FINAL ENVIRONMENTAL ASSESSMENT

TEST PILE PROGRAM, BANGOR WATERFRONT AT NAVAL BASE KITSAP, SILVERDALE, WA

June 2011

Abstract

This Environmental Assessment (EA) identifies and evaluates the potential effects of installing and removing 29 test and reaction piles at Naval Base Kitsap (NBK) at Bangor between July 16, 2011 and October 31, 2011. This EA analyses the proposed action and a No Action Alternative. The purpose and need for this activity is to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for the proposed second Explosive Handling Wharf (EHW-2) and other future projects at the Bangor waterfront at NBK. The analysis includes impacts associated with bathymetry, geology and sediments, water resources, air quality, airborne noise, marine vegetation, benthic invertebrates, fish, marine mammals, birds, cultural and tribal resources, environmental health and safety, socioeconomics and the Coastal Zone Management Act (CZMA). Additionally, cumulative impacts and mitigation measures are addressed in this EA. There is no cooperating agency for this document.

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EXECUTIVE SUMMARY

This Environmental Assessment (EA) was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code §4321, e*t seq.)*, as implemented by the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations Parts 1500-1508), and the office of the Chief of Naval Operations Instruction 5090.1C, Navy Environmental and Natural Resources program Manual, of October 30, 2007.

The purpose of the Test Pile Program to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for future projects at the Bangor waterfront at Naval Base Kitsap (NBK). The need for the proposed action is to obtain the most accurate geotechnical information to validate the design for the proposed second Explosive Handling Wharf (EHW-2) and to obtain sound propagation data to identify possible effects on the species and habitat within the project area. Sound propagation data would also be used to assist in the implementation of the mitigation for EHW-2 and other projects on NBK at Bangor and to inform subsequent Marine Mammal Protection Act (MMPA) documentation. Information obtained as part of the Test Pile Program would also be valuable for the design of future waterfront facilities upgrades at NBK at Bangor.

Two alternatives have been evaluated in this EA: 1) to conduct the Test Pile Program in the same location as the proposed EHW-2 along the Bangor waterfront at NBK; 2) No Action. The Preferred Alternative, to conduct the Test Pile Program along the Bangor waterfront at NBK, would include installing and removing 29 open ended, hollow steel test and reaction piles (from 30" to 60" in diameter) into the substrate in the location of the proposed EHW-2. During pile driving, 18 piles would be installed with a vibratory hammer and then "proofed[1]" with an impact hammer. After the initial 18 test piles are installed, three lateral load tests would be performed. The lateral load tests would require reinstallation of two of the 60 inch piles and one 48 inch pile. Additionally, two tension load tests would be performed, which would require installation of four reaction piles for each of the two tension load tests. The lateral load test, in combination with the tension load test, would result in the installation of an additional 11 piles. The Navy expects that some of the initial test piles would be pulled and reused as part of the 11 additional piles. The length of the piles would range from approximately 100 feet to 197 feet.

Noise attenuation measures would be used during all impact hammer operations and some vibratory hammer operations. The proposed action would also include the removal of all test piles. Implementation would occur over 40 work days between July 16 and October 14, 2011 for impact pile driving and until October 31, 2011 for vibratory pile driving and other in-water work. Work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September 16 through October 31, 2011. Hydroacoustic monitoring would be accomplished to assess effectiveness of noise attenuation measures. The presence of marine mammals and marbled murrelets would also be monitored during pile installation and removal.

[1] "Proofing" is driving the test pile the last few feet into the substrate to determine the capacity of the pile. The capacity during proofing is established by measuring the resistance of the pile to a hammer that has a piston with a known weight and stroke (distance the hammer rises and falls) so that the energy on top of the pile can be calculated. The blow count in "blows per inch" is measured to verify resistance, and pile compression capacities are calculated using a known formula.

Under the No Action Alternative the Test Pile Program would not be conducted. Geotechnical and sound propagation data would not be gathered to validate the design concepts, construction methods, and environmental analysis.

The anticipated impacts of the proposed action would primarily be noise related, resulting from pile driving. The analysis in the EA indicated these impacts would be short-term in nature (40 days). The airborne noise and underwater sound associated with pile driving could have an effect on wildlife (fish, birds, marine mammals, federally listed species, and benthic invertebrates), as well as humans (tribal use, on-base/off-base residence) associated with Hood Canal. As such, this EA analyzed the impacts to these species, as well as impacts to humans, marine vegetation, essential fish habitat, benthic invertebrates and other environmental resources.

This EA concludes the impacts associated with the proposed action would be minor and temporary and would not result in significant impacts to marine vegetation or benthic invertebrates.

The Navy analyzed the effects of the proposed action on federally listed and unlisted species of fish. The analysis concludes that the proposed action would not have a significant effect on federally unlisted fish including forage fish species occurring along Hood Canal in the vicinity of the proposed action. Under the Endangered Species Act, the Navy consulted with the National Marine Fisheries Service (NMFS) Northwest Regional Office and the United States Fisheries and Wildlife Service (USFWS) Washington Office regarding the impacts of the Test Pile Program on federally listed fish species. The Navy submitted a Biological Assessment (BA) to the NMFS Northwest Regional Office and the USFWS Washington Office on August 17, 2010. The analysis in the BA and incorporated into this EA concluded a may affect, likely to adversely affect finding for the following species under NMFS jurisdiction: the federally threatened Pacific Sound Chinook salmon, the federally threatened Hood Canal Summer-run chum salmon, the federally threatened Puget Sound steelhead, the federally threatened yellow eye rockfish, the federally threatened canary rockfish, and the federally endangered bocaccio rockfish. The analysis found that underwater sound level pressures may injure or behaviorally affect these federally threatened and endangered fish species if they are present in the study area during pile driving. The Navy concluded that the proposed action would have no effect on the North American green sturgeon and the Pacific eulachon, both under NMFS jurisdiction, based on these species lack of occurrence within the Hood Canal. The analysis concluded a may affect, not likely to adversely affect finding for the federally threatened bull trout, which is under USFWS jurisdiction. Proposed mitigation for fish is described in Chapter 4 of this EA. Critical habitat for bull trout and green sturgeon is designated, but does not occur in the immediate vicinity of the project area (i.e. Hood Canal). Therefore, under federal law, there would be no effect to critical habitat for these species. Critical habitat for the Puget Sound Chinook salmon and the Hood Canal summer-run chum salmon is designated in northern Hood Canal waters adjacent to the base. However, NBK at Bangor has been excluded from designated critical habitat. The Navy concluded that the proposed action may affect, but would not adversely affect critical habitat for these species. Critical habitat has not been designated for Puget Sound steelhead, bocaccio rockfish, canary rockfish, or yelloweye rockfish. As a result, there would be no impact to critical habitat. Critical habitat has been proposed for the Pacific eulachon, but the location of the proposed critical habitat is outside of the project area, therefore there would not be any impact to the proposed critical habitat. A Biological Opinion was received from the NMFS NW Regional Office on April 28, 2011 and concurred with the Navy's affect determinations for all species and critical habitat within their jurisdiction. A letter of concurrence was received from the USFWS Washington Office on April 19, 2011 and a subsequent letter clarifying the initial letter on May 11, 2011 in which the Service concurred with the Navy's affect determination for the bull trout, the only fish species under their jurisdiction.

The Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) requires federal agencies to consult with the NMFS on activities that may adversely affect Essential Fish Habitat (EFH) or when the NMFS independently learns of a federal activity that may adversely affect EFH. The Navy completed an EFH Assessment to evaluate how the proposed action may affect EFH designated within the action area by the Pacific Fishery Management Council (PFMC) and implemented by the NMFS Northwest Regional Office. The EFH Final Rule (67 FR 2354) states that, "Federal agencies retain the discretion to make their own determinations as to what actions may fall within NMFS' definition of "adverse effect". The Navy developed the EFH Assessment in accordance with existing Navy policy (OPNAVINST 5090.1B), at the time of consultation, which has determined that temporary or minimal impacts are not considered to adversely affect EFH. The EFH Final Rule (67 FR 2354) and 50 CFR 600.815 (a)(2)(ii) were used as guidance for this determination. The Navy's EFH Assessment concluded that the proposed action would not adversely affect essential fish habitat. In the Biological Opinion received by the Navy on April 28, 2011 from the NMFS Northwest Regional Office, NMFS included the results of their analysis of the proposed action's effect on essential fish habitat (EFH), pursuant to Section 305 (b) of the MSFCMA. The NMFS Northwest Regional Office concluded that the proposed action "will degrade EFH due to elevated underwater sound". Therefore, the Service included in their analysis three EFH conservation recommendations the Navy must implement necessary to avoid, mitigate, or offset the potential adverse effects on EFH. The NMFS Northwest Regional Office requested the Navy's reply to the EFH portion of the consultation to identify which conservation recommendations have been accepted. The Navy will provide written receipt of the Services Biological Opinion and acceptance of all of the proposed EFH conservations measures.

The Navy analyzed the effects of the proposed action on the federally threatened Steller sea lions, the federally endangered Southern Resident killer whales (SRKW), and several non-ESA listed species of marine mammals. No marine mammals would be exposed to sound levels resulting in injury or mortality during pile driving activities. The Test Pile Program would result in negligible impacts to the population, stock, or species level. In accordance with the ESA, the Navy submitted a Biological Assessment (BA) to the NMFS Northwest Regional Office on August 17, 2010. Consultation was initiated on January 26, 2011 for the Steller sea lion and the Southern Resident killer whale. The Navy's analysis concluded a may affect, not likely to adversely affect finding for the Steller sea lion and the Southern Resident killer whale. Critical habitat for the Steller sea lion has not been designated in Washington; therefore there would be no impact to critical habitat. Critical habitat for the Southern Resident killer whale has not been designated in Hood Canal; as a result, there would be no impact to critical habitat. A Biological Opinion was received on April 28, 2011 in which the NMFS Northwest Regional Office concurred with the Navy's determination of affect for these species. An Incidental Harassment Authorization (IHA) application was submitted on November 2, 2010 to the NMFS Headquarters to comply with the Marine Mammal Protection Act (MMPA) as a result of the anticipated behavioral harassment of marine mammals associated with the proposed action. The Navy anticipates the IHA will be received in June 2011. The proposed action will not proceed until receipt of the authorization. As with fish, mitigation measures, located in Chapter 4, would be utilized to reduce the impacts to marine mammals.

The Navy analyzed the effects of the proposed action on ESA-listed and unlisted species of birds, included migratory birds (shorebirds, wading birds, waterfowl, and raptors) or special status birds (bald eagle, osprey, and the Great Blue heron). The analysis concludes that the proposed action would not have a significant effect on birds including migratory birds or special status birds occurring in the vicinity of the proposed action. Under the Endangered Species Act, the Navy consulted with the USFWS Washington Office regarding the impacts of the Test Pile Program on the federally threatened marbled murrelet. The Navy submitted a Biological Assessment to the United States Fish and Wildlife Service (USFWS) Washington Office on August 17, 2010. The analysis in the BA and incorporated into this EA concludes that the proposed action may affect, likely to adversely affect the marbled murrelet. The analysis found that underwater sound level pressures may cause behavioral harassment which may affect the marbled murrelet if it is present in the study area during pile driving. Mitigation measures, located in Chapter 4, would be utilized to reduce the adverse impacts to marbled murrelets. Critical habitat for the marbled murrelet has not been designated along the Bangor waterfront at NBK; therefore there would be no impact to critical habitat. Formal consultation was initiated on October 14, 2010 and extensive consultations were conducted between the U.S. Navy and the USFWS Washington Office regarding the potential effect of the proposed action on marbled murrelets. A letter of concurrence was received from the USFWS Washington Office on April 19, 2011 and a subsequent letter clarifying the initial letter on May 11, 2011 in which the Service determined that the proposed action may affect, not likely to adversely affect the marbled murrelet. The Service concurred that there would be no effect to critical habitat for the marbled murrelet since none occurs in the vicinity of the proposed action.

Of particular note in the USFWS Washington Office’s letter of concurrence is that the Service used a newly developed set of criteria to assess injurious effects from underwater noise to the marbled murrelet. Their analysis differed from the analysis conducted by the Navy in several respects, including that their analysis was based on dual criteria of 206 dBpeak re: 1µPa and 183 dB SEL re: 1µPa. Based on the new criteria, the zone of influence for injurious effects was reduced compared to the Navy’s analysis, due to the low number of strikes (100 maximum) per day for the Test Pile Program. Overall, however, neither the Navy’s nor USFWS’s analyses concluded that injurious effects would occur to the marbled murrelet from the proposed action. The criterion and zone of influence for behavioral disturbance was the same in the analysis conducted by the Navy and USFWS. The Navy determined that the instances of exposure to underwater sound predicted in the modeling at the behavioral criterion level constituted harassment. The USFWS Washington Office concluded in their letter of concurrence that “exposure to underwater sound pressure levels that reach or exceed 150 dBrms re: 1µPa may cause behavioral response such as avoidance, interrupted resting or feeding. However, due to the inclusion of the in-water timing restriction during the breeding season to reduce the likelihood of delayed feeding attempts of young, the fact that pile driving is not continuous throughout the day, and that monitoring results show that marbled murrelets continue to forage in situations where they are exposed to sound levels at or above 150 dBrms re: 1µPa, we do not expect any measurable alterations in the normal behavior of marbled murrelet. Thus, effects to marbled murrelets from potential noise-related disturbances are considered insignificant." Therefore, the USFWS Washington Office determined that these exposures did not constitute harassment under the ESA, and that the proposed action would not likely adversely affect the marbled murrelet.

During consultation, the Navy disagreed with the decision by the USFWS Washington Office to change the criteria for assessing injurious effects based on both the timing of the change within the context of the consultation process and with the criterion value and metric that was developed. The Navy formally submitted a White Paper to the USFWS Washington Office on April 11, 2011 indicating the Navy's opposition to the proposed criteria change on the basis that the criteria did not represent the best available science; however, USFWS proceeded over the Navy's objections. The Navy is continuing discussions with the USFWS Washington Office regarding the appropriateness of the criteria for assessing injurious impacts to marbled murrelets and has indicated to the Service that the Navy does not consider the Test Pile Program's letter of concurrence as setting precedence for other future Navy consultations.

The Navy analyzed the effect of the proposed action on cultural resources within the vicinity of the project area. EHW-1 and Delta Pier are potentially eligible for the National Register of Historic Places (NRHP) due to their Cold War context; however, the proposed action would not impact EHW-1 or Delta Pier. No submerged archaeological sites are expected in the vicinity of the proposed action. Cultural resources at NBK at Bangor, including archeological, architectural and submerged resources would not be impacted. On June 28, 2010 the Washington State Historic Preservation Office (SHPO) concurred with the Navy's finding of no historic properties affected, see Appendix D. Traditional resources would not be impacted. Tribal access and shellfish harvesting occurs approximately 1.1 miles south of the project area at a beach south of the Delta pier. The proposed action would not alter or impact the current access granted to the tribes. On June 18, 2010, a government-to-government meeting between the Chairman of the Suquamish Tribe and the Navy was held. The Suquamish indicated they had no objection to the Test Pile Program. On July 29, 2010 a government-to-government meeting with the Chairman of the Skokomish Tribe was held. The Skokomish Tribe did not express any concern over the proposed Test Pile Program. A government-to-government meeting occurred on August 31, 2010 with the Jamestown S'Klallam and Port Gamble S'Klallam Tribes, Lower Elwha Klallam Tribe and the Point-No-Point Treaty Council. No adverse comments on the Test Pile Program were presented (Appendix C).

Environmental health and safety would not be significantly impacted by the proposed action. Hazardous materials would not be released into the environment. The residences near the base and on the west side of Hood Canal would be within the permissible noise levels per the Washington noise regulations (WAC 173-60-040). Recreational boaters, scuba divers, kayakers, etc. could be exposed to noise levels exceeding permissible residential exposure levels as they could be closer to the construction than land based receptors. However, the floating security barrier would prevent recreational and commercial users from access to the waterfront area of the base and prevent them from getting close enough to the pile drivers to sustain injury from noise levels associated with pile driving. Since no public recreational uses would occur within the project area, the proposed action would have no direct impact to recreational uses or access in the surrounding community. In order to maintain adequate levels of safety for vessel navigation during in-water construction activities, a Notice to Mariners would be issued to minimize navigational hazards outside the existing floating security fence.

Socioeconomics, environmental justice, the protection of children and the regional economy would not be significantly impacted as a result of the proposed action. There would be no disproportionately high and adverse environmental, human health and socioeconomic affects to minority and low income populations, including Indian tribes.

Water quality, including temperature, salinity, turbidity, dissolved oxygen, pH, fecal coliform levels and nutrient levels would not be significantly affected by the proposed action. A Coastal Consistency Determination (CDD) was submitted to the Washington Department of Ecology on August 17, 2010 to comply with the CZMA. On December 16, 2010 Washington Department of Ecology concurred with the Navy's assessment that the Test Pile Program is consistent Washington's Coastal Zone Management Program (CZMP), see Appendix A.

All resources analyzed in this EA have been evaluated for cumulative impacts, including past, present and reasonably foreseeable future Navy and Non-Navy actions on NBK at Bangor and in northern Hood Canal. Analysis in this document indicates that no significant cumulative impacts are anticipated for reasons of geographical distance, the relative scale of projects, and the nature and magnitude of specific impacts. Projects such as the EHW-1 Pile Replacement Project and the TRIDENT Support Facilities Explosives Handling Wharf, the potential impacts of which are currently being analyzed in an Environmental Impact Statement (EIS), are geographically co-located. The Test Pile Program and the EHW-1 Pile Replacement Project could be occurring during the same timeframe. The Test Pile Program, EHW-1 Pile Replacement Project and the proposed TRIDENT Support Facilities Explosives Handling Wharf project would employ the use of pile driving.

As detailed in Table ES.1, Test Pile Program would not result in significant impacts to the human environment.

TABLE ES.1 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE

Resource	Proposed Action	No-Action Alternative
Bathymetry	The Test Pile Program is short-term in duration and any impacts to bathymetry would be inconsequential. The proposed action would not result in significant impacts to bathymetry.	There would be no change in existing conditions and no impacts to bathymetry.
Geology and Sediments	No impact on subsurface slope stability is expected nor is the proposed action likely to cause chemical constituents to violate Sediment Quality Standards. No significant impacts to geology and sediments.	There would be no change in existing conditions and no impacts to geology and sediments.
Water Resources	No impact to temperature or salinity in the project area. Dissolved oxygen (DO) concentrations would not decrease as a result of pile installation and removal. Pile driving would not result in long term impacts to turbidity. The proposed action would not violate Water Quality Standards. The proposed action would not result in significant impacts to water resources.	There would be no change in existing conditions and no impacts to water resources.
Air Quality	Washington state is in attainment for all criteria pollutants (CO, NO_x, SO_x, O_3 and particulate matter [PM_{10} and $PM_{2.5}$]). The proposed action would not exceed Puget Sound Clean Air Agency thresholds or greenhouse gas reporting thresholds. The Test Pile Program would not result in significant impacts to air quality and would not require a permit.	There would be no change in existing conditions and no impacts to air quality.
Airborne Noise	The proposed action would occur over 40 work days between July 16 and October 14, 2011 for impact pile driving and until October 31, 2011 for vibratory pile driving and other in-water work. Work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September 16 through October 31, 2011. The closest off-base residences are approximately 1.5 miles north of the study area, the closest community west of the base across Hood Canal is approximately 4 miles away, and the closest on-base residence is 3.75 miles from EHW-1. The portion of Hood Canal adjacent to EHW-1 averages 1.5 in. width and is bordered on the west by a 768-acre Navy-owned buffer strip on the Toandos Peninsula. This military buffer zone is restricted to the public and there is no recreational access.	There would be no change in existing conditions and no impacts to airborne noise.

TABLE ES.1 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Airborne Noise (Continued)	Areas surrounding the buffer area have rural and commercial forest land use designations by Jefferson County. The noise associated with the proposed action would reduce to 60 dB during construction which is consistent with the Washington Noise Regulations under the Washington Administrative Code. Recreation and tribal access would not be adversely impacted as a result of construction. No adverse impacts to sensitive receptors would occur. No significant impacts to airborne noise.	
Marine Vegetation	No long term impacts to marine vegetations (green algae, red algae, kelp and eelgrass). Indirect impacts to marine vegetation could occur but these impacts would be temporary (only during pile installation and removal) and marine vegetation would be expected to recover. The Test Pile Program would not result in long term or significant impacts to marine vegetation including brown algae, red algae, green algae, eelgrass, and non-floating kelp..	There would be no change in existing conditions and no impacts to marine vegetation.
Benthic Invertebrates	A temporary loss of benthic habitat and direct mortality of less motile species could occur; however, benthic invertebrates would likely recover from the impacts of pile driving. The Test Pile Program would not result in significant impacts to benthic invertebrates.	There would be no change in existing conditions and no impacts to benthic invertebrates.
Fish	No affect to the North American Green Sturgeon and the Pacific eulachon would occur. Forage fish species occurring along Hood Canal in the vicinity of the proposed action may be affected but are not likely to be adversely affected by the proposed action when the mitigation measures described in Chapter 4 of this EA are utilized. The proposed action is determined to have a may affect, not likely to adversely affect for the federally threatened bull trout. The proposed action is determined to have a may affect, likely to adversely affect for the federally threatened Pacific Sound Chinook salmon, the federally threatened Hood Canal Summer-run chum, the federally threatened Puget Sound Steelhead, the federally threatened yellow eye rockfish, the federally threatened canary rockfish, and the federally endangered bocaccio rockfish.	There would be no change in existing conditions and no impacts to fish.

TABLE ES.1 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Fish (continued)	The proposed action would adversely affect essential fish habitat. Under NEPA, the proposed action will not result in significant impacts to fish. A Biological Assessment was submitted to the NMFS Northwest Regional Office on August 17, 2010. A Biological Opinion was received on April 28, 2011.	
Marine Mammals	The EA analyzes the effects of the proposed action to the threatened Steller sea lions, the endangered SRKW, and several non-ESA listed species of marine mammals. No marine mammals would be exposed to sound levels resulting in injury or mortality during pile driving activities. The proposed action would result in behavioral disturbance to several species of marine mammals due to underwater noise from pile operations. However, due to the lack of presence of the Steller sea lion and the SRKW within the action area during the months of the proposed Test Pile Program, no behavioral harassment is expected to either species. The proposed action would result in negligible impacts to the population, stock or species level. The proposed action would not result in significant impacts to marine mammals. Chapter 4 details the mitigation measures set in place to lessen the impacts to mammals. A Biological Assessment was submitted to the NMFS Northwest Regional Office on August 17, 2010. The Navy concluded that the proposed action may affect, but would not likely adversely affect the Steller sea lion and SRKW. A consultation with the NMFS Northwest Regional Office was initiated on January 26, 2011 for the Steller sea lion and the SRKW and a Biological Opinion was received on April 28, 2011 which concurred with these determinations. An IHA application was submitted on November 2, 2010 to the NMFS Headquarters to comply with the MMPA as a result of the anticipated behavioral harassment of marine mammals associated with the proposed action. The IHA will be received in June 2011. Construction will not proceed until receipt of this permit.	There would be no change in existing conditions and no impacts to marine mammals.

TABLE ES.1 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Birds	The EA analyzes the effects of the proposed action on the threatened marbled murrelet and several non-ESA listed bird species including migratory birds and birds of special status. The proposed action is not anticipated to have an adverse impact on migratory birds or special status birds. The Navy determined the proposed action is determined to have a may affect, likely to adversely affect finding for the marbled murrelet. Critical habitat for the marbled murrelet has not been designated along the Bangor waterfront at NBK; therefore, there would be no impact to critical habitat. Chapter 4 details the mitigation measures set in place to lessen the impacts to the marbled murrelet and other birds, generally. The Navy submitted a Biological Assessment to the USFWS Washington Office on August 17, 2010. Formal consultation was initiated on October 14, 2010 and extensive consultations were conducted between the U.S. Navy and the USFWS Washington Office regarding the potential effect of the proposed action on marbled murrelets. A letter of concurrence was received from the USFWS Washington Office on April 19, 2011 and a subsequent letter clarifying the initial letter on May 11, 2011 in which the Service determined that the proposed action may affect, not likely to adversely affect the marbled murrelet. The Service concurred that there would be no effect to critical habitat for the marbled murrelet since none occurs in the vicinity of the proposed action.	There would be no change in existing conditions and no impacts to birds.
Cultural and Tribal Resources	On June 28, 2010 the Washington SHPO concurred with the Navy's finding of "no historic properties affected," see Appendix D. EHW-1 and Delta Pier are potentially eligible for the National Register of Historic Places due to their Cold War context. EHW-1 and Delta Pier would not be impacted by the proposed action. No submerged archaeological sites are expected to occur in the vicinity of the proposed action. Traditional resources would not be impacted. The proposed action would not alter or impact the current access granted to the tribes.	No change in existing conditions and no impacts to tribal resources.

TABLE ES.1 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Cultural and Tribal Resources (continued)	On June 18, 2010, a government-to-government meeting with the Chairman of the Suquamish Tribe was held. The Suquamish indicated they had no objection to the Test Pile Program. On July 29, 2010 government-to-government meeting with the Chairman of the Skokomish Tribe occurred. The Skokomish Tribe did not express any concern over the proposed Test Pile Program. A government-to-government meeting occurred on August 31, 2010 with the Jamestown S'Klallam and Port Gamble S'Klallam Tribes, Lower Elwha Klallam Tribe and the Point-No-Point Treaty Council. No adverse comments on the Test Pile Program were presented (Appendix D).	
Environmental Health and Safety	The proposed action is not expected to result in any impacts related to public environmental health and safety. Construction activities are not likely to release hazardous materials to the environment. Construction crews would follow applicable state and federal laws to ensure a safe working environment. The noise associated with the proposed action would reduce to 60 dB during construction which is consistent with the Washington noise regulations. Recreational boaters, scuba divers, kayakers, etc. could be exposed to noise levels exceeding permissible residential exposure levels although no injury would be anticipated. In order to maintain adequate levels of safety for vessel navigation during in-water construction activities, a Notice to Mariners would be issued to minimize navigational hazards outside the existing floating security fence. Regulations under the Washington Administrative Code. The proposed action would not result in significant impacts to environmental health and safety.	No change in existing conditions and no impacts to environmental health and safety.

