloweye rockfish *S. ruberrimus*	
brown rockfish *S. auriculatus*	yellowtail rockfish *S. flavidus*	**Coastal Pelagic Species**
canary rockfish *S. pinniger*	shortspine thornyhead *Sebastolobus alascanus*	anchovy *Engraulis mordax*
China rockfish *S. nebulosus*	cabezon *Scorpaenichthys marmoratus*	Pacific sardine *Sardinops sagax*
copper rockfish *S. caurinus*	lingcod *Ophiodon elongatus*	Pacific mackerel *Scomber japonicus*
darkblotch rockfish *S. crameri*	kelp greenling *Hexagrammos decagrammus*	market squid Loligo opalescens
greenstriped rockfish *S. elongatus*	sablefish *Anoplopoma fimbria*	**Pacific Salmon Species**
Pacific ocean perch *S. alutus*	Pacific sanddab *Citharichthys sordidus*	chinook salmon *Oncorhychus tshawytscha*
quillback rockfish *S. maliger*	butter sole *Isopsetta isolepis*	coho salmon *O. kisutch*
redbanded rockfish *S. babcocki*	curlfin sole *Pleuronichthys decurrens*	Puget Sound pink salmon *O. gorbuscha*

3.4 Effects of Proposed Action

As described in detail in section 2.1.5 of this document, the proposed action may result in detrimental short- and long-term effects on a variety of habitat parameters. These adverse effects are:

1. Short-term degradation of benthic foraging habitat during dredging, capping, and habitat development activities.

2. Short-term degradation of water quality (e.g., elevated turbidity or the accidental release of contaminants including petroleum products, chemicals or deleterious materials) because of in-water construction activities.

3. Temporal delays during replacement of functioning subtidal habitat by enhanced intertidal habitats as part of habitat development.

4. Short-term production of high sound pressure levels during the impact driving of hollow steel piles that may injure or kill fishes.

3.5 Conclusion

NOAA Fisheries believes that the proposed action may adversely impact the EFH for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 1.

3.6 Essential Fish Habitat Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions that would adversely affect EFH. NOAA Fisheries was invited by the EPA and MWAC to recommend conservation measures during the preparation of the BA so that, with the exception of the pile driving (EFH Effect No. 4), all of NOAA Fisheries' concerns have been addressed by the stated conservation measures (section 2.9) and BMPs (section 2.8) in the BA. To minimize the effect of pile driving and conserve EFH, NOAA Fisheries recommends that the EPA implement the following conservation measures.

1. Steel piles should be driven with a vibratory hammer when substrate conditions are appropriate. The underwater sound produced by vibratory hammers appear to pose a lower risk to fishes than do the sounds produced by impact hammers.

2. If impact hammers are used to drive steel piles, hydroacoustic monitoring of the underwater sound pressure levels should be conducted, and if the thresholds for adverse effects on fishes are exceeded, a bubble curtain should be deployed. A report detailing the results of the hydroacoustic monitoring should be provided to NOAA Fisheries. Details on the recommended sound pressure thresholds, hydroacoustic monitoring

protocols, bubble curtain design and hydroacoustic monitoring reports are found in section 2.2.3 of this document.

3. A fisheries-qualified biologist should be present during impact driving of steel piles to observe and report any apparent adverse effects on fishes.

3.7 Statutory Response Requirement

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

3.8 Supplemental Consultation

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

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