TABLE ES.1 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Socioeconomics	The proposed action is not expected to result in any impacts related to socioeconomics. There would be no disproportionately high and adverse environmental, human health and socioeconomic affects upon minority and low-income populations, Indian Tribes or children. Tribal access and fishing rights would not be altered or impacted as a result of the proposed action because these areas are 1.1 miles south of the study area.	No change in existing conditions and no impacts to socioeconomics.
Coastal Zone Management Act	A CCD was submitted to the Washington Department of Ecology on August 17, 2010 to comply with the CZMA. On December 16, 2010 Washington Department of Ecology concurred with the Navy's assessment that the Test Pile Program is consistent Washington's CZMP (see Appendix A). Access to NBK at Bangor, including the project site, is controlled by the Navy and is restricted to authorized military personnel, civilians, contractors, and local tribes. Tribal access is restricted to the beach south of Delta Pier. Since no public recreational uses occur at the Test Pile Program project site, the proposed action would have no direct impact to recreational uses or access in the surrounding community. The Navy would implement mitigation measures to ensure impacts to fish, mammals and birds were reduced to the maximum extent feasible (Chapter 4). The discussion on water quality impacts (see Section 3.3) provides details regarding the proposed action's federal consistency with the CWA.	No change in existing conditions and no impacts to coastal zone management.

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° C	degrees Celsius
° F	degrees Fahrenheit
° W	West
µg/kg	micrograms per kilogram
µg/m^3	micrograms per cubic meter
µPa-m	Micro Pascals per meter
AAQS	Ambient Air Quality Standards
AQI	Air Quality Index
BA	Biological Assessment
BMPs	Best Management Practices
BOD	Biochemical oxygen demand
BRAC	Base Realignment and Closure
BSS	Beaufort Sea State
CA	California
CAA	Clean Air Act
CATEX	Categorical Exclusion
CDD	Coastal Consistency Determination
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CISS	Cast in Steel Shells
CKSD	Central Kitsap School District
CNO	Chief of Naval Operations
CO	Carbon Monoxide
CSL	Clean-up Screening Levels
CV	Coefficient of Variation
CWA	Clean Water Act
CZMA	Coastal Zone Management Act

CZMP	Coastal Zone Management Program
dB	decibel
dBA	A-weighted decibel
dBpeak	Peak decibels
dBrms	Decibel root mean square
DNR	Department of Natural Resources
DO	Dissolved Oxygen
DoD	Department of Defense
DoN	Department of the Navy
DPS	Distinct population segment
dw	Dry weight
EA	Environmental Assessment
EAC	Early Action Compact
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EHW	Explosives Handling Wharf
EHW-1	Explosive Handling Wharf #1
EHW-2	Explosive Handling Wharf #2
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordnance Disposal
EQ	Extraordinary Quality
ESA	Endangered Species Act
ESS	Electronic Security Systems
ESU	Evolutionarily significant unit
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FICON	Federal Interagency Committee on Noise
FONSI	Finding of No Significant Impact
ft	feet

GPS	Global Positioning System
HAP	Hazardous air pollutant
HCCC	Hood Canal Coordinating Council
HCDOP	Hood Canal Dissolved Oxygen Program
hp	Horse power
HPAH	Higher Molecular Polycyclic Aromatic Hydrocarbons
Hz	hertz
IHA	Incidental Harassment Authorization
INRMP	Integrated Natural Resources Management Plan
KB	Keyport/Bangor
kHz	Kilohertz
Kg	Kilograms
km	Kilometers
Lbs	Pounds
LPAH	Lower Molecular Polycyclic Aromatic Hydrocarbons
M	Meter
MBTA	Migratory Bird Treaty Act
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MHHW	Mean higher high water
Mi	mile
mL	milliliters
MLLW	Mean Lower Low Water
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MPN	Most Probable Number
MSFCMA	Magnuson-Stevens Fisheries Conservation and Management Act

MSL	Mean Sea Level
N/A	Not applicable
NAAQS	National Ambient Air Quality Standards
NAVBASE	Naval Base
NAVRESREDCOM	Naval Reserve Readiness Command Region
NEPA	National Environmental Policy Act
NBK	Naval Base Kitsap
ND	Not detected
NH_4	Ammonium
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrite
NO_3	nitrate
NO_x	nitrous oxides
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSWCCD	Navy Surface Warfare Center Carderock Division
NTU	Nephelometric Turbidity Units
OA	Operational Area
OR	Oregon
Pa	Pascal
PAH	Polycyclic aromatic hydrocarbon
PBDE	Polybrominated diphenyl ether
PCB	Polychlorinated biphenyl
PDA	Pile Dynamic Analyzer
PFMC	Pacific Fishery Management Council
PM	Particulate matter
PM_{10}	particulate matter smaller than 10 microns
$PM_{2.5}$	particulate matter smaller than 2.5 microns

PO_4	Phosphate
PPT	Parts per thousand
PSAMP	Puget Sound Ambient Monitoring Program
PSCAA	Puget Sound Clean Air Agency
PSU	Practical Salinity Units
PTS	Permanent Threshold Shift
RCW	Revised Code of Washington
ROI	Region of Influence
RMS	Root Mean Square
SARA	Species at Risk Act
SAS	Sound Attenuation System
SEL	Sound Exposure Level
SECNAVINST	Secretary of the Navy Instruction
SFOBB	San Francisco-Oakland Bay Bridge
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SISS	Swimmer Interdiction Security System
SMS	Sediment Management Standards
SO_2	sulfur dioxide
SPLs	Sound Pressure Levels
SRKW	Southern Resident Killer Whale
SSP	Navy Strategic Systems Programs
sq ft	square feet
SQS	Sediment Quality Standards
SUBASE	Submarine Base
SUBDEVRON	Submarine development Squadron
SWFPAC	Strategic Weapons Facilities Pacific
T-ROC	Thorndyke Resources Operation Complex
TBD	To be determined
TL	Transmission Loss

TOC	Total Organic Carbon
TNAP	Temporary Noise Attenuation Pile
TP#	Test Pile Number
TPF	Test Pile Floating concept
TPT	Test Pile Trestle
TRIDENT	Trident Fleet Ballistic Missile
TROC	Thorndyke Resources Operation Complex
TS	Threshold Shift
TSS	Total suspended solids
TTS	Temporary Threshold Shift
U&A	Usual and Accustomed fishing area
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WA	Washington
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington State Department of Ecology
WDOH	Washington Department of Health
WQS	Water Quality Standards
WRCC	Western Regional Climate Center
WSDOT	Washington State Department of Transportation
WSF	Washington State Ferries
ZOI	Zone of Influence

1 PROPOSED ACTION, PURPOSE AND NEED

1.1 INTRODUCTION

Naval Base Kitsap (NBK) at Bangor, Washington is located on Hood Canal approximately 20 miles west of Seattle, Washington (Figure 1–1). NBK at Bangor provides berthing and support services to United States (U.S.) Navy submarines and other fleet assets. The entirety of NBK at Bangor, including the land areas and adjacent water areas in Hood Canal, is restricted from general public access. However, tribal access is permitted to the beach south of Delta Pier (approximately 1.1 miles from the Explosives Handling Wharf) for shellfish harvesting.

1.2 PROPOSED ACTION

As part of the U.S. Navy's sea-based strategic deterrence mission, the Navy Strategic Systems Programs (SSP) directs research, development, manufacturing, test, evaluation, and operational support of the TRIDENT Fleet Ballistic Missile (TRIDENT) program. The proposed action (also called the Test Pile Program) is to install and remove 29 open ended, hollow steel test and reaction piles ranging in size from 30 inches in diameter to 60 inches in diameter; conduct lateral load and tension load testing on select piles; and measure in-water noise propagation during pile installation and removal. Table 2-1 in Chapter 2 lists all of the elements of the proposed action in more detail. All piles would be driven to an initial embedment depth with a vibratory hammer. The test piles would require the use of an impact hammer to be driven the remaining 10-15 feet (3-4 meters) (approximate) and for "proofing".[2] Geotechnical and sound data collected during pile installation and removal would be integrated into the design, construction, and environmental planning for the Navy's proposed second Explosives Handling Wharf (EHW-2). The Navy proposes to drive the test piles in the location planned for EHW-2 (south of the existing Explosives Handling Wharf [EHW-1]); however, other future projects can also benefit from the geotechnical and sound propagation data gathered from driving the test piles. The Test Pile Program would not disrupt current operations at EHW-1 or any other facility along the Bangor waterfront at NBK. Sound attenuation measures would be used during all impact hammer operations and some vibratory hammer operations. The proposed action would also include the removal of all test piles. Implementation would occur over 40 work days between July 16 and October 31, 2011 for all in-water work[3], however, impact pile driving after October 14, 2011 would be contingent upon the results of forage fish egg surveys. If forage fish eggs are not found prior to October 14, forage fish surveys will continue on a weekly basis and if any forage fish eggs are found impact pile driving will cease within a week of the survey. Work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September16 through October 31, 2011. Hydroacoustic monitoring would be accomplished to assess effectiveness of noise attenuation measures. The presence of marine mammals and marbled murrelets would also be monitored during pile installation and removal.

[2] "Proofing" is driving the test pile the last few feet into the substrate to determine the capacity of the pile. The capacity during proofing is established by measuring the resistance of the pile to a hammer that has a piston with a known weight and stroke (distance the hammer rises and falls) so that the energy on top of the pile can be calculated. The blow count in "blows per inch" is measured to verify resistance, and pile compression capacities are calculated using a known formula.

[3] In-water work would include all activities besides pile driving associated with the proposed action, including lateral and tension load tests, movement of barges and tug boats, the installation and removal of bubble curtains or other sound attenuation devices, etc.

Figure 1-1 Vicinity Map

1.3 STUDY AREA DESCRIPTION

NBK at Bangor is located on Hood Canal and utilizes various piers and a dock. The Navy uses the piers for vessel moorage, vessel maintenance, equipment testing and ordnance handling. The dock is used to perform maintenance on the underside of vessels. The proposed location for the Test Pile Program, also referred to in this document as the project area, is immediately south of EHW- 1 (see Figure 1-2). Two restricted areas (see Figure 1-3) are associated with NBK at Bangor, Naval Restricted Areas 1 and 2 (33 CFR 334.1220). Naval Restricted Area 1 covers the area to the north and south along Hood Canal encompassing the Bangor waterfront at NBK. The regulations associated with Naval Restricted Area 1 state that no person or vessel shall enter this area without permission from the Commander, Naval Submarine Base at Bangor or his/her authorized representative. Naval Restricted Area 2 encompasses the waters of Hood Canal within a circle of 1,000 yards (3,000 ft) diameter centered at the north end of NBK at Bangor and partially overlapping Naval Restricted Area 1. The regulations associated with Naval Restricted Area 2 state that navigation is permitted within that portion of this circular area not lying within Area No. 1 at all times except when magnetic silencing operations are in progress.

The non-tidal submerged lands adjacent to NBK at Bangor are state lands under the jurisdiction of the Washington State Department of Natural Resources (DNR). Nevertheless, the United States Navy retains a navigational servitude in all navigable waters regardless of the ownership of submerged lands. Thus, the United States may take actions concerning navigation over any navigable channel such as Hood Canal, to include affecting the submerged lands beneath the water column. At NBK Bangor, the restricted areas governing access to the waters immediately adjacent to the base are a valid exercise of the navigational servitude, as would be the construction of any facility relating to navigation, such as EHW-1 and the proposed EHW-2.

NBK at Bangor is surrounded by private residences along its north and south borders. The closest off-base residences are approximately 1.5 miles north of the project area, the closest community west of the base across Hood Canal is approximately 4 miles away, and the closest on-base residence is 3.75 miles from the project area. The portion of Hood Canal adjacent to the project area averages 1.5 miles in width and is bordered on the west by a 768-acre Navy-owned buffer strip on the Toandos Peninsula. This military buffer zone is restricted to the public and there is no recreational access. Areas surrounding the buffer area have rural and commercial forest land use designations by Jefferson County. The project area is also within the Usual and Accustomed (U&A) fishing area of the following five Native American Tribes: Skokomish Tribe; Lower Elwha Klallam Tribe, Port Gamble S'Klallam Tribe, Jamestown S'Klallam Tribe, and the Suquamish Tribe.

1.4 PURPOSE AND NEED

The purpose of the Test Pile Program is to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for the proposed EHW-2 and future projects at the Bangor waterfront at NBK.

Figure 1-2 Study Area

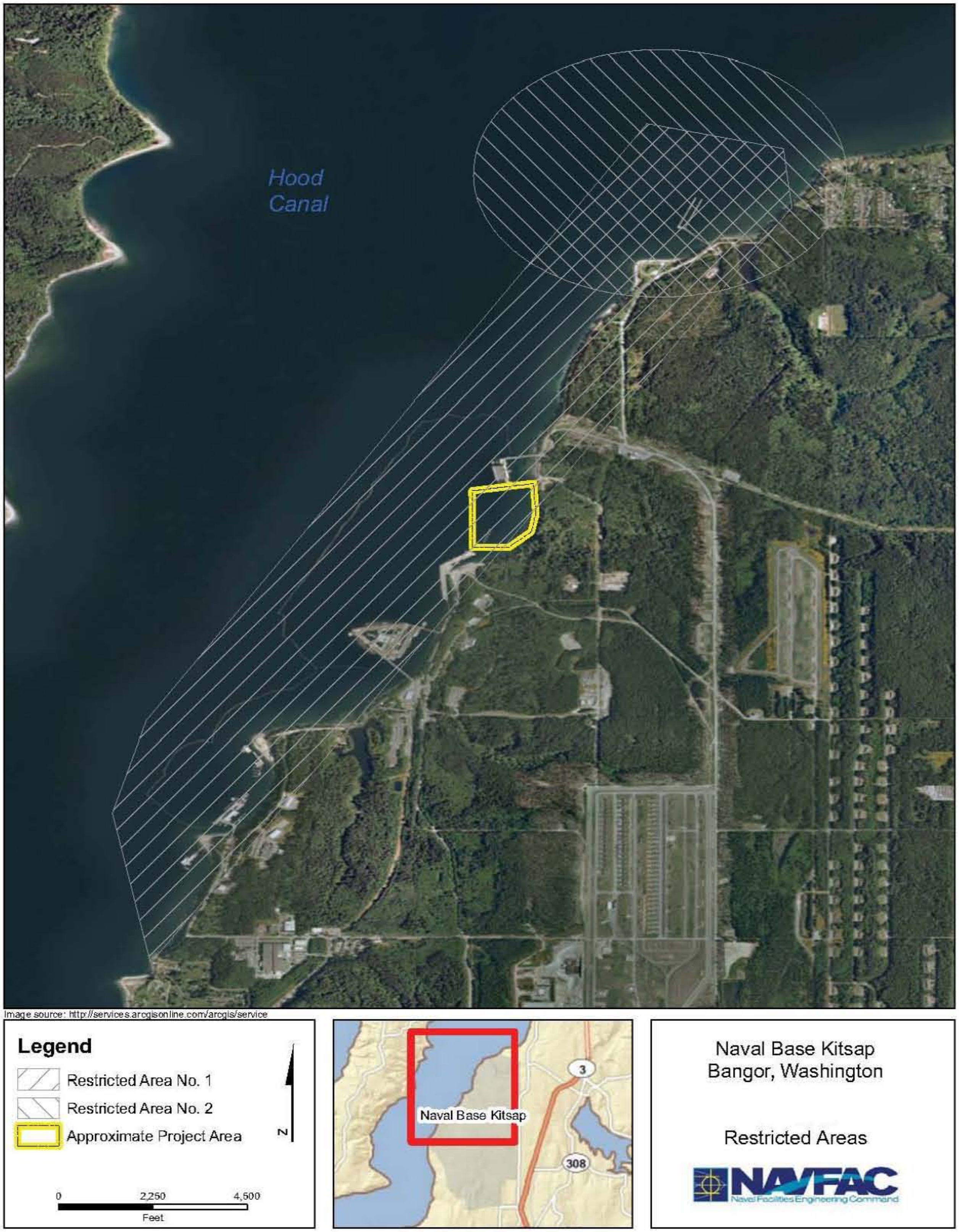

Figure 1-3 NBK at Bangor Restricted Areas

Implementation of the Test Pile Program could help reduce the cost of construction of the proposed EHW-2 and future projects, reduce overall project risks, provide important input to the environmental permitting process, and allow a more definitive understanding of project schedules. The Test Pile Program would serve to verify required embedment lengths and pile capacities and could reduce design conservatism, providing the potential of reduced pile lengths and the total number of piles required in the proposed EHW-2 project and other future projects along the Bangor waterfront at NBK. The program would also establish the ability to install the piles to the design tip using a vibratory hammer, limiting the number of strikes with an impact hammer to those needed to proof the pile, resulting in both environmental and cost benefits. The program would include hydro-acoustic monitoring to evaluate noise attenuation techniques and to establish the requirements necessary to protect birds, mammals and fish from potentially damaging noise.

The need for the Test Pile Program is to obtain the most accurate geotechnical data to validate the proposed EHW-2 design and to obtain sound propagation data to identify possible effects on the species and habitat within the project area. Sound propagation data would also be used to assist in the implementation of the mitigation for EHW-2 and other projects on NBK at Bangor and to inform subsequent Marine Mammal Protection Act (MMPA) documentation. Finally, information obtained as part of the proposed Test Pile Program would be valuable in informing the design of future waterfront facilities upgrades at NBK at Bangor.

1.5 ENVIRONMENTAL REVIEW PROCESS

1.5.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 requires the consideration of potential environmental consequences of federal actions. Regulations for federal agency implementation of the Act were established by the President’s Council on Environmental Quality (CEQ). Under NEPA, federal agencies must prepare an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) for any major federal action, except those actions that are determined to be “categorically excluded” from further analysis.

An EA is a concise public document that provides sufficient analysis for determining whether the potential environmental impacts of a proposed action are significant, resulting in the preparation of an EIS, or not significant, resulting in the preparation of a Finding of No Significant Impact (FONSI). An EIS is prepared for those federal actions that may significantly affect the quality of the human environment. Thus, if the Navy were to determine that the proposed action would have a significant impact on the quality of the human environment, an EIS would be prepared. An EA should include: brief discussions of the purpose and need for the proposal, the proposed action, the alternatives, the affected environment, the environmental impacts of the proposed action and alternatives, a listing of agencies and persons consulted and a discussion of the cumulative impacts associated with the alternatives.

This EA will be reviewed by the lead agency, the Navy, representatives of which will make a determination regarding the proposed action and whether a FONSI or an EIS is appropriate. Should the Navy conclude that a FONSI is appropriate; a FONSI that summarizes the issues presented in this EA will be prepared. The FONSI would be signed by the Navy and a notice of availability would be published in local newspapers in Kitsap County, WA.

The Navy has prepared this EA in accordance with applicable federal and state regulations and instructions, as well as with other applicable laws, rules and policies. These include, but are not limited to the following:

- NEPA as amended by Public Law 94-52, July 3, 1975 (42 U.S.C. 4321 *et seq.*), which requires environmental analysis for major federal actions significantly affecting the quality of the environment.
- Council on Environmental Quality (CEQ) regulations, as contained in 40 CFR Parts 1500 to 1508, which direct federal agencies on how to implement the provisions of NEPA.
- Navy Regulations for Implementing NEPA 32 CFR 775.
- OPNAVINST 5090.1C.

1.5.2 Agency Coordination and Permit Requirements

In addition to NEPA, other laws, regulations, permits, and licenses may be applicable to the proposed action, including the following:

- Permit from the U.S. Army Corps of Engineers (USACE), Seattle District in accordance with Section 10 of the Rivers and Harbors Appropriation Act of 1899. Section 10 of the Rivers and Harbors Act of 1899 prohibits the obstruction or alteration of any navigable water of the United States, unless authorized by USACE.
- Federal Coastal Consistency Determination (CCD) concurrence by the State of Washington Department of Ecology, Coastal Zone Management Program (CZMP) in accordance with the Coastal Zone Management Act (CZMA). This consultation would be completed to ensure the Navy is complying to the maximum extent practicable with the enforceable policies of the state's CZMP. The Washington CZMP was established via the Washington State Shoreline Management Act (SMA), and includes local government shoreline master programs.
- When cultural resources are located on federal lands, these resources are subject to the regulatory requirements of the National Historic Preservation Act (NHPA) of 1966, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. For the purpose of compliance with Section 106 of the NHPA, only "historic properties" are subject to assessment of adverse effects. A historic property is any prehistoric or historic district, site, building, structure, or object included in, or eligible for listing in, the National Register of Historic Places. The term "historic property" also includes properties of traditional spiritual and/or cultural importance to an Indian tribe, ethnic group, or subculture. To comply with Section 106 of the NHPA, the Navy has consulted with the Washington Department of Archeological and Historic Preservation (DAHP) and affected tribes on the proposed action.
- The Annotated 1999 Native American and Alaska Native Policy, promulgated by the U.S. Department of Defense (DoD), requires the Navy to consult with federally recognized tribes concerning proposed military activities that could affect tribal lands and resources, including sacred sites, on and off military reservations; this would include U&A treaty harvest rights or established affiliation with cultural resource sites in the

proposed action area. The Navy has consulted with tribes to assess whether the proposed action would significantly affect protected tribal resources or rights.

Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments, directs federal agencies to consult with tribes and respect tribal sovereignty when taking actions affecting Native American rights. In the Navy, the EO and DoD policies are implemented in accordance with Secretary of the Navy Instruction (SECNAVINST) 11010.14A, Department of the Navy Policy for Consultation with Federally Recognized Tribes, dated October 11, 2005. In 1855, Territorial Governor Isaac Stevens negotiated treaties with 24 of the 29 modern-day federally recognized tribes located in Washington State. The treaties included language pronouncing that, “[T]he right of taking fish at U&A grounds and station is further secured to said Indians in common with all citizens of the Territory…together with the privilege of hunting and gathering roots and berries on open and unclaimed lands”. Subsequent legal decisions have identified (U&A) areas and afforded tribes the right to fifty percent of all fish and shellfish present or passing through the tribe’s historic U&A areas, including on and off-reservation areas where tribes engaged in fishing, hunting and gathering of food, as well as access to historical fishing grounds and stations identified in treaties and other documents.

The Point No Point Treaty of 1855 granted U&A treaty harvest rights for fishing and hunting in Hood Canal and the Kitsap Peninsula to the S’Klallam and Skokomish Tribes. The S’Klallam, Skokomish, Elwha Klallam, Jamestown S’Klallam, and Suquamish Tribes have adjudicated U&A in Hood Canal. A 1997 cooperative agreement between the Navy and the Skokomish, Port Gamble S’Klallam, Lower Elwha Klallam, and Jamestown S’Klallam Tribes enabled tribal members to access designated beach areas on the Bangor waterfront at NBK to harvest shellfish. The Suquamish Tribe was a signatory to the Point Elliott Treaty of 1855, and was also recognized as having U&A treaty harvest rights in Hood Canal and the Kitsap Peninsula. The Navy invited the Native American tribes with U&A to participate in government-to-government consultation for the proposed action.

- The Endangered Species Act (ESA) of 1973, as amended, requires that an action authorized by a federal agency shall not jeopardize the continued existence of a federally endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. The Navy is consulting with U.S. Fish and Wildlife Service (USFWS) Washington Office and the National Marine Fisheries Service (NMFS) Northwest Regional Office under the ESA for federally threatened and endangered species that may be affected by the project.
- The Migratory Bird Treaty Act (16 USC 703-712), as amended, makes it a prohibited act, unless permitted by regulations, to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird” (16 USC 703). EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires that all federal agencies avoid or minimize

the effects of their actions on migratory birds and take active steps to protect birds and their habitat.

- The Fishery Conservation and Management Act of 1976 (16 USC § 1802), later changed to the Magnuson Fishery Conservation and Management Act in 1980, established a 200-nautical mile fishery conservation zone in U.S. waters and a regional network of Fishery Management Councils. The Fishery Management Councils are composed of federal and state officials, including the USFWS, which oversee fishing activities within the fishery management zone. In 1996, the Magnuson Fishery Conservation and Management Act was reauthorized and amended as the Magnuson-Stevens Fishery Conservation and Management Act (MSA), known more popularly as the Sustainable Fisheries Act. The MSA mandated numerous changes to the existing legislation designed to prevent overfishing, rebuild depleted fish stocks, minimize bycatch, enhance research, improve monitoring, and protect fish habitat.

  The MSA requires that Essential Fish Habitat (EFH) be identified and described for each federally managed species. NMFS and regional Fishery Management Councils determine the species distributions by life stage and characterize associated habitats, including habitat areas of particular concern. The MSA requires federal agencies to consult with NMFS on activities that may adversely affect EFH, or when NMFS independently learns of a federal activity that may adversely affect EFH. The MSA defines an adverse effect as "any impact which reduces quality and/or quantity of EFH [and] may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species' fecundity), site-specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR 600.810). The Navy would not consult with NMFS under the MSA for the proposed action because EFH would not be adversely affected.

- The Marine Mammal Protection Act (MMPA) of 1972, as amended, establishes a national policy designated to protect and conserve marine mammals and their habitats. This policy is intended to prevent diminishment of marine mammal populations beyond the point at which they cease to be a significant functioning element in the ecosystem, or below their optimum sustainable population. NMFS Headquarters is responsible for reviewing federal actions for compliance with the MMPA. The environmental analysis for the proposed action determines that there could be a take[4] of marine mammals. The Navy has applied for an Incidental Harassment Authorization (IHA) permit with NMFS Headquarters under the MMPA.

[4] "Take," as defined in the regulations implementing the MMPA, is: "…to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild" (50 CFR Section 216.3).

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2 DISCUSSION OF ALTERNATIVES

NEPA's implementing regulations (*e.g.*, 40 CFR 1502.14) provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Each of the alternatives must be feasible and reasonably foreseeable in accordance with the CEQ regulations (40 CFR 1500-1508). This chapter provides a description of the alternatives analyzed in this EA.

2.1 SITE SELECTION

The site selection process for this EA is based on the proposed location for the construction of EHW-2. The Test Pile Program must occur within the proposed EHW-2 footprint. Although the locations of the proposed EHW-2 piles within the footprint could change from those selected under the proposed Test Pile Program, the data collected during the Test Pile Program would assist in validating the design concepts and construction methods for the proposed EHW-2. However, the project footprint of the proposed Test Pile project must coincide with the proposed location of EHW-2 to ensure the most accurate and representative geotechnical and sound data is collected.

2.2 ALTERNATIVES

As required by NEPA, all reasonable alternatives must be considered. Reasonable alternatives include those that are practical and feasible. However, only those alternatives determined to be reasonable relative to their ability to fulfill the purpose and need for the proposed action will be analyzed in the EA. The proposed action and alternatives were developed giving due consideration to the purpose and need. This EA analyzes a No Action Alternative and one alternative to achieve the proposed action.

2.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not be conducted. The geotechnical and sound data resulting from the test pile installation would not be collected and therefore would not be available to validate the design concepts and construction methods for the proposed EHW-2. The No-Action Alternative would not meet the purpose of and need for the proposed action but represents the baseline condition against which potential consequences of the proposed action can be compared. As required by CEQ guidelines, the No-Action Alternative is carried forward for analysis in this EA.

2.2.2 Proposed Action

Under the proposed action, 29 test and reaction piles would be installed in Hood Canal and subsequently removed between July 16 and October 31, 2011[5]. Impact pile driving activities, including proofing, will only occur from July16 to October 14, with any impact pile driving after

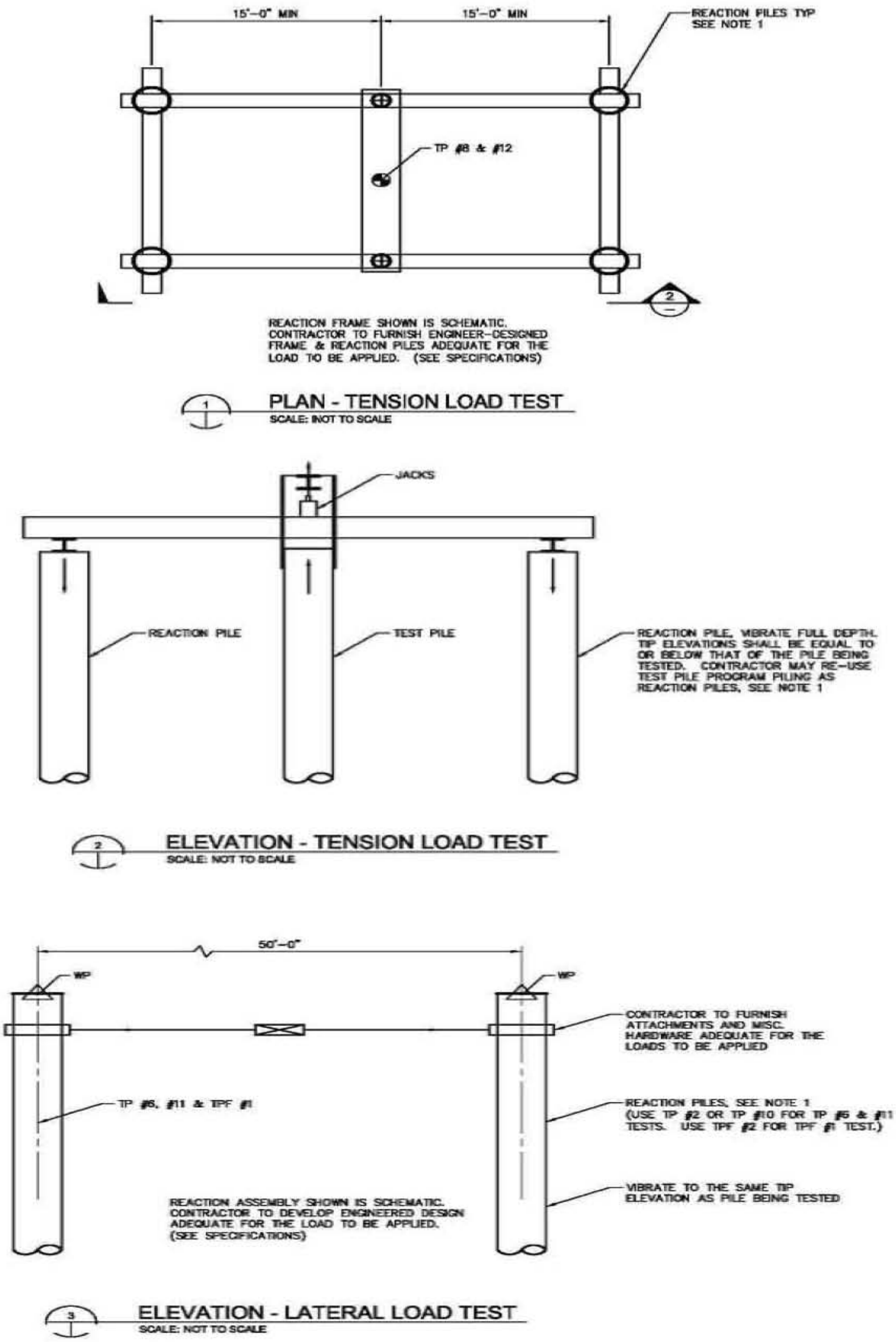
[5] The Navy, in consultation with NMFS NW region and USFWS NW region under ESA, has set timing restrictions for pile installation and removal activities to avoid in-water work when ESA-listed fish populations are most likely to be present. Therefore, the Test Pile Program would occur only between 16 July – 31 October of the approved in-water work window (July 16 - February 15) to minimize the number of fish exposed to underwater sound and other disturbance. These months (July – Oct.) were also selected because they overlap with times when Steller sea lions and the majority of California sea lions are not expected to be present within the project area.

October 14 contingent on the results of spawning fish egg surveys. If forage fish eggs are not found prior to October 14, forage fish surveys will continue on a weekly basis and if any forage fish eggs are found impact pile driving will cease within a week of the survey. Vibratory pile driving and other in-water work will be allowed to proceed through October 31, 2011. Work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September 16 through October 31, 2011. These test piles would be situated throughout the footprint of a proposed EHW-2, which is currently under development. Installation of the test piles would involve driving 18 hollow, open ended, steel pipe piles ranging in size from 30 inches to 60 inches in diameter into the substrate via by a vibratory hammer, then impact hammer. The length of the piles would range from approximately 100 feet to 197 feet. Additionally, three lateral load tests would be performed. The lateral load test would involve measurements of lateral displacement versus the load for the piles.[6] The lateral load tests would require re-installation of two of the 60-inch piles and one 48-inch pile. Two tension load tests would also be performed. The tension load test would measure the vertical capacity of a pile[7]. The tension load tests would require temporarily installing four 30- and 36-inch reaction piles around one of the test piles for each of the two tension load tests. The lateral load test in combination with the tension load test would result in the installation of an additional 11 piles. The Navy expects that some of the initial test piles would be pulled and reused as part of the 11 additional piles. Figure 2-1 provides a diagram of the lateral and tension load tests. Table 2.1 provides a proposed implementation plan for the Test Pile Program.

All of the test piles would be installed by a vibratory hammer to their initial embedment depths. The 18 test piles would require the use of an impact hammer to drive the piles the remaining 10-15 feet (approximately) into the substrate. While driving the piles with the impact hammer, the piles would be proofed; i.e. the impact hammer would perform a few blows to warm up the hammer and a number of blows to verify capacity. A Pile Dynamic Analyzer (PDA) would also be utilized to confirm capacity. As a contingency, any of the 29 test and reaction piles that cannot be driven to the desired depth using a vibratory hammer would be installed using an impact hammer. This contingency has been accounted for in the modeling analysis. For each pile installed, the actual driving time is expected to be no more than one hour for the vibratory portion of the project. The impact driving portion of the project is anticipated to take approximately 15 minutes per pile with no more than 100 blows per day. It is estimated that test pile installation could occur at a maximum rate of four piles per day, but a rate of two piles per day is more likely. The piles would be extracted using the vibratory hammer. Extraction is anticipated to take approximately 30 minutes per pile. A 108 day pile driving window (July 16 - October 31, 2011) was requested by the Navy to take into account delays that could occur due to the permitting process, materials availability, and inclement weather that may preclude construction.

[6] The lateral load test is accomplished by installing two like sized piles to the design penetration depth below the mudline, then pulling the piles towards each other while plotting the deflection for a given load. This test helps to better define lateral load resistance performance and lateral stiffness.

[7] The tension load test is accomplished by installing a pile to the design penetration depth below the mudline. Four temporary piles will then be installed around the pile to provide a foundation for a jacking frame. The frame will be constructed to allow for jacking against the four piles in compression while pulling up on the test pile in tension. The load versus displacement information is then recorded.



Source: Berger ABAM

Figure 2-1 Lateral Load and Tension Load Test

TABLE 2.1 PROPOSED TEST PILE PROGRAM IMPLEMENTATION PLAN

Test Pile NO	Suggested Driving Sequence	Pile Type	Driving Shoes/End Hardening	Vibrate & Impact	Lateral Load Test	Tension Load Test	Load to be Applied	Lateral Reaction Pile	Tension Reaction Pile	Initial Embedment Depth
TP#1	11	30’Ø x ¾”T x 190’L	None	X					X	150’
TP#2	12	48’Ø x 1”T x 195’L	Cutting Shoe *1	X				X		155’
TP#3	13	30’Ø x ¾”T x 195’L	Cutting Shoe *1	X					X	158’
TP#4	1	36’Ø x ¾”T x 185’L	Cutting Shoe *1	X					X	142’
TP#5	2	36’Ø x ¾”T x 195’L	Welded End Hardening	X					X	150’
TP#6	3	48’Ø x 1”T x 198’L	Welded End Hardening	X	X		TBD			149’
TP#7	4	36’Ø x ¾”T x 175’L	None	X						132’
TP#8	5	30’Ø x ¾”T x 175’L	None	X		X	TBD			132’
TP#9	6	30’Ø x ¾”T x 180’L	Cutting Shoe *1	X					X	140’
TP#10	7	48’Ø x 1”T x 180’L	None	X				X		140’
TP#11	8	48”Ø x 1”T x 192”L	None	X	X		TBD			150’
TP#12	9	30’Ø x ¾”T x 194’L	Welded End Hardening	X		X	TBD			154’
TP#13	10	36’Ø x ¾”T x 188’L	None	X					X	150’

TABLE 2.1 TEST PILE PROGRAM IMPLEMENTATION PLAN (continued)

Test Pile NO	Suggested Driving Sequence	Pile Type	Driving Shoes/End Hardening	Vibrate & Impact	Lateral Load Test	Tension Load Test	Load to be Applied	Lateral Reaction Pile	Tension Reaction Pile	Initial Embedment Depth
TPT#1	2	30’Ø x ¾”T x 152’L	Cutting Shoe *1	X					X	112’
TPT#2	1	24’Ø x ¾”T x 100’L	Cutting Shoe *1	X						50’
TPT#3	3	36’Ø x 1”T x 148’L	None	X					X	107’
TPF#1	2	48’Ø x 1”T x 140’L	Cutting Shoe *1	X	X		TBD			120’
TPF#2	1	48’Ø x 1”T x 145’L	None	X				X		120’

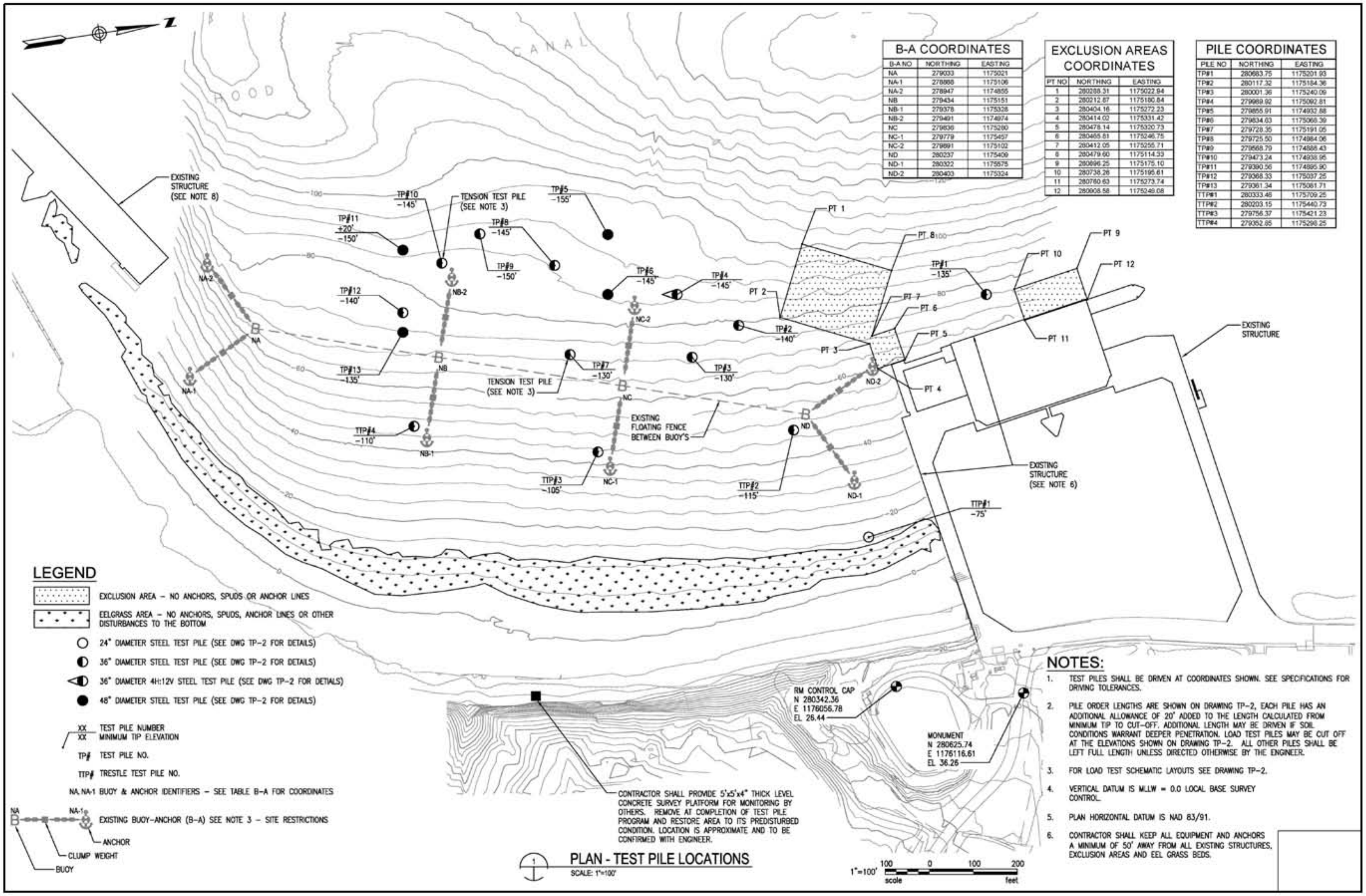
*1 – Welded end hardening using 90 ksi weld material
*2 – Inside edge cutting shoe
*3 – ‘H’ pile stinger
TP# - Test Pile Number (See figure 2-2 for locations)
TPT – Test Pile Trestle
TPF – Test Pile Floating concept
Ø – Diameter of the test piles
L – Length = Mudline + 60’ Embedment + 20 MLLW cut off + 20” Driving Allowance
T – Wall thickness
TBD – To Be Determined

For the proposed Test Pile Program, the contractor would most likely mobilize two floating barges, one large barge up to 80' wide x 300' long and one medium sized barge approximately 60' wide x 150' long,. These barges would be moved into location with a 44' tug boat, which would be refueled off site. The two barges would share the workload with the smaller barge working the inboard trestle test piles and the larger barge working the outboard test piles. The smaller barge would likely be on site for approximately two weeks of pile driving, while the larger barge would be on site for the full duration of the program which is expected to be approximately 40 days. Barge anchors and spuds (vertical steel shafts that hold the barge in place, i.e. an alternate anchoring device) would also be utilized during in-water activities. A conservative estimate of total bottom disturbance from the barge anchors, spuds, and test piles is approximately 6,970 ft^2 (647 m^2). Only one pile driving rig would be operated at any one time.

An existing parking lot could be utilized by the contractor for employee parking and a construction trailer. The use of an existing parking lot would not increase stormwater quality or quantity. The 40 work day duration of the program includes the time for the initial pile installations, time for performing the loading tests, and time to remove all of the test piles and demobilize. All test piles would be removed with a vibratory hammer as part of the proposed project and reused as part of the EHW-2 project if structurally intact; otherwise the piles would be recycled. Figure 2-2 shows in detail the proposed location of 18 test piles. Additional piles used for lateral load test and tension load tests are not shown in this figure, but would occur in the same general vicinity as the 18 pile locations shown.

Sound attenuation measures (i.e. Gunderboom SAS™, temporary noise attenuation pile [TNAP], confined bubble curtain and/or unconfined bubble curtain) would be used during all impact hammer operations and during some vibratory hammer operations. The Navy plans to use a Gunderboom Sound Attenuation System™ (SAS) as mitigation for in-water sound during construction activities. The Gunderboom SAS™ is a multipurpose enclosure that absorbs sound, attenuates pressure waves, excludes marine life from work areas, and controls the migration of debris, sediments and process fluids. The Gunderboom SAS™ is comprised of a water-permeable double layer of polypropylene/polyester fabric. The system is either suspended by flotation billets and anchored in place, or installed on a rigid frame surrounding the area of activity. As compressed air is released at the bottom of the curtain, the space between the two fabric layers inflates, creating a sound absorbing bubble wall. If the Navy cannot obtain the Gunderboom SAS™ or if it does not achieve the proposed noise attenuation, other traditional sound attenuation devices such as a confined or unconfined bubble curtain or temporary noise attenuation piles (TNAPs) will be used as a backup mitigation.

Confined and unconfined bubble curtains utilize air as a means of creating an effective barrier to sound propagation. Air is an effective means at attenuating sound due to the difference in density between air and water. A bubble curtain is usually a ring or series of stacked rings that are placed around a pile along the entire pile's length. The rings are made of flexible tubing which has small puncture holes through which compressed air is pumped. As compressed air is pumped through the tubing, bubbles are produced creating an air barrier which impedes the sound and pressure produced during pile driving from radiating away from the pile. In a confined system, the bubbles are confined to the area around the piles with a flexible material (plastic or cloth) or a rigid pipe. The material of the confining casing does not affect the overall sound reduction



Source: Berger ABAM

Figure 2-2 Test Pile Locations (Proposed Action)

provided by the system (CALTRANS, 2009). Confined systems are most often used when there is the potential for high water current velocities to sweep the bubbles away from the piles. Unconfined systems have no such system for restraining the bubbles. Temporary noise attenuation piles (TNAPs) are similar to a confined bubble curtain in that a sleeve or shroud is placed around the pile. However, instead of using a bubble curtain, TNAPs are often multi-walled and the interior space is filled with air, or can be foam-lined to reduce the transmission of sound outside the apparatus (WSDOT 2007).

The efficacy of sound attenuation devices is dependent upon a variety of site-specific factors, including environmental conditions such as water currents, sediment type, and bathymetry; the type and size of the pile; and the type and energy of the hammer. Thorson and Reyff (2004) determined that a properly designed bubble curtain could provide a reduction of 5 to 20 dB. Noise reduction results using an unconfined bubble curtain from several projects performed (Illingworth and Rodkin, 2001; WSDOT 2010c) indicate a wide variance results, with very little measurable attenuation in some cases and high attenuation in other cases. Reductions of 85 percent (approximately 17 dB, computed as 20•log10 the ratio of peak pressure reduced by 85 percent with the use of a bubble curtain) or more have been reported with the proper use of a confined bubble curtain (Longmuir and Lively 2001), although reductions of 5 to 15 dB are more typical (Laughlin 2005a). For the underwater acoustic analysis, an average SPL reduction of -10 dB was assumed during impact pile driving.

Additionally, the Navy would also monitor hydroacoustic levels, as well as the presence and behavior of marine mammals and marbled murrelets during pile installation and removal. The piles would be removed using a vibratory hammer at or before the completion of the proposed Test Pile Program because they could pose a potential navigation risk if left in place. The test piles would not be incorporated into the proposed EHW-2 construction because exact pile locations for the proposed structure have not been determined.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The development process for this EA considered other alternatives to the Test Pile Program. Five alternatives were considered, but eliminated from further consideration due to location, feasibility, operational and other impacts. A summary of each of the alternatives eliminated from further consideration is discussed below.

2.3.1 Alternate Pile Locations within the Study Area

The Test Pile Program would provide geotechnical and sound propagation data for the proposed EHW-2 as well as future projects along the Bangor waterfront at NBK. Test piles should be installed at locations as close as practicable to the proposed EHW-2 footprint. For this reason, installation of piles in alternate locations was considered, but eliminated. The environmental impacts associated with minor changes in the location of the Test Pile Program would not be significantly altered if the installation of test piles occurs in an alternate location, other than the locations depicted in Figure 2-2, within the proposed Test Pile Program project area. Installation of piles in alternate locations would not meet the purpose and need of the proposed action.

2.3.2 Lesser Number of Piles

Installation of fewer piles then those required under the proposed action was considered, but eliminated. Under the proposed action, the number of piles proposed for use in the Test Pile Program has been reduced to the minimum number required to gather accurate data to support the proposed EHW-2 project. Piles would be placed to optimize the data collection area and capabilities without compromising the integrity of the data. Installation of fewer piles would not meet the purpose and need of the proposed action.

2.3.3 Alternate Test Project Location

The Test Pile Program is designed to gather geotechnical and sound propagation data to validate waterfront renovations at Bangor, in particular the design for the proposed EHW-2 being planned at NBK at Bangor, WA. If the location of the Test Pile Program were to be altered, the results would not provide site-specific data needed for design of the proposed EHW-2. The installation and removal of test piles for this purpose must be performed in the location which is anticipated for the construction of the proposed EHW-2 to ensure the data collection effort for the proposed EHW-2 project is successful. Thus, conducting the test pile program in an alternate location was eliminated from consideration, as it did not meet the purpose and need of the proposed action.

2.3.4 Alternate Pile Installation Methodology

Two alternative methods of pile installation that might be accomplished using non-vibratory and non-impact hammer methods of pile installation were considered during the planning phase of the EA, but eliminated because they were deemed impractical.

The first methodology considered consisted of drilling a hole to a required depth (i.e., tip elevation) and then inserting the pile in the hole. This approach would result in very low capacities and is impractical, if not impossible, in deep water because geotechnical investigation shows the glacial till is not self supporting, i.e. the drilled hole would cave in and ultimately a large crater would remain (like digging a hole at the beach). A drilled hole would also not provide the skin friction required for bearing and tension capacities needed to support the structure. Drilling would also produce significant turbidity in the Hood Canal. This approach was quickly abandoned as an unfeasible alternative.

A second alternate methodology would have been to attempt to install conventional drilled shafts offshore. However, this method of construction would have been difficult, if not impossible, to complete in deep water because the technology has never been attempted in water exceeding two atmospheres and presently does not exist. For larger diameter shafts, the likely method of installation could possibly have consisted of advancing large diameter steel casing to the predetermined required tip elevation. For the size of shafts being considered for the project (60-inch diameter), this would likely have been accomplished using “hydraulic oscillator hydraulic rotator casing” methods. This type of construction consists of a machine that can push a casing into the ground while, at the same time, rotate it back and forth to provide a cutting action. The soil inside the advancing casing is then removed from the interior of the casing as the casing is advanced. Moreover, this type of installation would result in significant loss in bearing capacity. Accordingly, this alternative was not considered further.

2.3.5 Geotechnical Modeling

Geotechnical modeling can be used to assist in the design of piers, wharfs and other in-water structures. However, geotechnical modeling is based on assumptions. In order to formulate these assumptions, real data must be gathered. There is insufficient data on sediment conditions in the project area to accurately perform geotechnical modeling; therefore this alternative was eliminated from consideration in this EA. It is essential to gather real data by performing the Test Pile Program to ensure the validity of the proposed EHW-2 design and other future projects.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes existing environmental conditions of resources potentially affected by the proposed action and the No Action Alternative. This chapter also identifies and assesses the environmental consequences of the proposed action. The affected environment and environmental consequences are described and analyzed according to categories of resources. The categories of resources addressed in this EA are listed in Table 3-1.

Several resources areas have been eliminated from further discussion as it was concluded that these resources areas would not be impacted by the Test Pile Program. The resources excluded from the analysis and the reasons for excluding these resources are as follows:

- Visual Resources – Visual resources are the natural and manmade features that give a particular environment its aesthetic qualities. In developed areas, the natural landscape is more likely to provide a background for more obvious manmade features. The size, forms, materials, and functions of buildings, structures, roadways, and infrastructure would generally define the visual character of the built environment. These features form the overall impression that an observer receives of an area or its landscape character. Attributes used to describe the visual resource value of an area include landscape character, perceived aesthetic value, and uniqueness. The Test Pile Program is proposed to occur within the waters of Hood Canal off the Bangor waterfront at NBK. The proposed action is temporary, only lasting 40 days. All 29 test and reaction piles would be removed at or before the conclusion of the Test Pile Program. The placement or height of the piles would not affect operations at NBK at Bangor and the piles would not be lighted. Therefore, no permanent impact to visual resources would occur due to the temporary nature of the program.
- Recreational and Commercial Fishing – Recreational and commercial fishing does not occur in the proposed Test Pile Program project area at the Bangor waterfront at NBK. This area is restricted from access by the general public per 33 CFR 334.1220. Therefore the activities described under the proposed action would not have an impact on recreational and commercial fishing.

TABLE 3.1 RESOURCE AREAS AND CHAPTER LOCATIONS

Resource	Section	Resource	Section
Bathymetry	3.1	Fish	3.8
Geology and Sediments	3.2	Marine Mammals	3.9
Water Resources	3.3	Birds	3.10
Air Quality	3.4	Cultural Resources	3.11
Ambient Noise	3.5	Environmental Health and Safety	3.12
Marine Vegetation	3.6	Socioeconomics	3.13
Marine Invertebrates	3.7	Coastal Zone Management Act	3.14

3.1 BATHYMETRY

3.1.1 Affected Environment

Puget Sound is a glacially carved fjord with five major basins. Hood Canal is the westernmost basin and has a total length of approximately 62 miles (100 km) and a maximum depth of nearly 626 feet (200 m) (Kellogg, 2004). The basin is relatively straight for the majority of its length, with the exception of Dabob Bay, a major embayment. The primary components of Hood Canal are the entrance, Dabob Bay, the central region, and The Great Bend at the southern end (Gustafson et al., 2000) (Figure 3-1). Over most of its length Hood Canal varies in width from 1.0 to 2.5 miles (2 km to 4 km) (Kellogg, 2004).

A shallow sill extends across the short axis of the canal south of Hood Canal Floating Bridge and the northern end of NBK at Bangor in the vicinity of South Point and Thorndyke Bay. It is approximately 25 miles (40 km) long and lies at a depth of approximately 130 feet (40 m). Southward of the sill the bottom on the western side drops off steeply, while the eastern side slopes more gently downward (Figure 3-2). The main thalweg[8] and current runs along the west side of the channel, forming a hanging valley[9] at the sill crest (Gregg and Pratt, 2010). The sill limits exchanges of dense water between the deeper southern reach and Admiralty Inlet, the channel linking Puget Sound to the North Pacific Ocean via the Strait of Juan de Fuca (Gregg and Pratt, 2010). South of the sill, the bottom along the thalweg is extremely rough, varying by + 80 feet (25 m) over 0.6 miles (1 km) or less (Gregg and Pratt, 2010).

The sill, canal cross-sectional area and bathymetric irregularities exert a controlling affect on tidal currents, flow stratification, tidal energy and exchange of dissolved oxygen (Gregg and Pratt, 2010; Kellogg, 2004; Gustafson et al., 2000). However, an accurate description of the hydraulic properties of Hood Canal is hindered by its complex geometry and bathymetry (Gregg and Pratt, 2010).

3.1.2 Environmental Consequences

3.1.2.1 No Action Alternative

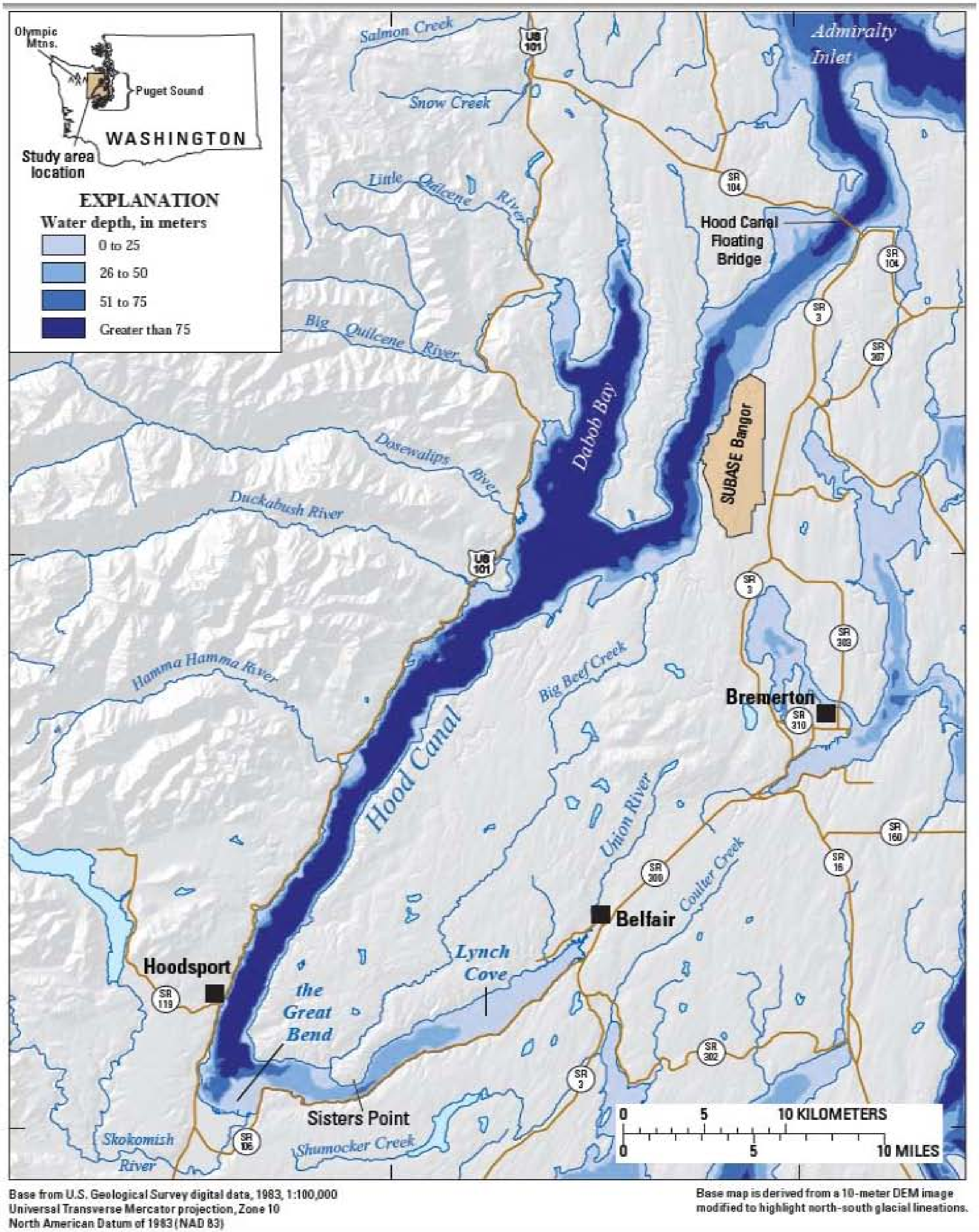
Under the No Action Alternative the Test Pile Program would not be conducted. Baseline bathymetric conditions would remain unchanged. Therefore, there would be no significant impacts to bathymetry from implementation of the No Action Alternative.

3.1.2.2 Proposed Action

The proposed action is to drive 29 test and reaction piles at NBK at Bangor supported by two barges (one large barge up to 80’ wide x 300’ long and one medium sized barge approximately 60’ wide x 150’ long), tugboats (approximately 44 feet), spuds (support legs for equipment), anchors and monitoring equipment (such as hydrophones). All work is temporary and the equipment and test piles would be demobilized and removed after 40 days.

Changes to the bathymetry from these activities would be inconsequential. The greatest localized change would likely occur from anchor or spud placement during pile driving.

[8] A thalweg is the line defining a channel’s maximum depth, and is also usually the line of a current’s fastest flow.
[9] A former tributary glacier valley that is incised into the upper part of a U-shaped glacier valley, higher than the floor of the main valley (USGS, 2010).



Source: Gustafson et al., 2000

Figure 3-1 Hood Canal Water Depths

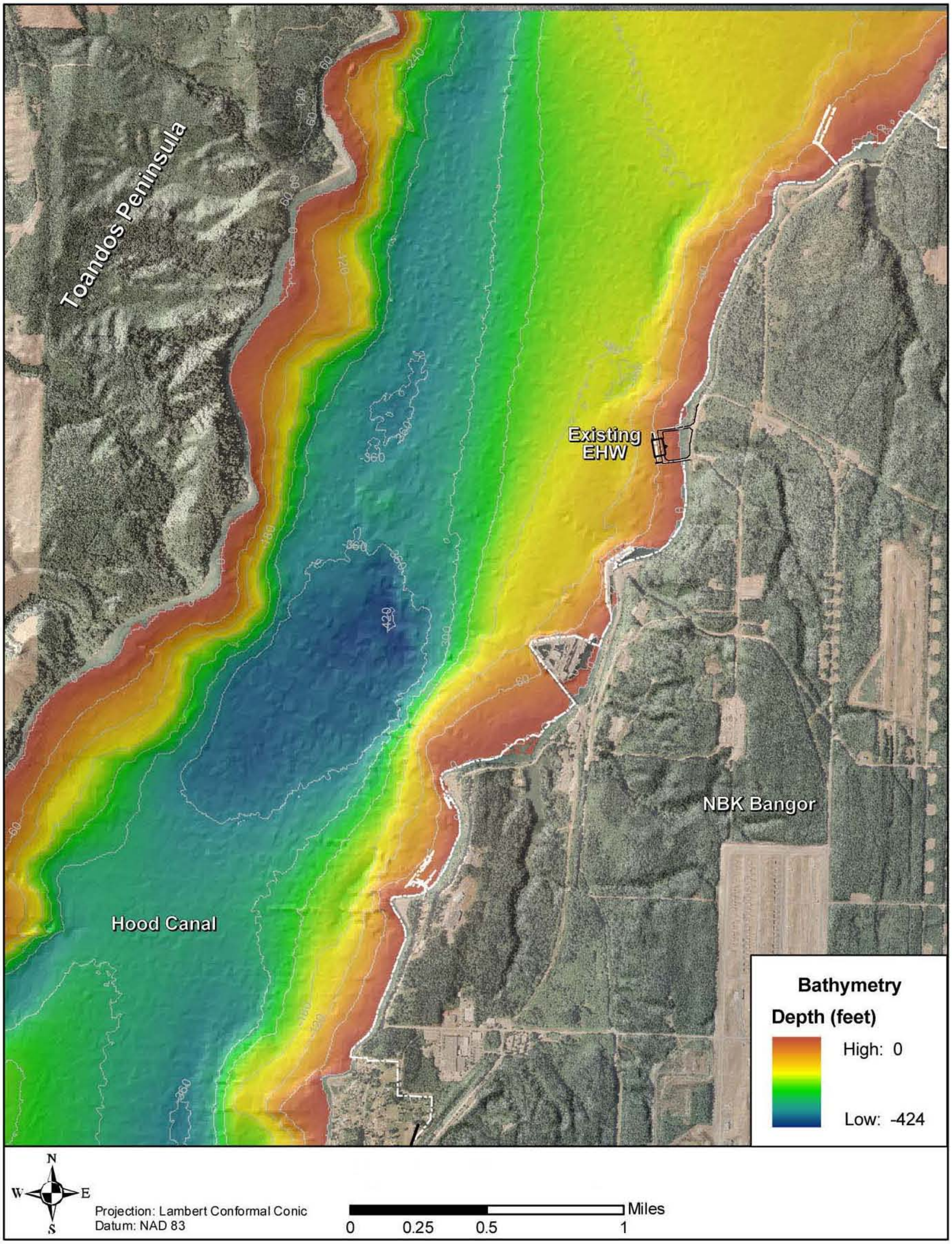


Figure 3-2 NBK at Bangor Waterfront Bathymetry

However, after a full seasonal cycle of storm and wind events, and daily and seasonal tide cycles, the seafloor topography should return to its original condition. Upon test pile extraction, holes would naturally fill in by the inward collapse of the mostly sand and gravel sediments characteristic of the study area. Therefore, the proposed action would not result in a significant impact to bathymetry.

3.2 GEOLOGY AND SEDIMENTS

3.2.1 Affected Environment

3.2.1.1 Regulatory Overview

The Washington State Sediment Management Standards (SMS) (WAC 173-204) provides the framework for the long-term management of marine sediment quality. The purpose of the SMS is to reduce and ultimately eliminate adverse biological impacts and threats to human health from sediment contamination. The SMS establishes standards for the quality of sediments as the basis for management and reduction of pollutant discharges by providing a management and decision-making process for contaminated sediments.

The marine Sediment Quality Standards (SQS) established by the SMS include numeric criteria using bulk contaminant concentrations and biological impacts criteria based on sediment bioassays that define the lower limit of sediment quality expected to cause no adverse impacts to biological resources in Puget Sound. The SMS Cleanup Screening Levels (CSL) consist of numeric chemical concentration and biological impacts criteria that represent cleanup thresholds. Bulk sediment concentrations between the SQS and CSL values require further investigation to determine whether actual adverse impacts exist at the site due to contaminated sediments.

3.2.1.2 Geology

Hood Canal basin is a glacially carved fjord with steep flanks rising abruptly to elevations of more than 200 feet (60 m) above mean sea level (MSL). Farther inland on the Kitsap Peninsula, slopes are moderate and many upland areas are nearly flat. The Bangor waterfront at NBK geomorphology is typical of shorelines around Hood Canal and the Puget Sound. Steep bluffs rising several hundred feet above sea level and merging into uplands with a gentler slope is indicative of this area. Maximum elevations at NBK at Bangor are nearly 500 feet (152 m) MSL (USGS, 2002; 2003). The advance and retreat of glaciers resulting from periodic episodes of glaciation have shaped the underlying geologic conditions of the surrounding area. Successive layers of sediments alternating between dense till layers and other fine- and coarse-grained layers of sediments are found throughout the area. Glacial deposits in the project area are more than 1,200 feet (365 m) thick and are underlain by bedrock.

3.2.1.3 Sediments

Sediment found along the east shore of Hood Canal is primarily from natural erosion of bluffs (by wind or wave action). No rivers or large watersheds feed into Hood Canal along the east shore; however, numerous small drainages along the waterfront do feed Hood Canal, contributing to a secondary source of sedimentation. Littoral drift or shore drift is the primary mechanism for sediment transport from eroding bluffs. Drift results primarily from the oblique approach of wind-generated waves and can therefore change in response to short-term (daily, weekly, or seasonal) shifts in wind direction. Over the long term, however, many shorelines exhibit a single direction of net shore drift, determined through geomorphologic analysis of beach sediment patterns and of coastal landforms (WDOE, 2009). A net northerly shore drift occurs at the Bangor waterfront at NBK (WDOE, 1991).

Sediment transport and deposition can become altered by constructed features (e.g., wharves, piers, dolphins, floats, ramps, groins [man-made structures designed to trap sand as it is moved down the beach by the long shore drift], and jetties [structures, similar to piers, that project into a body of water to influence the current or tide or to protect a harbor or shoreline from storms or erosion]) by decreasing water velocity, resulting in sedimentation along one side of an obstruction. Offshore structures that alter wave energy (such as breakwaters, floats, and moored vessels) reduce erosion along the shore and allow drift sediment to accumulate. Piers, groins and jetties can create a change in the distribution of sediments resulting in patches of coarse-grained sediment adjacent to patches of fine-grained sediment as well as sediment-depleted beaches on the opposite side of the obstruction. As natural wave and current action gradually move fine sediment from intertidal elevations to subtidal elevations, the upper intertidal substrate gradually coarsens and its slope steepens without new sources of sediment to replace the finer material (Downing, 1983).

The proposed study area contains a relatively consistent subsurface matrix series. The ground surface elevation in the vicinity of the Test Pile Program ranges from +26 feet (8 m) Mean Lower Low Water (MLLW) at the onshore area to approximately -90 feet (27.43 m) MLLW at the western project area edge; with a 10 to 16 percent slope toward the west. Previous borings conducted by Hart Crowser (Hart Crowser, 2010b) demonstrate a subsurface profile that generally consists of recent soil deposits underlain by older glacial deposits. Recent deposits comprised of soft silt and loose sand downslope within the site area to medium dense silty sand with variable amounts of shell and gravel upslope towards the shoreline. Older underlying glacial deposits consist of dense to very dense sand and gravel with variable silt content and interspersed layers of hard silt and clay.

Physical and Chemical Properties of Sediments

Hammermeister and Hafner (2009) described the existing marine sediments in the proposed project area as those composed of gravelly sands with some cobbles in the intertidal zone, transitioning to silty sands in the subtidal zone. The presence of glacial till approximately six feet (two meters) below mud line in the intertidal zone, increasing to over 10 feet (3 m) in the subtidal zone was found in subsurface coring studies performed in 1994 (URS, 1994). The composition of sediment samples from the project area ranged from 65 to 100 percent for sand, less than 1 to 7 percent for gravel, two to 32 percent silt, and 2 to 11 percent clay. Table 3.2 provides a detailed description of the physical and chemical characteristics of the surface sediments at the proposed Test Pile Program location.

Sediment parameters (such as Total Organic Carbon [TOC], metals, and organic contaminants) were used to characterize sediment quality. TOC, which provides a measure of how much organic matter occurs in sediments, was less than 1 percent at the project area (see Table 3.2). A range of 0.5 to 3 percent is typical for Puget Sound marine sediments, particularly those in the main basin and in the central portions of urban bays (PSWQAT and PSEP, 1997). Total sulfide concentrations range from not detected (ND) (i.e., below detection limit of 0.4 milligrams per kilogram [mg/kg]) to 82.6 mg/kg (see Table 3.2). Ammonia concentrations range from 1.3 to 6.2 mg/kg (see Table 3.2). There are no SQS for TOC, sulfides or ammonia concentrations.

TABLE 3.2 PHYSICAL AND CHEMICAL CHARACTERISTICS OF SURFACE SEDIMENTS AT THE TEST PILE PROGRAM SITE

PARAMETER	SEDIMENT QUALITY STANDARDS (SQS)	CLEANUP SCREENING LEVELS (CSL)	NEW EHW SITE[1] (MINIMUM – MAXIMUM VALUES)
Conventionals			
Total Organic Carbon (TOC) (%)	–	–	0.2 – 0.9
Total Volatile Solids (%)	–	–	1.4 – 3.4
Total Solids (%)	–	–	57.8 – 75.7
Ammonia (mg-N/kg)	–	–	1.3 – 6.2
Total Sulfides (mg/kg)	–	–	ND – 82.6
Grain Size			
Percent Gravel (>2.0mm)	–	–	<0.1 – 6.9
Percent Sand (<2.0mm – 0.06mm)	–	–	64.6 – 100
Percent Silt (0.06mm – 0.004mm)	–	–	2.0 – 32.1
Percent Fines (<0.06mm)	–	–	4.6 – 41.2
Percent Clay (<0.004mm)	–	–	2.3 – 11.3
Metals (mg/kg)			
Antimony	–	–	<0.1
Arsenic	57	93	1.1 – 3.5
Cadmium	5.1	6.7	<0.1 – 0.3
Chromium	260	270	13.4 – 26.6
Copper	390	390	5.8 – 21.6
Lead	450	530	2.2 – 6.5
Mercury	0.41	0.59	ND – <0.1
Nickel	–	–	13.2 – 28.2
Selenium	–	–	ND – 0.4
Silver	6.1	6.1	<0.1
Zinc	410	960	21.8 – 47.2
Butyltins (µg/kg)			
Di-n-butyltin	–	–	ND – 13.0
Tri-n-butyltin	–	–	ND – 7.5
Tetra-n-butyltin	–	–	ND
n-butyltin	–	–	ND – 0.9
Low Molecular Polycyclic Aromatic Hydrocarbons (LPAH) (mg/kg TOC)			
Naphthalene	99	170	ND
Acenaphthylene	66	66	ND
Acenaphthene	16	57	ND – 1.5
Fluorene	23	79	ND – 1.4
Phenanthrene	100	480	1.0 – 10.0
Anthracene	220	1200	ND – 1.4
2-Methylnaphthalene	38	64	ND

TABLE 3.2 PHYSICAL AND CHEMICAL CHARACTERISTICS OF SURFACE SEDIMENTS AT THE TEST PILE PROGRAM SITE (continued)

PARAMETER	SEDIMENT QUALITY STANDARDS (SQS)	CLEANUP SCREENING LEVELS (CSL)	TEST PILE PROGRAM PROJECT AREA [1](MINIMUM – MAXIMUM VALUES)
Total LPAH[2]	370	780	0.7 – 14.3
High Molecular Polycyclic Aromatic Hydrocarbons (HPAH) (mg/kg TOC)			
Fluoranthene	160	1200	1.1 – 10.0
Pyrene	1000	1400	1.0 – 9.6
Benz(a)anthracene	110	270	ND – 3.7
Chrysene	110	460	ND – 8.2
Benzofluoranthenes[3]	230	450	ND – 6.7
Benzo(a)pyrene	99	210	ND – 3.1
Indeno(1,2,3-cd)pyrene	34	88	ND – 2.3
Dibenz(a,h)anthracene	12	33	ND
Benzo(g,h,i)perylene	31	78	ND – 2.3
Total HPAH[4]	960	5300	2.2 – 48.8
Chlorinated Aromatics (mg/kg TOC)			
1,3-Dichlorobenzene	—	—	ND
1,2-Dichlorobenzene	2.3	2.3	ND
1,4-Dichlorobenzene	3.1	9	ND
1,2,4-Trichlorobenzene	0.81	1.8	ND
Hexachlorobenzene	0.38	2.3	ND
Phthalate Esters (mg/kg TOC)			
Dimethylphthalate	53	53	ND
Diethylphthalate	61	110	ND – 5.7
Di-n-Butylphthalate	220	1700	3.5 – 26.1
Butylbenzylphthalate	4.9	64	ND – 2.1
bis(2-Ethylhexyl)phthalate	47	78	ND – 8.3
Di-n-Octylphthalate	58	4500	ND
Phenols (µg/kg dw)			
Phenol	420	1200	14.0 – 53.0
2-Methylphenol	63	63	ND
4-Methylphenol	670	670	ND – 23.0
2,4-Dimethylphenol	29	29	ND
Pentachlorophenol	360	690	ND
Misc. Extractables (mg/kg TOC)			
Benzyl Alcohol	57	73	ND
Benzoic Acid	650	650	ND
Dibenzofuran	15	58	ND – 10.4
Hexachloroethane	—	—	ND
Hexachlorobutadiene	3.9	6.2	ND
N-Nitrosodiphenylamine	28	130	ND

TABLE 3.2 PHYSICAL AND CHEMICAL CHARACTERISTICS OF SURFACE SEDIMENTS AT THE TEST PILE PROGRAM SITE (continued)

PARAMETER	SEDIMENT QUALITY STANDARDS (SQS)	CLEANUP SCREENING LEVELS (CSL)	TEST PILE PROGRAM PROJECT AREA [1] (MINIMUM – MAXIMUM VALUES)
Hexachloroethane	—	—	ND
Hexachlorobutadiene	3.9	6.2	ND
N-Nitrosodiphenylamine	28	130	ND
Pesticides and PCBs (mg/kg TOC)			
Total DDT[5]	—	—	ND
Aldrin	—	—	ND
alpha-Chlordane	—	—	ND
Dieldrin	—	—	ND
Heptachlor	—	—	ND
gamma-BHC (Lindane)	—	—	ND
Total PCBs[6]	12	65	ND

Source: SQS and CSL from WAC 173-204-320(b), EHW sample data are from Hammermeister and Hafner (2009).

__ = No sediment quality standard or screening levels exist; dw = dry weight; ND = not detected; PCB = polychlorinated biphenyl; TOC = total organic carbon; mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram.

1 Samples taken at depths from 0–10 cm. Values represent the ranges for samples from 13 locations near the proposed EHW project area.
2 Sum of LPAH results for naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. LPAH does not include 2-methylnaphthalene.
3 Sum of benzo(b)fluoranthene and benzo(k)fluoranthene.
4 Sum of HPAH results for fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeneo(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene
5 Sum of 4,4'-DDD, 4-4'-DDE, and 4-4'-DDT
6 Sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260

Metals

The concentrations of metals in sediments at the project area seen in Table 3.2 are based on sampling conducted by Hammermeister and Hafner (2009). These concentrations are comparable to background levels for Puget Sound and below sediment quality guidelines (e.g., SQS values and CSL values). For example, cadmium concentrations ranged from less than 0.1 to 0.3 mg/kg, which were below the standards of 5.1 and 6.7 mg/kg for SQS and CSL, respectively.

Organic Contaminants

Organotin (butyltin) compounds in marine sediments primarily result from residues from anti-fouling paints applied to vessel hulls (Danish EPA, 1999). The Organotin Anti-Fouling Paint Control Act banned the use of organotins in anti-fouling paints for ships less than 25 meters (82 feet) in length and non-aluminum hulls in 1988. Organotin concentrations within the sediments at the proposed EHW-2 project area contain tri-n-butyltin concentrations up to 7.5 micrograms per kilogram (µg/kg) or 870 µg/kg TOC (see Table 3.2). Although sediment quality standards for organotins do not currently exist, Garono and Robinson (2002) proposed a threshold value of 6,000 µg/kg TOC for tributyltin in sediments as a protective measure for juvenile salmonids. Concentrations in sediments near the project area are below this threshold.

Concentrations of individual polycyclic aromatic hydrocarbon (PAH) compounds in sediments near the project area varied from ND to 10 mg/kg TOC (see Table 3.2). Concentrations of individual PAH compounds, as well as the summed concentrations (i.e., total LPAHs and total higher molecular polycyclic aromatic hydrocarbons [HPAHs]) were below the corresponding SQS and CSL values.

Concentrations of other classes of organic contaminants, such as chlorinated aromatics, phthalate esters, phenols, and other miscellaneous extractable compounds, typically were at or below the analytical detection limits and consistently below the SQS and CSL values.

3.2.2 Environmental Consequences

3.2.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not be conducted. Baseline conditions for geology and sediments would remain unchanged. Therefore, there would be no significant impacts to geology and sediments from implementation of the No Action Alternative.

3.2.2.2 Proposed Action

Under the proposed action, sediment would be disturbed and subsequently suspended in the water column. The use of the vibratory hammer and impact hammer could cause the very fine soft sandy silt layers located above the hard glacial deposits to be susceptible to liquefaction and subsequent contraction. As a result, the sediments would quickly settle back to the bottom of the project area or be carried out with tidal flow. Such suspension would be localized to the immediate area of the pile being driven and removed and the use of bubble curtains would further confine the suspended sediments. Overall, a maximum area of 647 m^2 would be disturbed without consideration to the bubble curtains (used for sound mitigation, but also containing sediment plumes). The immediate surface impact area per pile would be 2-8 m^2, depending on pile radius, plus the distance between the pile and bubble curtain. During test pile operations, the contractor would experiment with different distances to determine how close the bubble curtains can be placed to the piles without hindering machinery maneuvers. The underlying glacial materials, although a coarse and cohesion-less granular material, would tend to collapse in on itself when drilled and removed (Hart Crowser, 2010a). This action would have no effect on the subsurface slope stability within the project area.

Construction activities would not result in the discharge of wastes containing metals or otherwise alter the concentrations of trace metals in bottom sediments. Nor would construction activities result in the discharge of high levels of contaminants or otherwise alter the concentrations of organic contaminants in bottom sediments. However, because the magnitude of metal and organic compound concentrations in sediment can vary as a function of grain size (higher concentrations typically are associated with fine-grained sediments due to higher interior surface areas), small changes to grain size associated with construction-related disturbances to bottom sediments could result in minor changes in metal and organic compound concentrations. This would mainly occur during the removal of the test piles. These changes would not likely cause chemical constituents to violate SQS due the small scale of temporary operations and the general lack of sediment contaminants in the project area. Therefore, the proposed action would not result in a significant impact to geology or sediments.

3.3 WATER RESOURCES

3.3.1 Affected Environment

3.3.1.1 Regulatory Overview

Water quality describes the chemical and physical composition of water as affected by natural conditions and human activities. The Clean Water Act (CWA) (33 USC §1251), established the basic structure for regulating discharges of pollutants into waters of the United States. The CWA contains the requirements to set water quality standards (WQS) for all contaminants in surface waters. The U.S. Environmental Protection Agency (USEPA) is the designated regulatory authority to implement pollution control programs and other requirements of the CWA. However, USEPA has delegated regulatory authority for the CWA in Washington to Washington State Department of Ecology (WDOE) for the implementation of pollution control programs as well as other CWA requirements.

The Rivers and Harbors Act regulates the development and use of the nation's navigable waterways. 33 USC 401 §10 of the Act prohibits unauthorized obstruction or alteration of navigable waters and vests the USACE with authority to regulate discharges of fill and other materials into such waters.

3.3.1.2 Water Quality

EHW-1 is located along the northern stretch of Hood Canal on the Bangor waterfront at NBK. Hood Canal was designated as an Extraordinary Quality (EQ) water body by the WDOE. Because of this designation, WDOE requires any federal, state, local, and/or private action to maintain the standards shown in Table 3.3. The area of the proposed action is not in an impaired waterway area.

The area surrounding EHW-1 was sampled for water quality parameters (temperature, salinity, dissolved oxygen [DO], and turbidity) in 2005 and 2006 (Phillips et al., 2008). The sampling locations (Figure 3-3) compared a series of shallow, nearshore locations with deeper, offshore locations. These same sites were sampled again in 2007 and 2008 (Phillips et al., 2009). Water quality sampling in the proposed project area did not measure for nutrients, pH, or fecal coliform levels. Existing conditions for those parameters are based on information collected as part of regional monitoring programs, such as the WDOE's Marine Water Quality Monitoring Program (WDOE, 2005).

Figure 3-3 Water Quality Monitoring Stations for 2005

TABLE 3.3 MARINE WATER QUALITY CRITERIA

WATER QUALITY CLASSIFICATION	WATER QUALITY CRITERIA			
Aquatic Life	**Temperature**[1]	**Dissolved Oxygen**[2]	**Turbidity**[3]	**pH**
Extraordinary Quality	13°C (55°F)	7.0 mg/L	+5 NTU or +10%[4]	7.0 – 8.5[6]
Excellent Quality	16°C (61°F)	6.0 mg/L	+5 NTU or +10%[4]	7.0 – 8.5[7]
Good Quality	19°C (66°F)	5.0 mg/L	+10 NTU or +20%[5]	7.0 – 8.5[7]
Fair Quality	22°C (72°F)	4.0 mg/L	+10 NTU or +20%[5]	6.5 – 9.0[7]
	COLIFORM BACTERIA			
Shellfish Harvesting	Geometric mean not to exceed 14 MPN/100 mL fecal coliforms[8]			
Recreation				
Primary Contact	Geometric mean not to exceed 14 MPN/100 mL fecal coliforms[8]			
Secondary Contact	Geometric mean not to exceed 70 MPN/100 mL enterococci[9]			

Source: WAC 173-201A as amended in November 2006.

1 One-day maximum (degrees Celsius [°C]). Temperature measurements should be taken to represent the dominant aquatic habitat of the monitoring site. Measurements should not be taken at the water's edge, the surface, or shallow stagnant backwater areas.

2 One-day minimum (milligrams per liter [mg/L]). When DO is lower than the criteria or within 0.2 mg/L, then human actions considered cumulatively may not cause the DO to decrease more than 0.2 mg/L. DO measurements should be taken to represent the dominant aquatic habitat of the monitoring site. Measurements should not be taken at the water's edge, the surface, or shallow stagnant backwater areas.

3 Measured in Nephelometric Turbidity Units (NTU); point of compliance for non-flowing marine waters — turbidity not to exceed criteria at a radius of 150 feet from activity causing the exceedance.

4 5 NTU over background when the background is 50 NTU or less; or 10 percent increase in turbidity when background turbidity is more than 50 NTU.

5 10 NTU over background when the background is 50 NTU or less; or 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

6 Human-caused variation within range must be less than 0.2 units.

7 Human-caused variation within range must be less than 0.5 units.

8 No more than 10 percent of all samples used to calculate geometric mean may exceed 43 most probable number (MPN)/100 milliliters (mL); when averaging data, it is preferable to average by season and include five or more data collection events per period.

9 No more than 10 percent of all samples used to calculate geometric mean may exceed 208 MPN/100 mL; when averaging data, it is preferable to average by season and includes five or more data collection events per period.

Temperature

The temperature of marine surface waters designated as extraordinary quality should average less than 13.0°C (55ºF), or 0.3°C (0.5ºF) above natural levels (WAC, 173-201A). Monthly mean surface water temperatures along the Bangor waterfront at NBK are summarized in Table 3.4. Temperatures for the nearshore locations (water depth ranging from 1 to 60 meters) met extraordinary quality standards during the winter months (January to May 2006) and excellent quality standards during the summer months (July to September 2005 and June 2006). Nearshore areas are susceptible to greater temperature variations due to seasonal fluxes in solar radiation input. Water temperatures at the offshore locations (water depths ranging from 20 to 60 meters) met extraordinary quality standards in July 2005, September 2005, and March through May 2006 and excellent quality standards during late summer (August) (Phillips et. al., 2008). Additional survey data from 2007 and 2008 using methodology of Phillips et al. (2008) show water temperatures met extraordinary quality standards during the winter and extraordinary to excellent quality standards in the spring (Hafner and Dolan, 2009).

TABLE 3.4 MONTHLY MEAN SURFACE WATER TEMPERATURES (°C/°F)

SAMPLING MONTH (2005, 2006)[1]	NEARSHORE		OFFSHORE	
	TEMPERATURE	RATING	TEMPERATURE	RATING
July 2005	14.3°C (57.8°F)	Excellent	11.6°C (52.9°F)	Extraordinary
August 2005	13.8°C (56.8°F)	Excellent	13.5°C (56.3°F)	Excellent
September 2005	14.9°C (58.8°F)	Excellent	11.6°C (52.9°F)	Extraordinary
January 2006	8.2°C (46.8°F)	Extraordinary	---	---
February 2006	8.1°C (46.6°F)	Extraordinary	---	---
March 2006	8.5°C (47.3°F)	Extraordinary	8.3°C (46.9°F)	Extraordinary
April 2006	9.6°C (49.3°F)	Extraordinary	9.3°C (48.7°F)	Extraordinary
May 2006	10.9°C (51.6°F)	Extraordinary	11.0°C (51.8°F)	Extraordinary
June 2006	13.2°C (55.8°F)	Excellent	---	---

Source: Phillips et al., 2008.
Data are from 13 nearshore and 4 offshore stations along the Bangor waterfront at NBK. Those stations near the project area are shown in Figure 3–3.
--- No data were collected at this depth during this sampling month.

Salinity

Between June 2005 and July 2006, surface water salinity levels along the Bangor waterfront at NBK ranged from 26 to 35 practical salinity units (PSU) (Phillips et al., 2009). Salinity measurements with depth reflected a stratified water column, with less saline surface water overlying cooler saline water at depth. The transition between the lower salinity surface waters and higher salinity subsurface waters occurred at a depth of about 33 feet (Phillips et al., 2009).

The lowest surface water salinity (26.7 PSU) was measured in January 2006 when input from fresh water may have been high due to winter storms and runoff. The range of salinity along the Bangor waterfront at NBK is typical for marine waters in Puget Sound (Newton et al., 1998; 2002).

Dissolved Oxygen (DO)

Per the state’s water quality classification, concentrations of DO in extraordinary quality marine surface waters, such as Hood Canal, should exceed 7.0 mg/L, allowing for only 0.2 mg/L reductions in the natural condition by human-caused activities (WAC, 173-201A). State guidelines [WAC 173-201A 200(1)(d)(i)] specify that “when a water body’s DO is lower than the criteria in Table 200(1)(d) (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, the human action considered cumulatively may not cause the DO of that water body to decrease more than 0.2 mg/L.” Data from WDOE’s Marine Water Quality

Monitoring Program for 1998 to 2000 and Hood Canal Dissolved Oxygen Program (HCDOP) for 2002 to 2004 show that Hood Canal is particularly susceptible to low DO levels (Newton et al., 2002; HCDOP, 2005).

The nearshore sampling locations adjacent to the project area indicate that DO levels routinely meet the WDOE standards (Table 3.3). Off-shore waters of Hood Canal sampled in the location of the project area periodically do not meet the state WQS set forth by the Washington State Water Pollution Control Act (Revised Code of Washington [RCW] 90.48); however, this portion is not considered impaired by State standards. Moreover, waters of Hood Canal located approximately 0.5 miles north of the NBK at Bangor base boundary do not meet the state water quality standards and are on the 303(d) list (WDOE's list of impaired waterways) requiring the development of a cleanup plan.

Scientists have proposed the following possible causes for the lower DO concentrations in Hood Canal: (1) changes in production or input of organic matter due to naturally better growth conditions, such as increased sunlight (or other climate factors), increased nutrient availability, or human loading of nutrients or organic material; (2) changes in ocean properties, such as seawater density that affects flushing of the canal's waters, oxygen concentration, or nutrients in the incoming ocean water; (3) changes in river input or timing from natural causes (e.g., drought) or from human actions (e.g., diversion) that affect both flushing and mixing in the canal; and (4) changes in weather conditions, such as wind direction and speed, which affect the flushing and/or oxygen concentration distribution. There is supporting evidence for all of these hypotheses (HCDOP, 2009).

Although DO is low in much of Hood Canal, this problem is less pronounced in northern Hood Canal, the location of NBK at Bangor, than elsewhere in the canal. At NBK at Bangor, DO routinely meets standards in nearshore waters including the project area (Table 3.5). Additional survey work was undertaken following the methodology of Phillips et al. (2008) during 2007 and 2008. Minimum DO concentrations in 2007 met the extraordinary water quality standard of 7.0 mg/L for all surveys except for one; the DO minimum for March 8–9, 2007 was 3.9 mg/L at BS06, or below fair quality. All other beach locations on this date ranged between 5.0 mg/L and 7.7 mg/L, or good to extraordinary quality (Phillips et al., 2009).

Turbidity

Turbidity is a measure of the amount of light scatter related to total suspended solids (TSS) in the water column and is measured in Nephelometric Turbidity Units (NTUs). Sources of turbidity in Hood Canal waters may include plankton, organic detritus from streams and other storm or wastewater sources, fine suspended sediment particulates (silts and clays), and re-suspended bottom sediments and organic particulates. Suspended particles in the water have the ability to absorb heat in the sunlight, which then raises water temperature and reduces light available for photosynthesis.

Washington State-designated extraordinary quality marine surface waters should have an average turbidity reading of less than 5 NTUs (WAC, 173-201A). For good and fair quality use categories, maximum one-day turbidity increases cannot exceed 10 NTU above background

TABLE 3.5 MONTHLY MEAN DISSOLVED OXYGEN (mg/L)

SAMPLING MONTH (2005, 2006)	NEARSHORE		OFFSHORE	
	DO	RATING	DO (MG/L)	RATING
July 2005	8.4	Extraordinary	5.8	Good
August 2005	7.1	Extraordinary	6.9	Excellent
September 2005	8.5	Extraordinary	4.9	Fair
January 2006	9.3	Extraordinary	---	---
February 2006	8.9	Extraordinary	---	---
March 2006	9.7	Extraordinary	8.2	Extraordinary
April 2006	9.8	Extraordinary	8.1	Extraordinary
May 2006	9.1	Extraordinary	9.0	Extraordinary
June 2006	9.8	Extraordinary	---	---

Source: Phillips et al., 2008.
Data are from 11 nearshore and 4 offshore stations along the Bangor waterfront at NBK. Those stations near the project area are shown in Figure 3–3.
--- No water quality data were collected at this depth during this sampling month

when the background is below 50 NTU. Turbidity measurements were collected along the Bangor waterfront at NBK, including the vicinity of the proposed EHW-2 project area, from July 2005 through May 2006, except for October to December 2005 (Phillips et al., 2008). These mean monthly turbidity measurements for both nearshore and offshore waters ranged from 0.7 to 3 NTU and were consistently within the Washington State standards for extraordinary water quality.

Additional survey work was completed in 2007 and 2008 (Hafner and Dolan, 2009). Although analysis is still in draft, preliminary data indicate that water quality parameters were similar to those in earlier years of survey work. Water temperatures met extraordinary quality standards during the winter and extraordinary to excellent quality standards in the spring. Minimum DO concentrations in 2007 met the extraordinary water quality standard of 7.0 mg/L for all surveys, except for one; the DO minimum for March 8–9, 2007 was 3.9 mg/L at BS06, or below fair quality. All other beach locations on this date ranged between 5.0 mg/L and 7.7 mg/L, or good to extraordinary quality. All turbidity measurements fell within acceptable ranges. Initial assessments report that, with the exception of one sample with below fair DO levels, water quality parameters meet good to extraordinary standards for aquatic uses (Phillips et al., 2009).

Fecal Coliform

Fecal coliform includes two bacteria groups (coliforms and fecal streptococci) that are commonly found in animal and human feces and are used as indicators of possible sewage contamination in marine waters (USEPA, 1997). Although the fecal indicator bacteria typically are not harmful to humans, they indicate the possible presence of pathogenic bacteria, viruses, and protozoa that also live in animal and human digestive systems. Therefore, their presence in marine waters at elevated levels may indicate the presence of pathogenic microorganisms that pose a health risk.

The Washington Department of Health (WDOH) Office of Food Safety and Shellfish Programs conduct annual fecal coliform bacteria monitoring in Hood Canal including stations near the Bangor waterfront at NBK. The standard for approved shellfish growing waters is a fecal coliform geometric mean not greater than 14 most probable number (MPN)/100 mL and an estimate of the 90th percentile not greater than 43 MPN/100 mL (see Table 3.3). When this standard is met, the water is considered safe for shellfish harvesting and for water contact use by humans (also referred to as primary human contact). The most recent data from August 2002 through November 2007 covering six monitoring stations in Hood Canal near the Bangor waterfront at NBK (WDOH, 2008) showed an average geometric mean of 3.1 MPN/100 mL and an estimated 90th percentile of 11.8 MPN/100 mL. These values are within the shellfish harvesting and recreation standard for fecal coliform.

WDOH summarizes the annual fecal coliform bacteria monitoring results in Hood Canal and the rest of Puget Sound in the form of an index rating system ranging from bad to good, where lower numbers indicate lower fecal coliform. In 2005, the fecal pollution index for Hood Canal was 1.09, which corresponds to a WDOH "good" rating (low bacterial levels) for most of the survey sites (WDOH, 2006). The fecal pollution index for the area near the proposed EHW-2 project area was 1.0, which was also a good rating.

While WDOH uses a rolling average of about 30 samples to calculate the 90th percentile for classification of shellfish growing areas, the WDOE water quality criteria uses no more than one year of data to determine compliance with WAC 173-201A if enough data points are available to reasonably represent seasonal variation. However, WDOE's assessment policy allows for bridging data over several years to determine a geometric mean when doing so does not mask periods of non-compliance with the standards. The closest sampling stations to the project area (85 and 86) meet the WDOE standard.

pH

The term pH is a measure of alkalinity or acidity. It affects many chemical and biological processes in water. For example, low pH can allow toxic elements and compounds to become mobile and available for uptake by aquatic plants and animals, which can produce conditions toxic to aquatic life, particularly to juvenile organisms. Washington State-designated extraordinary quality marine surface waters should have a pH reading between 7.0 and 8.5 (WAC, 173-201A). WDOE's Marine Water Monitoring Program monitors pH in Hood Canal marine waters in the vicinity of the Bangor waterfront at NBK. The measured pH levels from the 2005 monitoring year ranged from 3.6 to 8.4, and all but 5 of the 45 data values were within extraordinary quality standards (WDOE, 2005).

Nutrients

Nutrients (particularly nitrogen-based compounds), sunlight, and a stratified water column play important roles in algae productivity in Hood Canal. High algae productivity (e.g., algal blooms) is believed to be a contributing factor to low DO conditions in Hood Canal, due to algae die off and decomposition (HCDOP, 2005). Nitrogen enters the canal from the ocean, rivers, and atmosphere. However, as more nitrogen enters Hood Canal through uncontrolled sources (e.g., runoff, fertilizer use, leaking septic systems), algae growth is stimulated, which can then reduce oxygen levels when the algae dies and decomposes in the late summer and early fall (HCDOP, 2005).

WDOE's Marine Water Monitoring Program monitors nutrients in Hood Canal marine waters in the vicinity of the Bangor waterfront at NBK (WDOE, 2005a). Concentrations of nitrate and phosphate during the 2005 monitoring year ranged from 0.02 to 2 mg/L and from 0.04 to 0.4 mg/L, respectively. Specific water quality standards for nutrients are not established, but the ranges observed in Hood Canal near the project area are typical for marine waters in Puget Sound (Newton et al., 1998; 2002).

Overall, water quality along the NBK at Bangor shoreline is good by most measures and for the most part meets applicable standards. Exceptions for the 2005-2006 sampling year were limited to dissolved oxygen offshore below the extraordinary WQS over the summer months.

3.3.2 Environmental Consequences

3.3.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not occur. The baseline conditions would remain unchanged. Therefore, there would be no significant impacts to water resources from implementation of the No Action Alternative.

3.3.2.2 Proposed Action

The proposed action would include the installation and removal of all test piles and occur over 40 work days between July 16 and October 14, 2011 for impact pile driving (contingent on the results of spawning fish egg surveys) and until October 31, 2011 for vibratory pile driving and other in-water work. Work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September 16 through October 31, 2011. The proposed action would not require dredging or placement of fill. Under 33 CFR §323.3, the test piles are not considered fill material. Hydrophones would be suspended at mid-water depth and 10 meters from the source pile. There would also be no direct discharges of waste to the marine environment. Construction-related impacts to water quality would be limited to short term, temporary and localized changes associated with re-suspension of bottom sediments from pile installation and barge and tug operations, such as anchoring and propeller wash, as well as accidental spills of fuel into Hood Canal. These changes would be spatially limited to the construction corridor, including areas potentially impacted by anchor drag and areas immediately adjacent to the testing sites that could be impacted by plumes of re-suspended bottom sediments that are not expected to violate applicable state or federal water quality standards. Fuel spills are unlikely as boats, barges, and equipment would be fueled off-site; however, as a precaution, moored or docked barges and tugboats could be surrounded with containment booms which capture surface fluids and solids that have a density ≤ 1 g/cm^3.

Best Management Practices (BMPs) would be used during all activities to reduce the likelihood of deleterious materials entering the waterway. BMPs may include debris curtains/shield gather debris or retrieval of incidental debris with nets. Secondary containment devices such as booms may be used around stationary vessels. Bubble curtains would be used for noise mitigation during impact driving, but these curtains would also confine turbidity plumes and increase DO concentrations. NBK at Bangor has an approved Spill Management Plan (DoN, 2006a) that complies with 40 CFR 112 and a regional Integrated Spill Contingency Plan (DoN, 2010a) is in place. These plans outline procedures designed to reduce the likelihood of spills and increase the response time and efficiency of clean up. As a result, accidental spills or discharges of deleterious materials would not be expected to adversely impact marine water quality at the project area.

Temperature

The proposed action would not impact water temperature because pile driving and removal activities would not discharge wastewaters. Temperature increases resulting from turbidity would be negligible, since turbidity would be temporary because most of the disturbed sediments are sand, gravel, shell, clay, and hard silt, which resettle quickly. The use of bubble curtains would help to confine turbidity plumes, resulting in stable water temperatures. Heat generated from boat engines and the friction of pile driving and removal would not elevate water temperatures in the project area beyond the excellent water quality standard set forth by the Revised Code of Washington 90.48.

Salinity

The proposed action would not impact salinity because pile driving and removal activities would not discharge wastewaters. In the absence of project-related discharges, the proposed action would not alter salinity in Hood Canal.

Dissolved Oxygen

The proposed action would not discharge any wastes containing materials with an oxygen demand into Hood Canal. However, pile installation would re-suspend bottom sediments, which may contain chemically reduced organic materials. Subsequent oxidation of sulfides, reduced iron, and organic matter associated with the suspended sediments would consume some DO in the water column. The amount of oxygen consumed would depend on the magnitude of the oxygen demand associated with suspended sediments (Jabusch et al., 2008). The impacts of sediment re-suspension from pile installation and removal on DO concentrations would be minimal.

Additionally, sound attenuation measures (i.e. Gunderboom SAS™, TNAP, confined bubble curtain and/or unconfined bubble curtain) would be used during all impact hammer operations and some vibratory hammer operations. The Navy plans to use a Gunderboom Sound Attenuation System (SAS™) as one form of mitigation for in-water sound during construction activities; however, in combination with the traditional bubble curtain, it would have the added benefit of offsetting the temporary decreased in DO concentrations, as discussed below. The Gunderboom SAS™ is a multipurpose enclosure that decreases noise levels, excludes marine life from work areas, and controls the migration of debris, sediments and process fluids. The Gunderboom SAS™ is comprised of a water-permeable double layer of polypropylene/polyester fabric. Compressed air is released at the bottom of the fabric and moves up to the top of the fabric inflating the fabric and creating a wall. A traditional bubble curtain/wall could also be used. This bubble curtain would increase DO concentrations in marine waters at the project area by: (1) increasing the rate of vertical mixing of site waters; (2) promoting dissolution of air bubbles, thereby increasing oxygen saturation levels; and, (3) confining re-suspended solids to within the curtain. Use of a bubble curtain would help offset the minimal, temporary decrease in DO concentrations due to sediment re-suspension; therefore, construction activities would not cause changes that would violate water quality standards or exacerbate low DO concentrations that occur seasonally in Hood Canal waters. The bubble curtains would provide a net benefit to the DO levels. The Gunderboom SAS™ would be installed around each pile prior to driving and extraction activities. The contractor would remove the Gunderboom SAS™ from the waterway after completion of the test pile program and dispose of in accordance with local, state, and federal laws.

Turbidity

Installation of piles would re-suspend bottom sediments within the immediate construction area, resulting in short-term and localized increases in suspended sediment concentrations that, in turn, would cause increases in turbidity levels. Barge and tug operations could also resuspend bottom sediments. The suspended sediment/turbidity plumes would be generated periodically, in relation to the level of in-water construction activities. The disturbed sediments would be a mix of soft and hard silt, clay, sand, gravel, and shell. The majority of these sediments, including clay, sand, gravel, and shell would resettle within minutes of disturbance. Hard silt would settle next, followed by soft silt. The use of sound attenuation devices would help confine sediment plumes during construction; therefore, sediments would settle back in the general vicinity from which they rose. Disturbed sediments could also be dissipated by the strong tidal currents in the area. Construction activities would not result in persistent increases in turbidity levels or cause changes that would violate water quality standards because processes that generate suspended sediments, which result in turbid conditions, would be short-term and localized and suspended sediments would disperse and/or settle rapidly.

The amount of bottom sediments that would be re-suspended into the water column during pile placement, and the duration and spatial extent of the resulting suspended sediment/turbidity plume, would reflect the composition of the sediments. In general, coarse-grained sediments (e.g., sands and gravels) that occur in the nearshore environment of the project area are more resistant to resuspension and have a higher settling speed than fine-grained sediments in deeper, offshore portions of the project area. Higher settling rates would result in a shorter water column residence time and a smaller horizontal displacement by local currents (Herbich and Brahme, 1991; LaSalle et al., 1991; Herbich, 2000). Assuming that bottom sediments are disturbed during construction, and resuspended by two-thirds of the water column (a conservative assumption of 40 feet), the maximum water column residence of sand sized particles would be approximately 2 minutes. A sand particle settles through the water column at a velocity of approximately 0.3 foot/second. The water column residence time would be proportionately shorter in shallower waters. With a current velocity of 1 foot/second, the maximum dispersion distance would be approximately 130 feet (i.e., it would take 130 seconds for a sand particle to settle 40 feet through the water column, at which time the particle is being transported horizontally at a rate of 1 foot/second, resulting in horizontal displacement of 130 feet). Silt and clay particles associated with the offshore sediments that are resuspended during construction activities could have relatively longer water column residence times because they have slower settling speeds. Based on the size of sediment particles typical of the project site, the settling period for individual particles could be up to several hours depending on the water depth and initial distance above the bottom. Suspended silt- and clay-sized particles would form weak (low particle density) plumes, which would be subject to rapid dilution by currents and eventual flushing during subsequent tidal exchanges (Morris et al., 2008). Therefore, relatively greater dispersion of these fine-grained suspended sediments would occur.

In general, sediments resuspended due to turbidity could cause the release of sediment-bound contaminants to near-bottom waters. However, sediments in the project site are characterized as uncontaminated (Hart Crowser, 2000; Foster Wheeler, 2001; Hammermeister and Hafner, 2009). As a result, increases in chemical contaminant concentrations in marine waters as a result of sediment resuspension during pile installation would be minor.

Construction activities would not result in persistent increases in turbidity levels or cause changes that would violate water quality standards because processes that generate suspended sediments, which result in turbid conditions, would be short-term and localized and suspended sediments would disperse and/or settle rapidly. Plumes would be confined by bubble curtains and therefore sediments would settle back in the general vicinity from which they rose. Impacts would be short-term and localized and suspended sediments would disperse settle rapidly.

<u>Fecal Coliform, pH, and Nutrients</u>

The proposed action would not result in the discharge of wastes containing nutrients nor would this action impact fecal indicator bacteria or pH levels in the project area. Therefore, there would be no significant impacts to these water resources from implementation of the proposed action.

3.4 AIR QUALITY

This section discusses air quality in the vicinity of the proposed action as well as anticipated impacts which could occur as a result of implementing the proposed action. The No Action Alternative would not be anticipated to result in any change in emissions since no new activities would occur. However, the proposed action would be anticipated to result in a change in air emissions; therefore, only potential impacts associated with its implementation are discussed.

3.4.1 Affected Environment

3.4.1.1 Regulatory Overview

The Clean Air Act (CAA) of 1970, 42 U.S.C. 7401, et seq., amended in 1977 and 1990 is the primary federal statue governing air quality. Under authority of the CAA, the USEPA sets the maximum acceptable concentration levels for specific pollutants that may impact the health and welfare of the public. With USEPA oversight, states may set concentration levels for additional pollutants not regulated by the USEPA. The State of Washington administers the provisions of the majority of the CAA.

The CAA prohibits federal agencies from engaging in, supporting, providing financial assistance for licensing, permitting, or approving any activity that does not conform to an applicable State Implementation Plan (SIP). Federal agencies must determine that a federal action conforms to the SIP before proceeding with the action.

In Washington, the Washington Department of Ecology (WDOE) administers the State's CAA and implements its regulations (RCW Chapter 70.94 and Washington Administrative Code [WAC] 173-400). The WDOE has, in turn, delegated the responsibility of regulating stationary emission sources to local air agencies. In Kitsap County, the WDOE has delegated this responsibility to the Puget Sound Clean Air Agency (PSCAA) which serves as the local air agency. In areas that exceed the National Ambient Air Quality Standards (NAAQS), the CAA requires preparation of a SIP. The SIP details how the State would attain the standards within mandated time frames. Both the federal CAA and the State CAA identify emission reduction goals and compliance dates based upon the severity of the NAAQS violation within a region. PSCAA has developed rules which regulate stationary sources of air pollution in Kitsap County (PSCAA, 2009a).

Seven pollutants are commonly found in the air. These "criteria pollutants" are particularly common in developed countries such as the U.S. and include the following:

- particulate matter 10 microns in size, or PM_{10}
- particulate matter 2.5 microns in size, or $PM_{2.5}$
- ground-level ozone (O_3)
- carbon monoxide (CO)
- sulfur oxides (SO_x)
- nitrogen oxides (No_x)
- lead

3.4.1.2 Attainment, Air Emissions and Air Quality Index

The NAAQS, discussed above, include primary and secondary standards. The primary standards are limits set to protect human health. The secondary standards set limits intended to protect public welfare, including environmental and property damage (USEPA, 2009). A geographic area with air quality that meets the primary standard, since its air is as clean as or cleaner than the standard, is called an "attainment" area. USEPA designates areas that do not meet the primary standard as "nonattainment" areas. Areas that were previously designated non-attainment, but are now in attainment, are designated as maintenance areas. The primary and secondary standards are listed in Table 3.6.

Kitsap County is presently in attainment of all NAAQS. The regulatory requirements for proposed emission sources in attainment areas are typically less rigorous than they are in nonattainment and maintenance areas.

In 1999, the PSCAA adopted a local health goal for a daily average of particulate matter never to exceed 25 $\mu g/m^3$. All four counties monitored by the PSCAA exceeded this health goal (but did not violate CAA standards) during the winter of 2007 (PSCAA, 2009b).

The USEPA has developed a nationwide reporting index for the criteria pollutants, known as the Air Quality Index (AQI) based on a 500-point scale for five major pollutants: CO, No_x, SO_x, O_3, and particulate matter. The highest pollutant value determines the daily ranking.

TABLE 3.6 NATIONAL AND WASHINGTON STATE AMBIENT AIR QUALITY STANDARDS

Air Pollutant	Averaging Time	Washington/PSCAA AAQS ([a,b])	NAAQS	
			Primary[c]	Secondary[d]
Carbon Monoxide (CO)	8-Hour 1-Hour	9 ppm 35 ppm	9 ppm 35 ppm	- -
Nitrogen Dioxide (NO_x)	Annual 1-Hour	0.053 ppm -	0.053 ppm 0.1 ppm	0.053 ppm -
Sulfur Dioxide (SO_x)	Annual 24-Hour 3-Hour 1-Hour[e] 1-Hour[f]	0.02 ppm 0.10 ppm - 0.25 ppm 0.40 ppm	0.03 ppm 0.14 ppm - - -	- - 0.5 ppm - -
Total Suspended Particles	Annual 24-Hour	60 μg/m^3 150 μg/m^3	- -	- -
Particulate Matter (PM_{10})[g]	Annual 24-Hour	50 μg/m^3 150 μg/m^3	- 150 μg/m^3	- 150 μg/m^3
Particulate Matter ($PM_{2.5}$)[h]	Annual 24-Hour	15 μg/m^3 35 μg/m^3	15 μg/m^3 35 μg/m^3	15 μg/m^3 35 μg/m^3
Ozone (O_3)	1-Hour 8-Hour[i]	0.12 ppm 0.075 ppm	0.12 ppm 0.075 ppm	0.12 ppm 0.075 ppm
Lead and Lead Compounds	Calendar Quarter Rolling 3-Month[j]	1.5 μg/m^3 0.15 μg/m^3	1.5 μg/m^3 0.15 μg/m^3	1.5 μg/m^3 0.15 μg/m^3

Sources: USEPA, 2009a; WAC 173-470; WAC 173-474; WAC 173-475.

a. The NAAQS and Washington State standards are based on standard temperature and pressure of 25ºC and 760 millimeters of mercury, respectively. Units of measurement are ppm and micrograms per cubic meter (μg/m3).

b. National and Washington State standards, other than those based on annual or quarterly arithmetic mean, are not to be exceeded more than once per year.

c. National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each state must attain the primary standards no later than 3 years after the SIP is approved by the USEPA.

d. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a reasonable time after the state implementation plan is approved by the USEPA.

e. Not to be exceeded more than twice in seven consecutive days.

f. Not to be exceeded more than once per year throughout the state of Washington and never to be exceeded within the PSCAA region.

g. PM10 is particulate matter smaller than 10 microns. The 3-year average of the 99th percentile (based on the number of samples taken of the daily concentrations) must not exceed the standard.

h. PM2.5 is particulate matter smaller than 2.5 microns. The 3-year annual average of the daily concentrations must not exceed the standard.

i. The 3-year average of the 4th highest daily maximum 8-hour average concentration must not exceed the standard. As of June 21 15, 2005, USEPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas, none of which occur in the Puget Sound area.

j. Final rule on rolling 3-month average for lead was signed October 15, 2008

For example, if CO is 152 and other pollutants are below 60, then the AQI for that day is 152. The index is broken down as follows: (1) 0–50 good, (2) 51–100 moderate, (3) 101–150 unhealthy for sensitive groups, (4) 151–200 unhealthy, (5) 201–300 very unhealthy, and (6) 301–500 hazardous (PSCAA, 2009b).

Within the vicinity of the proposed action, the AQI indicated that air quality was good for most of 2007 (PSCAA, 2009b). Approximately 88 percent of the year air quality was rated as good, and for 12 percent of the year it was rated as moderate. The highest AQI for Kitsap County in 2007 was 92; thus, there was no occurrence of the AQI within the range of unhealthy for sensitive groups.

The PSCAA maintains a network of monitoring stations across Washington, with three stations in Kitsap County. These stations are located in Silverdale, Poulsbo, and Bremerton. PSCAA only monitors particulate matter in the county because there are so few point sources of air pollutants. This includes PM_{10} and $PM_{2.5}$, which is used as a measure of regional visibility. For the majority of 2007, visibility was rated as good. A few moderate visibility days occurred in February, May, July, September, November, and December. Average visibility for the Puget Sound area has steadily increased over the last decade, with year-to-year variability caused by weather conditions (PSCAA, 2009b).

3.4.1.3 Greenhouse Gases

While not regulated by PSCAA like other conventional air pollutants, greenhouse gases are reportable in certain scenarios to USEPA. Greenhouse gases include: carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), and fluorinated gases such as Chlorofluorocarbons: compounds consisting of chlorine, fluorine, and carbon and Hydrochlorofluorocarbons: compounds consisting of hydrogen and sulfur hexafluoride (SF_6) (USEPA, 2010).

3.4.2 Environmental Consequences

The evaluation of impacts to air quality considers whether conditions resulting from the project during construction and operation violate federal, state, or local air pollution standards and regulations. Applicable air pollution standards and regulations that are the basis for determinations of environmental consequences are discussed in Section 3.4.1. The amount of emissions is anticipated to be below the threshold required to conduct a conformity analysis, therefore a conformity analysis was not conducted as part of this EA.

3.4.2.1 No Action Alternative

Under the No Action Alternative the Test Pile Program would not be conducted. Baseline air quality conditions would remain unchanged. Therefore, there would be no significant impacts to air quality from implementation of the No Action Alternative.

3.4.2.2 Proposed Action

As stated above, Kitsap County is presently in attainment of all NAAQS criteria pollutants. Air emissions were calculated using methodology prescribed in the most recent edition of the USEPA's AP-42 document (USEPA, 1996). Emissions were only calculated for NAAQS and greenhouse gas pollutants (specifically CO_2) with known emissions factors. The No Action Alternative would not involve any activities which would result in emissions; therefore, calculations were not performed and additional analysis was not carried forward. However, because activities associated with the proposed action would be anticipated, these emissions were calculated. The contractor would follow all rules and regulations including opacity regulations (PSCAA Regulation 1, Section 9.03). Table 3.7 depicts the anticipated emissions under the proposed action for pollutants which had emissions factors in the AP-42 (USEPA, 1996). All calculations and assumptions associated with the calculations are included in Appendix B.

The following assumptions were made in calculating total estimated emissions:

- A vibratory hammer would be used for the first 60 minutes of the installation for each pile.
- An impact hammer would be used for the last 15 minutes of installation.
- Thirty minutes would be required to remove each piling.
- Only the vibratory hammer would be used to remove each piling.
- Both the vibratory hammer and pile driver would utilize 600 horse power (hp) diesel engines.
- One tugboat with a 600 hp diesel engine would operate at 100% of capacity 100% of the time during pile installation and removal.
- Fugitive dust associated with pile driving is negligible.

TABLE 3.7 EMISSIONS ANTICIPATED ASSOCIATED WITH THE PROPOSED ACTION

Air Pollutant	**Emissions (lbs)**		**Emissions (tons)**	
NO_x	1888	lbs.	0.94	tons
CO	407	lbs.	0.20	tons
SO_x	125	lbs.	0.06	tons
PM_{10}	134	lbs.	0.06	tons
CO_2	70,035	lbs.	35.02	tons
SUM	**72,589**	**lbs.**	**36.29**	**tons**

As illustrated in the above table, the potential air emissions associated with the proposed action would not be anticipated to exceed any of the above PSCAA thresholds or greenhouse gas reporting thresholds established by USEPA. In addition, the activities proposed would be anticipated to be minimal and temporary in nature and no permanent emissions would be anticipated. Additionally, reasonable precautions would be implemented to minimize fugitive dust emissions from pile driving and no temporary construction permit from PSCAA would be required. Therefore, no significant impacts to air quality would be anticipated as a result of implementation of the proposed action.

3.5 AIRBORNE NOISE

3.5.1 Affected Environment

3.5.1.1 Regulatory Overview

Occupational Safety and Health Programs for Federal Employees

Executive Order (EO) 12196, *Occupational Safety and Health Programs for Federal Employees*, directs federal agencies to furnish places and conditions of employment free from recognized hazards causing, or likely to cause, death or serious physical harm, and to ensure prompt abatement of unsafe or unhealthy working conditions.

Navy Regulations

Navy regulations regarding noise are found in the 2001 Navy Occupational Safety and Health Program Manual (Chief of Naval Operations Instruction [OPNAVINST] 5100-19D), which is directed at preventing occupational hearing loss and assuring auditory fitness for all Navy personnel. The Navy's Occupational Exposure Level over an 8-hour time-weighted average in any 24-hour period is 84 decibel (dB) in the A-weighting scale (dBA). The decibel is a unit of measure based on a logarithmic scale for sound levels, while dBA is a weighted measure of sound levels corresponding to the frequency range humans hear. When noise exposures are likely to exceed 84 dBA, hearing-protective devices are required.

State of Washington Regulations

Maximum allowable noise levels, at the state level, are established by the Washington Administrative Code (WAC) Chapter 173-60. This code establishes zones, or environmental designations, of Class A, B, or C based on land-use characteristics for the purposes of noise abatement (Table 3.8). This regulation applies to noise created on the base that may propagate into adjacent non-Navy properties. The Bangor waterfront at NBK is considered a Class C zone, along with other industrial areas. Class B zones include commercial and recreational areas and residential areas are considered Class A zones.

TABLE 3.8 WASHINGTON MAXIMUM PERMISABLE ENVIRONMENTAL NOISE LEVELS (dBA)

NOISE SOURCE	RECEIVING PROPERTY		
	A – RESIDENTIAL (DAY/NIGHT)	B – COMMERCIAL	C – INDUSTRIAL
A – Residential	55/45	57	60
B – Commercial	57/47	60	65
C – Industrial	60/50	65	70

Source: WAC 197-60-040.

Washington noise regulations (WAC 173-60-040) limit the noise levels from a Class C noise source that affect a Class A receiving property to 60 dBA (daytime) and 50 dBA (nighttime). Under the WAC daytime hours are 7:00 AM to 10:00 PM and nighttime hours are 10:00 PM to 7:00 AM. However, the state noise rules allow these levels to be exceeded by 5 dBA for 15 minutes, 10 dBA for five minutes, and 15 dBA for up to 1.5 minutes within any one-hour period without violating the limits. In addition, the following activities are exempt from these noise limitations:

- Sounds created by motor vehicles on public roads are exempt at all times, except for individual vehicle noise, which must meet noise performance standards set by WAC 173-60-050.
- Sounds created by motor vehicles off public roads, except when such sounds are received in residential areas.
- Sounds originating from temporary construction activities during all hours when received by industrial or commercial zones and during daytime hours when received in residential zones.
- Sounds caused by natural phenomena and unamplified human voices.

3.5.1.2 Sound Environment

The Federal Interagency Committee on Noise (FICON) (1992) defines noise as unwanted sound. More specifically, FICON defines noise as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Human response to sound can vary depending on several factors, including the type and characteristics of the noise source, distance between the noise source and the receptor, sensitivity of the receptor, and time of day.

Due to wide variations in sound levels, measurements are in dB, which is a unit of measure based on a logarithmic scale (e.g., a 10 dB increase corresponds to a 100-percent increase in perceived sound). Noise impacts to humans are commonly assessed by quantifying sound levels. As a result, sound levels are weighted (A-weighted) to correspond to the same frequency range that humans hear (approximately 20 Hz to 20 kHz). To make comparisons between sound levels, dB sound levels are always referenced to a standard intensity at a standard distance from the source. Humans, under most conditions, can detect changes in noise in 5 dB increments (USEPA, 1974). In many cases, sound levels are not corrected for standard distance and reflect levels as measured at the receiver's location.

Ambient noise levels are made up of natural and manmade sounds. Natural sound sources include the wind, rain, thunder, water movement such as surf, and wildlife. Sound levels from these sources are typically low, but can be pronounced during violent weather events. Sounds from natural sources are not considered undesirable. Ambient background noise in urbanized areas typically varies from 60 to 70 dBA, but can be higher; suburban neighborhoods experience ambient noise levels of approximately 45 to 50 dBA (USEPA, 1974).

The sound environment at NBK at Bangor is influenced by several factors. The natural environment such as wind and surf produce some of the existing ambient noise. However, the primary sound environment is influenced by military activities such as waterfront operations, movement of people and military vehicles at the base, and the various industrial activities that occur at the shoreline facilities. Consequently, human activity is responsible for the majority of the daily ambient noise at NBK at Bangor. Noise levels at NBK at Bangor vary based on location but are estimated to average around 65 dBA in the residential and office park areas, with traffic noise ranging from 60 to 80 dBA during daytime hours (Cavanaugh and Tocci, 1998). The highest levels of noise are produced along the waterfront and at the ordnance handling areas where estimated noise levels range from 70 to 90 dBA and may peak at 99 dBA for short durations. These higher noise levels are produced by a combination of sound sources including heavy trucks, forklifts, cranes, marine vessels, mechanized tools and equipment, and other sound generating industrial/military activities.

Maximum noise levels produced by common construction equipment, including trucks, cranes, compressors, generators, pumps, and other equipment that might typically be employed along NBK at Bangor's industrial waterfront and ordnance handling areas (WSDOT, 2010). The maximum noise levels may be as high as 99 dBA, presuming multiple sources of noise may be present at one time. This estimate assumes that an increase of 3 dB can occur when two similar sources combine together (WSDOT, 2010). These maximum noise levels are intermittent in nature, and not present at all times.

A noise-sensitive receptor is defined as a location or facility where people involved in indoor or outdoor activities may be subject to stress or considerable interference from noise. Such locations or facilities often include residential dwellings, hospitals, nursing homes, educational facilities, and libraries. Sensitive noise receptors may also include supporting habitat for certain wildlife species or noise-sensitive cultural practices. The closest sensitive noise receptors at NBK at Bangor include residences located just north of the northern property boundary, approximately 1.5 miles from the proposed project area. The project area is about 2.5 miles southwest of the nearest school and 13 miles north of the nearest hospital. Navy property allowing tribal shellfish harvesting is approximately one mile south of the site and only used intermittently. Tribal consultations with the Suquamish Tribe, Skokomish Tribe, Jamestown S'Klallam and Port Gamble S'Klallam Tribes, Lower Elwha Klallam Tribe and the Point-No-Point Treaty Council have concluded and the tribes did not have any objections to the Test Pile Program (Appendix C). The closest off-base residences are approximately 1.5 miles north of the proposed project area, the closest community west of the base across Hood Canal is approximately 4 miles away, and the closest on-base residence is 3.75 miles away. The portion of Hood Canal adjacent to the proposed project area averages 1.5 miles in width and is bordered on the west by a 768-acre Navy-owned buffer strip on the Toandos Peninsula. This military buffer zone is restricted to the public and there is no recreational access. Areas surrounding the buffer area have rural and commercial forest land use designations by Jefferson County.

3.5.2 Environmental Consequences

3.5.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not be conducted. Baseline conditions would remain unchanged. Therefore, there would be no significant impacts to ambient noise from implementation of the No Action Alternative.

3.5.2.2 Proposed Action

This EA considers the intensity and the duration of noise that would be generated by the proposed action and whether this noise would be harmful to humans or disrupt human activities when evaluating ambient noise impacts. The proposed action is to drive and remove 29 test and reaction piles in Hood Canal along the Bangor waterfront at NBK. Pile driving noise would be generated during regular work hours (work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September 16 through October 31, 2011).

The proposed Test Pile Program would result in a temporary increase in noise in the vicinity of the project area. The closest residence is a small rural population approximately 1.5 miles to the north of NBK at Bangor. The impact pile driver would be estimated to produce a maximum peak level of 105 dBA re 20µPa at a distance of 50 feet from the pile (WSDOT, 2010). The vibratory hammer would be estimated to produce noise levels of 95 dBA re 20µPa at 50 feet (WSDOT, 2010). Impact and vibratory hammers would never operate simultaneously. Other construction activities or equipment such as cranes, generators, and any other necessary equipment would also generate noise; however, this noise would be much lower in level compared to noise produced by the impact hammer (Table 3.9). In the absence of pile driving noise, the maximum construction noise from equipment such as the crane, generator, etc. running simultaneously would be less than that of the vibratory pile driver (WSDOT, 2008).

TABLE 3.9 MAXIMUM NOISE LEVELS AT 50 FEET FOR COMMON CONSTRUCTION EQUIPMENT

Equipment Type	Maximum Noise Level
Impact pile driver	105
Vibratory pile driver	95
Scraper	90
Backhoe	90
Crane	81
Pumps	81
Generator	81
Front loader	79
Air Compressor	78

Source: WSDOT, 2008
Maximum Sound Pressure Levels in dBA re 20µPa (A-weighted)

WSDOT (2008) indicates that construction noise behaves as a point-source, propagating in a spherical manner, with a 6 dB decrease in sound pressure level per doubling of distance.[10] Two specific noise conditions exist at the proposed Test Pile Program project area, namely propagation over water across and along Hood Canal, and propagation over heavily vegetated terrain on the east side of Hood Canal. In relation to propagation over water, WSDOT (2008)

[10] RL = SL-TL

Where: RL is the Received Level of sound, SL is the Source Level of sound and TL is the Transmission Loss. TL=20logR (R is the distance from the source).

RL=210-20log10(meters)	RL= 210-20log20(meters)
RL = 210-20	RL=210-26
RL=190dB	RL=184

**A doubling in distance from 10 meters to 20 meters results in a 6dB reduction in the sound pressure.

considers this a "hard-site" condition; thus, no additional noise reduction factors apply. However, in the second condition, two noise reduction factors apply for the topography of the proposed Test Pile Program site. The first factor is a 1.5 dB reduction per doubling of distance in "soft-site" conditions, wherein normal, unpacked earth is the predominant soil condition. The second factor is a reduction of 10 dB for interposing dense vegetation (e.g., trees and brush) between the noise source and potential receptors (WSDOT, 2008).

Noise associated with the impact hammer is expected to attenuate to 61 dBA at 1.5 miles (2,414 m) and 60 dBA at 1.68 miles (2,710 m). Noise associated with the vibratory hammer is expected to attenuate to 60 dBA at .53 miles (860 m). These estimates assume a free flowing medium (e.g. over water) without obstructions. Trees and other vegetation obstruct sound transmission and can create a 10 dBA reduction in sound. The estimates provided in this analysis do not account for the 10 dBA reduction in sound associated with vegetation and other structures obstructing sound transmission. Thus, the actual sound received by the residence 1.5 miles north of NBK at Bangor would be less than 60 dBA.

Recreational activities such as boating, scuba diving, kayaking, and fishing on Hood Canal occur adjacent to the base. Recreational users could be exposed to noise levels exceeding permissible residential exposure levels, as they could be closer to the construction than land based receptors. The sound levels would not be injurious, but could result in behavioral disturbances such as increased respiration and elevated heart rates. The adverse noise impact would be experienced by greater numbers of recreational users during the summer months when recreational uses are likely to increase. However, the floating security barrier would prevent recreational users from getting close enough to the pile driver to receive injurious noise levels.

The proposed Test Pile Program would be a temporary action occurring over a 40 day period. The impact hammer and the vibratory driver would be used intermittently throughout the 40 day period and would produce sound levels at or below 60 dBA around the nearest residence 1.5 miles from NBK at Bangor. Therefore, no significant impacts to ambient noise would result from the implementation of the proposed action.

3.6 MARINE VEGETATION

3.6.1 Affected Environment

The waterfront of NBK at Bangor has been extensively surveyed for marine vegetation, including eelgrass and macroalgae (Morris et al., 2009). The dominant types of vegetation along NBK at Bangor are red algae, green algae, brown algae, and eelgrass (Table 3.10). Each group is discussed below in more detail.

Red Algae

Red algae of the genera *Ceramium, Endocladia, Gracilaria, Mastocarpus, Mazzaella, Porphyra*, and other unidentified red algae are present along the Bangor waterfront at NBK (Pentec, 2003). Red algae, particularly *Gracilaria*, are most abundant at water depths between 10 feet (3 m) and 25 feet (7.6 m) below MLLW. Red algae are typically found within the upper and lower intertidal zones, and are less abundant in the nearshore marine subtidal zone (Figure 3-4; Table 3.10).

Green Algae

Among green algae, sea lettuce (*Ulva* spp.) is the predominant species of algae along the Bangor waterfront at NBK. Sea lettuce is found in sheltered or partially exposed lower-intertidal and nearshore marine subtidal zones from 2 feet (0.6 m) above MLLW to 20 feet (6 m) below MLLW (Morris et al., 2009). Boulders in the nearshore zone off NBK at Bangor are often encrusted with sea lettuce (Pentec, 2003). It has a high nutrient value and provides an important source of marine nitrogen after it dies and decomposes, supporting eelgrass growth (Kirby, 2001).

Brown Algae

Brown algae occur in a variety of forms along the Bangor waterfront at NBK, including encrusting, branching, leafy, and filamentous, or hair-like, algae. Several leafy species (e.g., Egregia spp.) and branching species (e.g. *Fucus* spp.) are commonly found attached to rocks in upper intertidal zone (Table 3.10).

Sargassum

Several species of kelp, including flattened acid kelp (*Desmarestia ligulata),* witches hair (*D. aculeata*), and understory kelp (*Laminaria* spp.) are present near the project area. *Desmarestia* spp. Are found in the nearshore marine subtidal and lower intertidal zones. Understory kelp provide a major source of decomposed nutrients to the seafloor, and are important vertical habitat for species in the subtidal zone (Mumford, 2007). A narrow band of understory kelp occurs shoreward of the project area (Figure 3-4). The band is approximately 1,600 feet (488 m) long and covers 2.3 acres (Morris et al., 2009). Canopy-forming kelp beds (e.g., bull kelp) do not occur near the project area (Morris et al., 2009).

A non-native brown algae species, wireweed (*Sargassum muticum*), was first documented in Washington State waters in the 1950s and was likely introduced from Japan when Pacific oysters were planted in the early 1900s. The complex branching of *Sargassum* provides habitat for invertebrates such as amphipods; however, where it overlaps with native marine vegetation, *Sargassum* outcompetes them (Critchey et al., 1997). *Sargassum* is thought to negatively affect water movement, light penetration, sediment accumulation, and DO concentrations at night (Williams et al., 2001). Two large *Sargassum* mats occur along the Bangor waterfront at NBK south of the project area, and other small pockets of Sargassum are located outside of the project area (Morris et al., 2009).

Eelgrass

Eelgrass (*Zostera marina*) is prevalent in low-energy areas, occurring in lower intertidal and nearshore marine subtidal zones that are abundant in organic matter and nutrients (Johnson and O'Neil, 2001). Eelgrass beds are habitat for fish and shellfish species because they provide vital three-dimensional structure (Nightingale and Simenstad, 2001a). They are important in maintaining migratory corridors and as foraging areas for juvenile salmonids, other fish and invertebrates (Simenstad and Cordell, 2000). Along the shoreline adjacent to the project area, the native Zostera marina is the dominant eelgrass species. Approximately 37.7 acres of eelgrass

TABLE 3.10 NBK AT BANGOR WATERFRONT MARINE VEGETATION COVERAGE

Zone	Vegetation Type	NBK Waterfront (%)[1]
Upper Intertidal	**Brown Algae**[2] (*Fucus*)	
	Present	60.4
	Absent	39.6
Upper Intertidal; Lower-Intertidal	**Red Algae** (*Gracilaria*)	
	Present	76.8
	Absent	23.2
Upper Intertidal; Lower-Intertidal; Nearshore Marine (subtidal photic zone)	**Mixed Red Algae**[2] (*Ceramium, Endocladia, Gracilaria, Mastocarpus, Mazzaella, Porphyra,*)	
	Present	Interspersed
	Absent	100
Lower-Intertidal; Nearshore Marine (subtidal photic zone)	**Green Algae** (*Ulva*)	
	Present	97.4
	Absent	2.6
Lower-Intertidal; Nearshore Marine (subtidal photic zone)	**Brown Algae** (*Desmarestia*)	
	Present	15.9
	Absent	0
Lower-Intertidal; Nearshore Marine (subtidal photic zone)	**Eelgrass** (*Zostera marina)*	
	Present	81.9
	Absent	18.1
Nearshore Marine (subtidal photic zone)	**Brown Algae** (*Laminaria*)	
	Present	75.8
	Absent	24.2

Sources: WDNR, 2006; Morris et al., 2009.

[1] Percent represented by proportionate amount in sampled area.[2] Macroalgae coverage data obtained by SAIC in 2007 were concentrated in the lower intertidal and shallow (less than 70 feet MLLW) zones along the NBK at Bangor shoreline. Mixed red algae and *Fucus* distribution coverage based on the Washington State Shorezone Inventory (WDNR, 2006).

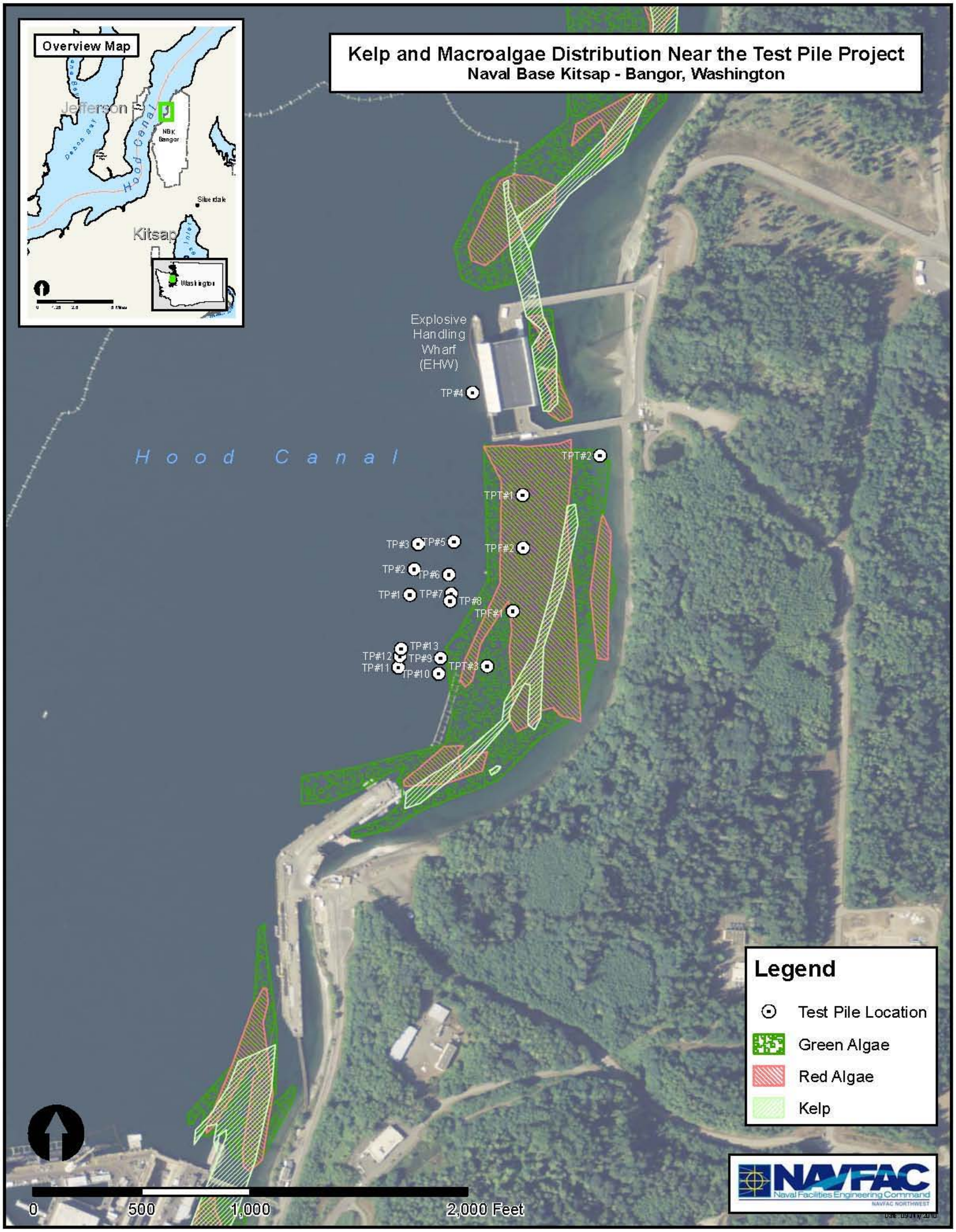


Figure 3-4 Macroalgae Distribution off NBK at Bangor near the Test Pile Project

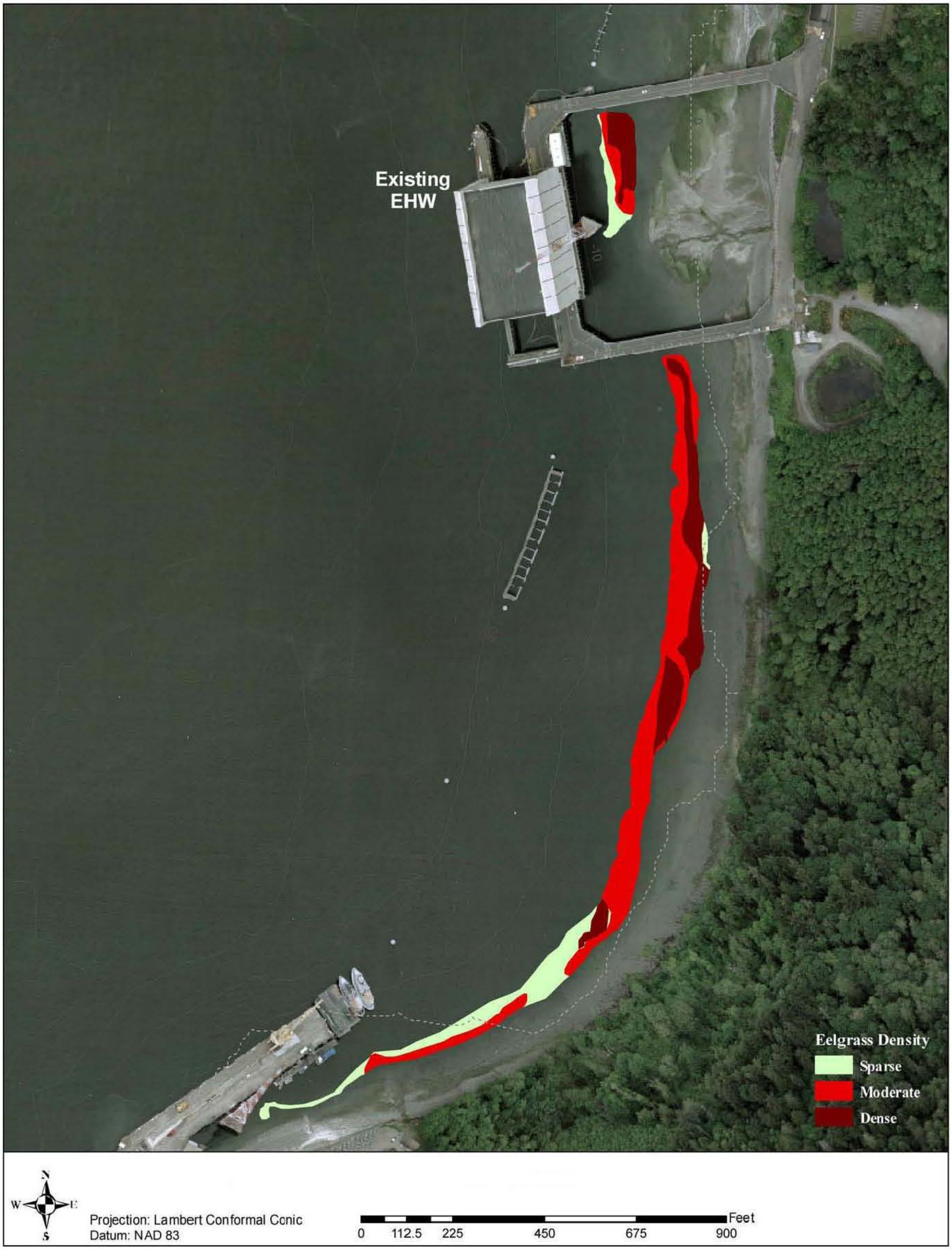


Figure 3-5 Eelgrass Distribution off NBK at Bangor near the Test Pile Project

are present along a narrow depth band roughly parallel to shore from 2 feet (0.6 m) to 20 feet (6 m) below MLLW (Garono and Robinson, 2002; Morris et al., 2009) (Figure 3-5). This 37.7 acre band of eelgrass includes a 2,400-foot long, 3.3-acre continuous eelgrass bed south of the existing EHW-1 (Morris et al., 2009). A non- native eelgrass species, *Zostera japonica*, occurs in small patches between 2 feet (0.6m) above and below MLLW, which is also outside of the project area.

3.6.2 Environmental Consequences

3.6.2.1 No Action Alternative

Under the No Action Alternative the Test Pile Program would not be conducted. Baseline conditions for marine vegetation, as described above, would remain unchanged. Therefore, there would be no impacts to marine vegetation from implementation of the No Action Alternative.

3.6.2.2 Proposed Action

The installation of the test piles would involve driving 18 steel pipe piles ranging in size from 30 inches to 60 inches in diameter into the substrate. Additionally, lateral load and tension load tests would be performed, which would require driving 11 additional piles. Impact pile driving would occur until October 14 (contingent on the results of spawning fish egg surveys); however, other in-water work may continue until October 31. Marine vegetation could potentially be indirectly affected by the proposed action due to minimal deterioration of water quality, which marine vegetation depends upon for survival and by direct removal or disturbance during pile removal and installation. As indicated in Section 3.3, Water Resources, the Test Pile Project would not result in a significant impact to geology or sediments and would result in no measurable change to existing DO levels at the Bangor waterfront at NBK or in Hood Canal, in general. Thus, the proposed action would not result in violations of water quality standards for DO and would, therefore, maintain water quality in the vicinity of the project area. Moreover, pile driving activities would not discharge contaminants or otherwise appreciably alter the concentrations of trace metal or organic contaminants in bottom sediments. NBK at Bangor has an approved Spill Management Plan (DoN, 2006a) and a regional Integrated Spill Contingency Plan (DoN, 2010a) is in place. Therefore, violations of water quality standards for DO and accidental spills or discharges of deleterious materials would not be expected to adversely impact marine water quality, and subsequently marine vegetation, at the project area.

In addition to the potential indirect impacts listed above, impacts to water quality could also occur as a result of resuspension of bottom sediments from pile installation and barge and tug operations, which would, in turn, affect marine vegetation. A conservative estimate of total bottom disturbance from the barge anchors, spuds, and test piles is approximately 6,970 ft^2 (647 m^2) or 0.16 acres. Bottom disturbance would be temporary over a 40 day project period and would be minimized by the use of a Gunderboom SAS™ or other bubble curtains or bubble walls. The use of these devices would help confine sediment plumes during construction; therefore, sediments would settle back in the general vicinity from which they rose. Disturbed sediments could also be dissipated by the strong tidal currents in the area. The temporary increase in turbidity is expected to decrease the light available for marine vegetation; however, these impacts would be minor and temporary in nature enabling marine vegetation to recover from any minor impacts that would result from the proposed action.

Potential direct impacts to marine vegetation during the proposed Test Pile Program would include damage or removal through pile removal and anchor drag. The project area is located entirely outside of eelgrass and kelp beds, which would minimize their potential for being directly impacted. Red and green algae are absent from a majority of the test pile locations, with only five of the 18 pile locations having these types of vegetation present.

In summary, impacts to marine vegetation from the proposed Test Pile Program are expected to be minor and temporary and all species would be expected to recover. Due to the minor and temporary nature of potential indirect and direct effects, the proposed action would have no significant impacts on marine vegetation. Furthermore, potential impacts to marine vegetation resulting from the Test Pile Program would be mitigated as part of the proposed EHW-2 mitigation, if necessary, which would include transplanting eelgrass from the construction area to an undisturbed area within the Bangor waterfront at NBK and removing *Sargassum* from other areas of the Bangor waterfront at NBK where it is inhibiting growth of eelgrass (DoN, 2010b).

3.7 BENTHIC INVERTEBRATES

3.7.1 Affected Environment

Benthic invertebrates are bottom dwelling animals that live burrowing or buried in the soft sediments (infauna) and those that live attached to hard bottom substrates (epifauna). Four major groups (Phylum) are found in Hood Canal and in the project area: 1) marine worms (Annelids); 2) snails and bivalves (Molluscs); 3) crabs and other crustaceans (Arthropods); and, 4) sea stars and sea urchins (Echinoderms).

The types and numbers of benthic organisms are closely linked to sediment grain size (gravel, sand, silt, clay, etc.), levels of DO, and the amount of total organic carbon (TOC). The organic carbon content is itself strongly correlated with sediment grain size; it is higher in more fine-grained sediments than in coarser sediments.

Hood Canal has been divided into nine biotic subregions based on soft-bottom benthic community structure, dominant taxa, percent fines (i.e., the percent of silt or clay material), percent TOC, and depth (WDOE, 2007). NBK at Bangor and the proposed project area, specifically, are within the north Hood Canal biotic subregion.

Sediments at the northern end of Hood Canal are primarily composed of relatively coarse sands near the entrance, on the sill, and in the shallows along the shorelines of both the main axis of the canal and the adjoining bays. Sediments south of the sill, down the central axis of the canal, at the greatest depths, and in portions of the terminal inlets are primarily finer-grained silts and clays. The composition of sediment samples from the project area range from 65 to 100 percent for sand, less than 1 to 7 percent for gravel, 2 to 32 percent for silt, and 2 to 11 percent for clay (Hammermeister and Hafner, 2009).

A recent survey of four different areas along the Bangor waterfront at NBK found consistently greater benthic community development in the subtidal zone compared to the intertidal zone and variable community development within and among survey areas (Weston, 2006). A mean total of 2 to 12 species with a mean total abundance of 3 to 67 individuals per square foot (0.10 m^2) was observed in the intertidal zone. Subtidal values varied from a mean total of 36 to 77 species and a mean total abundance of 301 to 736 individuals per square foot (0.10 m^2). Table 3.11 provides a list of some of the benthic invertebrates and shellfish occurring at NBK at Bangor. The soft-bottom benthic community within the project area is dominated by marine worms, crustaceans, and molluscs across the tide zone, although in the intertidal zone other organisms also may be numerically abundant (Weston, 2006; WDOE, 2007).

TABLE 3.11 BENTHIC INVERTEBRATES AT THE BANGOR WATERFRONT AT NBK

Phylum	Major Taxa of Phyla	Genera or Species	Typical Location	Common Name or Description
Mollusca	***Gastropod***	*Alvania compacta*	Sand, silt, clay or mixed substrate, vegetated shallow subtidal	Snail
		Lirularia acuticostata	Mixed substrate, intertidal-subtidal	Sharp-keeled lirularia, a snail,
	Bivalves	*Macoma* sp.	Mixed substrate, intertidal-subtidal	Clam
		Nutricola spp.	Sandy subtidal	Clam
		Saxidomus giganteus	Sandy subtidal	Butter Clam
		Panopea abrupta	Sandy intertidal-subtidal	Geoduck clam
		Rochefortia tumida	Sandy intertidal-subtidal	Robust mysella
		Axinopsida serricata	Sandy or mixed substrate with organic enrichment subtidal	Silky axinopsid
		Protothaca staminea	Sandy intertidal-subtidal	Native littleneck clam
		Tellina carpenteri	Sandy or mixed sand/silt intertidal-subtidal	Clam
		Parvilucina tenuisculpta	Sandy, silty, clay or mixed substrate in shallow subtidal	Fine-lined lucine
		Protothaca staminea	Sandy intertidal-subtidal	Rough-sided littleneck clam
		Mytilus spp.	Intertidal-subtidal, hard substrates	Blue mussel
		Pododesmus macroschisma	Hard substrates	Jingle shell
		Hinnites giganteus	Rocky substrates subtidal, rarely intertidal under boulders	Giant rock scallop
		Crassostrea gigas	Rocky substrates	Pacific oyster
		Ostrea lurida	Rocky substrates	Olympia oyster
Crustaceans	***Ostracod***	*Euphilomedes carcharodonta*	All soft substrates	Seed-shrimp
	Tanaid	*Leptochelia dubia*	Mixed substrate, vegetated habitat, manmade structures	Tanaid
	Barnacles	*Balanus* sp.	Rocky, manmade structures	Barnacle
	Amphipods	*Protomedeia* sp.	All soft substrates	Gammarid

TABLE 3.11 BENTHIC INVERTEBRATES AT THE BANGOR WATERFRONT AT NBK (continued)

PHYLUM	MAJOR TAXA OF PHYLA	GENERA OR SPECIES	TYPICAL LOCATION	COMMON NAME OR DESCRIPTION
		Aoroides spp.	Detritus, sand, vegetated habitats	Corophiid
		Rhepoxynius boreovariatus	Sandy subtidal	Gammarid
		Corophium and *Monocorophium* spp.	Sandy subtidal, manmade structures	Corophiid
	Crabs	*Pinnixa occidentalis*	Sand/silt/clay subtidal	Pea crab
		Hemigrapsus oregonsis	Quiet water, rocky habitats, gravel	Green Shore crab
		Pagurus granosimanus	Mixed substrate, eelgrass, subtidal	Hermit crab
		Pugettia spp.	Sand/silt/clay subtidal, eelgrass	Kelp crab
		Cancer gracilis	Intertidal and subtidal, eelgrass	Graceful crab
		Cancer magister	Intertidal and subtidal, eelgrass	Dungeness crab
		Cancer oregonensis	Rocky and manmade structures, intertidal-subtidal	Oregon Cancer crab
		Cancer productus	Sandy, protected rocky areas, eelgrass, intertidal-subtidal	Red Rock crab
		Carcinus maenas	Intertidal, mixed substrates	European green crab
		Telmessus cheiragonus	Eelgrass, kelp, sargassum	Helmet crab
		Pagurus granosimanus	Mixed substrate, eelgrass, subtidal	Hermit crab
	Shrimps	*Crangon* sp.	Shallow waters, sandy substrates	True shrimps
		Pandalus sp.	Mixed sand substrate intertidal and shallow subtidal	Spot shrimp
		Neotrypaea sp.	Mixed sand substrate intertidal and shallow subtidal	Ghost shrimp
Annelida	***Polychaetes***	*Platynereis bicanaliculata*	Mixed substrates, manmade structures, eelgrass	Nereidae
		Podarkeopsis glabra	Soft substrates	Hesionidae
		Pectinaria californiensis	Sandy, low intertidal and subtidal	Cone worm
		Owenia collaris	Sandy, intertidal-subtidal	Oweniidae
		Euclymeninae	Mixed substrates, subtidal	Maldanidae

TABLE 3.11 BENTHIC INVERTEBRATES AT THE BANGOR WATERFRONT AT NBK (continued)

PHYLUM	MAJOR TAXA OF PHYLA	GENERA OR SPECIES	TYPICAL LOCATION	COMMON NAME OR DESCRIPTION
Echinoderma	***Echinoderms***	*Pisaster brevispinus*	Subtidal eelgrass	Pink sea star
		Pisaster ochraceus	Lower intertidal, hard structures	Purple star
		Amphiodia urtica/periercta	Subtidal silty mud	Burrowing brittle star
		Pycnopedia helianthoides	Lower intertidal to subtidal soft substrates	Sunflower star
		Dendraster excentricus	Flat, sandy subtidal	Sand dollar
		Strongylocentrotus droebachiensis	Intertidal to subtidal soft substrates	Green sea urchin
Chordata	***Tunicates***	*Corella willmeriana*	Subtidal to deepwater	Transparent tunicate
		Distaplia occidentalis	Intertidal to subtidal	Mushroom compound tunicate

Sources: Abbott and Reish, 1980; Barnard et al., 1980; Lee and Miller, 1980; Kozloff, 1983; URS, 1994; WDOE, 1998; Pentec, 2003; Weston, 2006.

Molluscs

Molluscs are invertebrates that have soft, unsegmented bodies and are usually protected by a shell. Molluscs occurring within the project area include two major classes: bivalves (mollusks with two-part shells, such as clams, oysters, and mussels), and gastropods (slugs and snails). Of the bivalves, mussels and oysters attach to hard substrate, while clams live partially buried in the substrate. Oysters and many species of clams are filter feeders on plankton. Some clams also may feed on organic matter at the sediment surface. Gastropods live on the substrate surface and may feed on vegetation and organic matter at the sediment surface, and/or prey on other invertebrates.

A variety of bivalves occur within the project area, ranging from intertidal to subtidal depths (see Table 3.11). Common intertidal species include Macoma clams, rough-sided littleneck clams, and robust mysella. The most abundant species in subtidal waters include silky axinopsid, various dwarf venus clams, fine-lined lucine, and robust mysella (Weston, 2006). Robust mysella live in semi-permanent burrows and can be an indicator of a more stable habitat (Ockelmann and Muus, 1978). Common species on hard substrates include multiple blue mussel species, jingle shell, rock scallop, Olympia oyster, and Pacific oyster (DoN, 2001a; WDFW, 2007a). An approximately 15-foot oyster bed is located parallel to the shore running near and under EHW-1 (Figure 3-6). Bivalve siphons were detected throughout the project area during a 2007 survey in a wide range of depths. Siphon characteristics indicated these were geoducks. These organisms tended to be more concentrated in the silty sand substrate present below 25 feet (8 m) water depth.

Figure 3-6 Oyster Densities Near the Project Area

As of 2005, the gastropod snail *Alvania compacta* was abundant in shallow subtidal waters within the project area (Weston, 2006); it is commonly found in mixed sediments including fine gravels (Kozloff, 1983). Other snails are associated with eelgrass beds, and limpets occur intertidally on hard substrates such as docks, cobble, and rocks.

Crustaceans

Crustaceans are aquatic arthropods with an exoskeleton or shell, a pair of appendages on each segment, and two pairs of antennae. Examples are shrimps, crabs, barnacles, and amphipods. Crustaceans are associated with all soft-bottom and hard substrate habitats and also occur in the water column. The most abundant species in the 2005 benthic sediment sampling along the Bangor waterfront at NBK was the seed-shrimp (Weston, 2006). Seed-shrimp are minute crustaceans that are protected by a bivalve-like shell and typically feed on detritus in the subtidal nearshore marine habitats. Seed-shrimp comprised almost 30 percent of the individual organisms in the sandy deltaic subtidal zones along the waterfront (Weston, 2006). Larger crabs and shrimps, which are mobile and evasive during sampling, are not well quantified near the project area. Several species have been commonly observed (Weston, 2006). Dungeness crabs range from intertidal to subtidal depths in sandy habitats and may use eelgrass beds as nursery areas (LFR, 2004). Hermit crabs, cancer crabs, kelp crabs, and shore crabs occur in rocky and/or vegetated habitats. European green crab and helmet crab also have been reported (DoN, 2001a).

Annelids

Annelids are segmented worms that can be found in soils and freshwater and marine environments. Polychaetes, a type of marine worm, are a major component of the benthic community and occupy intertidal and subtidal soft- and hard-bottom habitats (Weston, 2006). Sessile polychaetes are often tube-building while other species may be active burrowers (Kozloff, 1983). Polychaetes are typically more abundant in the nearshore subtidal zone than in the intertidal zone (Weston, 2006; WDOE, 2007). Several species of polychaetes live among fouling organisms on manmade structures. Suspension-deposit spionids, herbivorous nereids, predatory syllids, and scale worms were found during rapid assessment of several marinas in Puget Sound (Cohen et al., 1998).

Echinoderms

Echinoderms are a group of marine invertebrates that usually have symmetry of five appendages and skin typically covered in spines. Examples include starfish, sea urchins, and sea cucumbers. Echinoderms contributed up to six percent to the abundance of benthic organisms occurring in soft-substrate benthic sediment sampling conducted in 2005 along the waterfront but only two percent, at most, to the abundance of benthic organisms within the project area (Weston, 2006). These species included brittle stars and green sea urchins (DoN, 1988; Weston, 2006). However, sea stars have also been observed at many locations along the waterfront (DoN, 1988). Purple stars are found primarily in the lower-intertidal zone on pilings where they feed on mussels. Pink sea stars are often found in subtidal eelgrass beds (Pentec, 2003).

The red sea urchin has not been documented near the project area but typically lives in rocky areas, which are not extensively found at the waterfront. Red urchin habitat ranges from protected shallow subtidal to inland marine deeper water nearshore marine habitats.

3.7.2 Environmental Consequences

3.7.2.1 No Action Alternative

Under the No Action Alternative the Test Pile Program would not be conducted. Baseline conditions, as described above, for benthic invertebrates would remain unchanged. Therefore, there would be no significant impacts to benthic invertebrates from implementation of the No Action Alternative.

3.7.2.2 Proposed Action

The evaluation of impacts to benthic communities and shellfish considered whether the proposed action would cause decreases in benthic invertebrate populations, or significant loss of benthic habitat or decreases in habitat value for benthic invertebrates.

Physical Impacts of Pile Installation/Removal Activities

The installation of the test piles would involve driving 18 steel pipe piles ranging in size from 30 inches to 60 inches in diameter into the substrate. Additionally, lateral load and tension load tests would be performed which would require driving 11 additional piles. The proposed action would impact benthic communities through the disruption of the sediment surface and subsurface during the installation and removal of each pile, and from anchor and spud placement for the barges. Depending upon the species impacts to individual benthic organisms could range from temporary disturbance to mortality. Some benthic organisms would be physically crushed and lost within the footprint of the piles, as well as from barge anchors and spuds. To minimize impacts to benthic organisms and habitat the pile driving barge will remain in waters that have a minimum depth of 6 ft (2 m) to avoid grounding or potentially impacting the nearshore. Additionally, no spudding or anchoring will be allowed in any existing eelgrass habitat. A conservative estimate of total bottom disturbance from the barge anchors, spuds, and test piles is approximately 6,970 ft^2 (647 m^2).

Mean density estimates of benthic organisms in the project area are in the range of 830 individuals/ft^2 (0.10 m^2) (Barry A. Vittor & Associates, Inc., 2001). The barge anchors, spuds, and test piles would result in a temporary loss of benthic habitat, as well as direct mortality of less motile benthic organisms. Indirect impacts to habitat and benthic organisms are likely to result from turbidity caused by driving and removing barge anchors, spuds, and the test piles. The area within a 150-foot radius of the pile driving footprint could have higher levels of turbidity. Disturbed sediments would eventually redeposit upon the existing benthic community. Suspension and surface deposit feeders would be the most susceptible to burial. Mobile infaunal feeders would be more likely to survive burial due to their ability to burrow upward through the newly deposited material. Filter and suspension feeding invertebrates (e.g. bivalves, tunicates, crustaceans, and some polychaetes) may close their shells, suspend feeding, or increase feeding rates in response to turbidity increases (LaSalle et al., 1991; Cruz-Rodriguez and Chu, 2002). Generally, marine invertebrates have been shown to be tolerant of relatively high suspended solid concentrations over periods of hours to days, with adverse impacts limited to prolonged exposures (e.g. continuously up to 21 days) and/or to high concentrations (e.g. fluid mud) (reviews in LaSalle et al., 1991; O'Connor, 1991; Clarke and Wilber, 2000; and Wilber and Clarke, 2001). These conditions are unlikely to occur during the proposed action as contractors will only work at the project area up to 6 days per week, and the duration of the project will be approximately 40 work days. As a result, impacts from increased turbidity levels would likely result in short term loss of localized areas of the benthic community. Most affected areas would experience some reduction in diversity and abundance of benthic species. However, benthic organisms, particularly annelids, are very resilient to habitat disturbance and are likely to recover to pre-disturbance levels in less than two years (CH2M Hill, 1995; Parametrix, 1994; 1999; Anchor Environmental, 2002; Romberg, 2005). Therefore, the proposed action would have no significant impacts on benthic invertebrates.

Impacts from Noise Associated with Pile Installation/Removal

Indirect impacts to benthic invertebrates associated with increased noise and vibration during pile driving would occur during the proposed action. Underwater sound levels likely to result from unattenuated impact pile driving during the Test Pile Program would be 195 dB re:1µPa (RMS), 210 dB re:1µPa (PEAK), and 185 dB re:1µPa^2-sec (SEL) at 10 meters (33 ft). The use of sound attenuation devices during impact pile driving would reduce these initial sound pressure levels by -10 dB. Underwater sound levels likely to result from vibratory pile driving would be 180 dB re: 1µPa (RMS) at 10 meters (33 ft). Vibratory pile driving is the primary means of pile installation and removal activities during the Test Pile Program. No studies have been identified that document invertebrate response to pile driving. Although there are few studies of noise impacts to invertebrates, available information suggests a variety of species (crabs, shrimp, clams, mussels, squid, sea cucumbers) tolerate temporary exposures to increased sound levels within the range expected from pile driving without long-term adverse impacts (Stocker, 2001; Christian et al., 2003; Moriyasu et al., 2004; Kent and McCauley, 2006).

Sound thresholds associated with sublethal physiological or behavioral responses are not well understood and apparently vary among invertebrate species. For example, egg development of snow crabs was delayed by exposure to seismic air gun peak sound levels of 201 to 227 dBpeak (Christian et al., 2003), but no impacts to Dungeness crab larvae were observed at mean sound pressures as high as 231 dBrms (Pearson et al., 1994). Continuous exposure of sand shrimp in aquaria to a high sound-level increase (30 dB in the 25 to 400 Hz bandwidth) resulted in sublethal behavioral changes and reduced growth and reproduction (review in Moriyasu et al., 2004). Consequently, invertebrates may experience acoustic stress and disturbance as a result of impact hammer pile driving. Based on evidence from the limited scientific studies conducted to date, reproductive impairment of some invertebrate species, in the form of delayed egg maturity, could result from impact pile driving. However, these impacts would be temporary in nature and would not be expected to extend beyond the duration of pile driving. Additionally, the peak sound levels associated with the potential to cause these impacts (201-227 dBpeak) would only occur only within a 28 foot radius (8.5 m) around any pile being proofed with an impact hammer (assuming the use of a sound attenuation device). Additionally, piles will primarily be installed and removed using the vibratory method, which would result in much lower noise levels (180 dBrms re 1µPa at 33 feet [10 m]) that are not expected to result in impacts to benthic species. As a result, pile driving noise as a result of the proposed action would have no significant impacts on benthic invertebrates.

3.8 FISH

There are nine species of fish that have been listed as federally threatened or endangered under the Endangered Species Act (ESA) that occur near the Test Pile Program project area in Puget Sound, Washington (Table 3.12). These species, as well as other important fishes that inhabit waters around the proposed Test Pile Program project area, are discussed below.

TABLE 3.12 ENDANGERED SPECIES ACT-LISTED FISH HISTORICALLY SIGHTED IN HOOD CANAL IN THE VICINITY OF NBK AT BANGOR

Species	ESA-Listed Status	Relative Occurrence in Hood Canal, Washington	Season(s) of Occurrence
Chinook salmon *Oncorhynchus tshawytscha* Puget Sound ESU	Threatened	Common	Juveniles – May to Jul; Adults – Aug to Oct
Chum salmon *Oncorhynchus keta* Hood Canal Summer-run ESU	Threatened	Common	Juveniles – Jan to Apr; Adults – Aug to Oct
Steelhead trout *Oncorhynchus mykiss* Puget Sound DPS	Threatened	Common	Year-round
Bull Trout *Salvelinus confluentus* All U.S. stocks	Threatened	Rare to occasional use	Unknown
Bocaccio *Sebastes paucispinis* Puget Sound/Georgia Basin DPS	Endangered	Rare to occasional use	Year-round
Canary rockfish *Sebastes pinniger* Puget Sound/Georgia Basin DPS	Threatened	Rare to occasional use	Year-round
Yelloweye rockfish *Sebastes ruberrimus* Puget Sound/Georgia Basin DPS	Threatened	Rare to occasional use	Year-round
Green sturgeon *Acipenser medirostris* Southern DPS	Threatened	Rare to occasional use	Year-round
Pacific Eulachon/Smelt *Thaleichthys pacificus* Southern DPS	Threatened	Rare to occasional use	Year-round

Seven species of Pacific salmonids occur in the Puget Sound area. Salmonids belong to, or are characteristic of, the family *Salmonidae*, which includes the salmon, trout, and whitefish. Those found in the Puget Sound area include Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), steelhead trout (*O. mykiss*), cutthroat trout (*O. clarki*), and bull trout (*Confluentus salvelinus*). Four of these seven species (Chinook salmon, chum salmon, steelhead trout, and bull trout) have populations that have been listed as federally threatened under the ESA within the vicinity of Hood Canal.

Neither pink salmon or cutthroat trout have been listed under ESA; coho salmon have one evolutionary significant unit (ESU) listed as federally endangered, three ESUs as federally threatened, and one ESU listed as a species of concern, but none of the coho salmon ESUs utilize Hood Canal. An ESU is a population or group of populations of Pacific salmon that represents an important component of the evolutionary legacy of the species as a result of being substantially reproductively isolated from other conspecific populations.

Salmonids use Hood Canal as a passageway between spawning streams flowing into the canal and marine rearing areas in Puget Sound, the Strait of Juan de Fuca, and the North Pacific Ocean. Hood Canal also provides important estuarine and nearshore rearing and refuge habitat for juvenile salmonids (Bhuthimethee et al., 2009). There are two small estuaries at NBK at Bangor: Devil's Hole and Cattail Lake. Both outflows create small deltas seaward of their entry into Hood Canal. In the summer months, the outflows contribute nutrient-rich freshwater that is warmer than the surrounding saltwater (Phillips et al., 2008). In both Devil's Hole and Cattail Lake outflows, the shallow deltas support dense marine vegetation and benthic invertebrate communities, which provide food and refuge for juvenile salmonids (Phillips et al., 2008).

Rockfish are another important group of fish that occur in the project waters. This diverse group is made up of mostly bottom dwelling fish of the genus *Sebastes* especially prevalent in the North Pacific Ocean (Love et al., 2002). Three of the five Puget Sound rockfish species are federally listed under the ESA. Bocaccio (*Sebastes paucispinis*) is the only one of the three federally listed as endangered, while canary rockfish (*S. pinniger*) and yelloweye rockfish (*S. ruberrimus*) are federally listed as threatened (75 FR 22276).

As in most fish with pelagic (open ocean) larvae, current patterns play a large role in the recruitment and distribution of rockfish larvae within and between basins (Palsson et al., 2009). As summarized by Drake et al. (2008), onshore currents, eddies, upwelling shadows, and other localized circulation patterns create conditions that retain larvae rather than disperse them. The shallow sill (~50 meters deep) at the mouth of Hood Canal further limits the circulation and exchange of water between this basin and the Strait of Juan de Fuca and central Puget Sound (Babson et al., 2006). Thus, Puget Sound basins, including Hood Canal, have greater retention of, and reliance upon, intra-basin rockfish larvae for recruitment than coastal systems (Drake et al., 2008).

In addition to salmonids and rockfish, Puget Sound provides habitat for at least 44 other fish species including, herring, smelt, sand lance, perch, gunnel, pipefish, stickleback, tubesnout and flatfish, as well as two additional ESA-listed species, the southern distinct population segment (DPS) of the North American green sturgeon (*Acipenser medirostris*) and the southern DPS of Pacific eulachon (*Thaleichthys pacificus*) (SAIC, 2006; Bhuthimethee et al., 2009). A DPS represents a population or group of populations that is isolated from other populations of the same species and significant in relation to the entire species. In contrast to salmonids which exclusively use freshwater for spawning, these fish species may use areas of Puget Sound shoreline for spawning. Additional important forage species include Pacific herring (*Clupea pallasii*), surf smelt (*Hypomesus pretiosus*), and sand lance (*Ammodytes hexapterus*), which represent the three most important forage fish species in the area (Penttila, 1997; Stout et al., 2001). They serve as a key prey source for salmonids, rockfish and other predatory fishes in the area, as well as birds and marine mammals (Salo, 1991; Love et al., 2002).

3.8.1 Affected Environment

3.8.1.1 Regulatory Overview

Endangered Species Act (ESA)

Federally threatened and endangered species are those listed for protection under the Federal Endangered Species Act (ESA) (16 U.S.C. 1536), administered by the National Marine Fisheries Service (NMFS) and the USFWS. The Services also list federal species of concern, which is a term used to indicate species that might be in need of conservation actions. Federal species of concern do not receive legal protection and this term does not imply the species would eventually be proposed for listing (USFWS, 2008b).

Under NEPA the impacts of a proposed action to threatened and endangered species must be considered. The ESA of 1973 established protection over, and conservation of threatened and endangered species and the ecosystems upon which they depend. An “endangered” species is a species that is in danger of extinction throughout all or a significant portion of its native habitat, while a “threatened” species is one that is likely to become endangered within the foreseeable future throughout all or in a significant portion of its native habitat.

The USFWS and NMFS jointly administer the ESA and are also responsible for the listing of species (i.e., the labeling of a species as either threatened or endangered). The USFWS has primary management responsibility for management of terrestrial and freshwater species, while the NMFS has primary responsibility for marine species and anadromous fish species (species that migrate from saltwater to freshwater to spawn). The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species.

Magnuson-Stevens Fishery Conservation and Management Act

The Fishery Conservation and Management Act of 1976, later changed to the Magnuson Fishery Conservation and Management Act in 1980, established a 200 nautical mile (nm) fishery conservation zone in U.S. waters and a regional network of Fishery Management Councils. The Fishery Management Councils are composed of federal and state officials, including the USFWS, which oversee fishing activities within the fishery management zone. In 1996, the Magnuson Fishery Conservation and Management Act was reauthorized and amended as the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), known more popularly as the Sustainable Fisheries Act. The MSFCMA mandated numerous changes to the existing legislation designed to prevent overfishing, rebuild depleted fish stocks, minimize bycatch, enhance research, improve monitoring, and protect fish habitat.

One of the most significant mandates in the MSFCMA is the essential fish habitat (EFH) provision, which provides the means to conserve fish habitat. The EFH mandate requires that the regional Fishery Management Councils, through federal Fishery Management Plans (FMP), describe and identify EFH for each federally managed species, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitats. Congress defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 USC 1802[10]). The term “fish” is defined in the MSFCMA as “finfish, mollusks, crustaceans, and all other forms of marine animals and plant life other than marine mammals and birds." The regulations for implementing EFH clarify that "waters" include all aquatic areas and their biological, chemical, and physical properties, while "substrate" includes the associated biological communities that make these areas suitable fish habitats (CFR 50:600.10). Habitats used at any time during a species' life cycle (i.e., during at least one of its life stages) must be accounted for when describing and identifying EFH. In addition to EFH designations, areas called habitat areas of particular concern (HAPC), which are a subset of designated EFH that is especially important ecologically to a species/life stage and/or is vulnerable to degradation, are also to be designated to provide additional focus for conservation efforts (50 CFR 600.805-600.815). Categorization as HAPC does not confer additional protection or restriction to designated areas.

Authority to implement the MSFCMA is given to the Secretary of Commerce through NMFS. The MSFCMA requires that EFH be identified and described for each federally managed species. The NMFS and regional Fishery Management Councils determine the species distributions by life stage and characterize associated habitats, including HAPC. The MSFCMA requires federal agencies to consult with the NMFS on activities that may adversely affect EFH, or when the NMFS independently learns of a federal activity that may adversely affect EFH. The MSFCMA defines an adverse effect as "any impact which reduces quality and/or quantity of EFH [and] may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species' fecundity), site-specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR 600.810).

3.8.1.2 ESA-Listed Fish

Puget Sound Chinook Salmon

Status and Management

The Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) ESU was listed as federally threatened under the ESA in 1999 (64 FR 14308), with the federally threatened listing reaffirmed in 2005 (70 FR 37160). The Puget Sound Chinook salmon ESU includes all naturally spawned populations from all rivers and streams flowing into Puget Sound. Average adult Chinook escapement (number of fish surviving to reach spawning grounds or hatcheries) in recent years is relatively low, particularly for the mid-Hood Canal stock, for which average escapements were typically below the low escapement threshold of 400 Chinook fish (WDFW, 2002). Reduced viability and listing of these specific stocks were attributed to habitat loss and degradation, primarily the result of the draining and filling of wetlands, sedimentation due to urban development and forest practices, and diking for flood control; hatcheries; and harvest management issues. Additionally, DO levels in Hood Canal are at a historic low, which is a concern and future threat to recovery of Hood Canal stocks of this and all other Hood Canal salmonid ESUs (70 FR 76445). Chinook salmon are managed as an ESA-listed species by NMFS and as a fishery by the Pacific Fishery Management Council (PFMC) through the Pacific Coast Salmon Fishery Management Plan (PFMC, 2003).

Critical Habitat

Critical habitat was designated for Puget Sound Chinook by the NMFS on February 16, 2000 (65 FR 7764) and was revised on September 2, 2005 (70 FR 52630), with an effective date of

January 02, 2006 (70 FR 52685). Critical habitat consists of the water, substrate, and the adjacent riparian zone of accessible estuarine and riverine reaches and extends to a depth of 30 meters MLLW. Nearshore marine waters within Hood Canal were included as part of this designation. Although critical habitat occurs in northern Hood Canal waters adjacent to the base, NBK at Bangor is excluded from critical habitat designation for ESA-listed Puget Sound Chinook salmon by federal law (70 FR 52630). Therefore, no Puget Sound Chinook salmon critical habitat occurs in the immediate vicinity of the project area, although critical habitat does occur within northern Hood Canal immediately beyond the northern and southern base boundaries (Figure 3-7).

Distribution, Behavior, and Ecology

Chinook salmon are one of the least abundant salmonids occurring along the Bangor shoreline at NBK (Figure 3-8). Past and recent surveys have found that Chinook salmon migrating from southern Hood Canal streams and hatcheries are found most frequently along the Bangor waterfront at NBK from late May to early July (Schreiner et al., 1977; Prinslow et al., 1980; Bax, 1983; Salo, 1991; SAIC, 2006; Bhuthimethee et al., 2009).

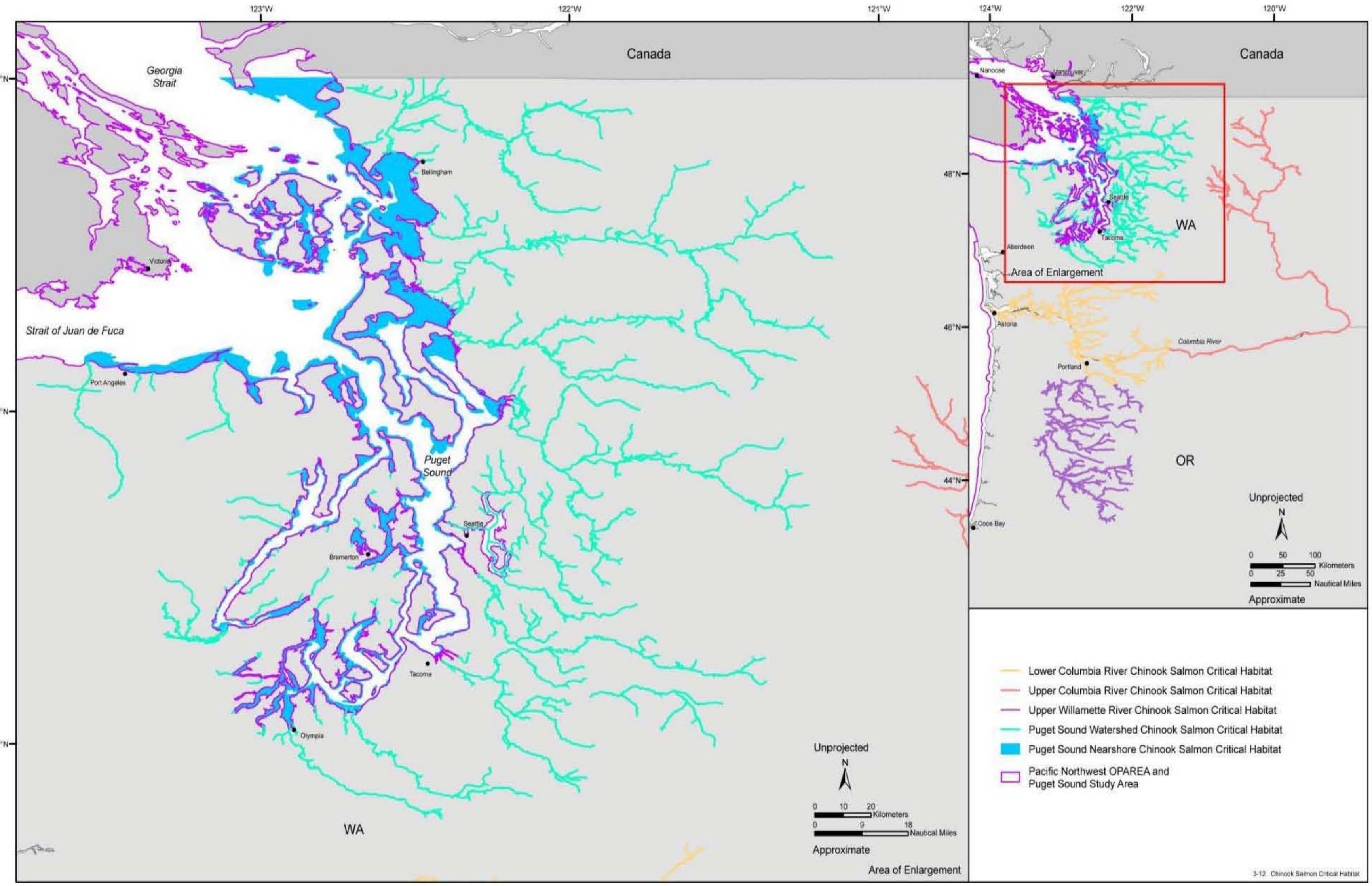
Emergent Chinook fry (young juvenile salmon), like fry of other Pacific salmonids, depend on shaded, nearshore habitat, with slow-moving currents, where they forage on drift organisms, including insects and zooplankton (Healey, 1991). Smolts (juveniles that have transitioned from fresh water to salt water) usually migrate to estuarine areas within the first year, approximately three months after emergence from spawning gravel (in general, April through July with population variability).

The peak out-migration timing of juvenile Puget Sound Chinook along the Bangor shoreline at NBK, and within the greater Hood Canal region, occurs from May to early July. During spawning season, adult Chinook salmon enter Hood Canal waters from August to October to begin spawning in their natal streams in September with peak spawning occurring in October. Table 3.13 provides a compilation of information regarding the in-migration and spawn timing of adult Puget Sound Chinook past NBK at Bangor, and within the greater Hood Canal region.

TABLE 3.13 SPAWNING PERIOD TIMING AND PEAK PRESENCE OF ADULT HOOD CANAL STOCKS OF PUGET SOUND CHINOOK

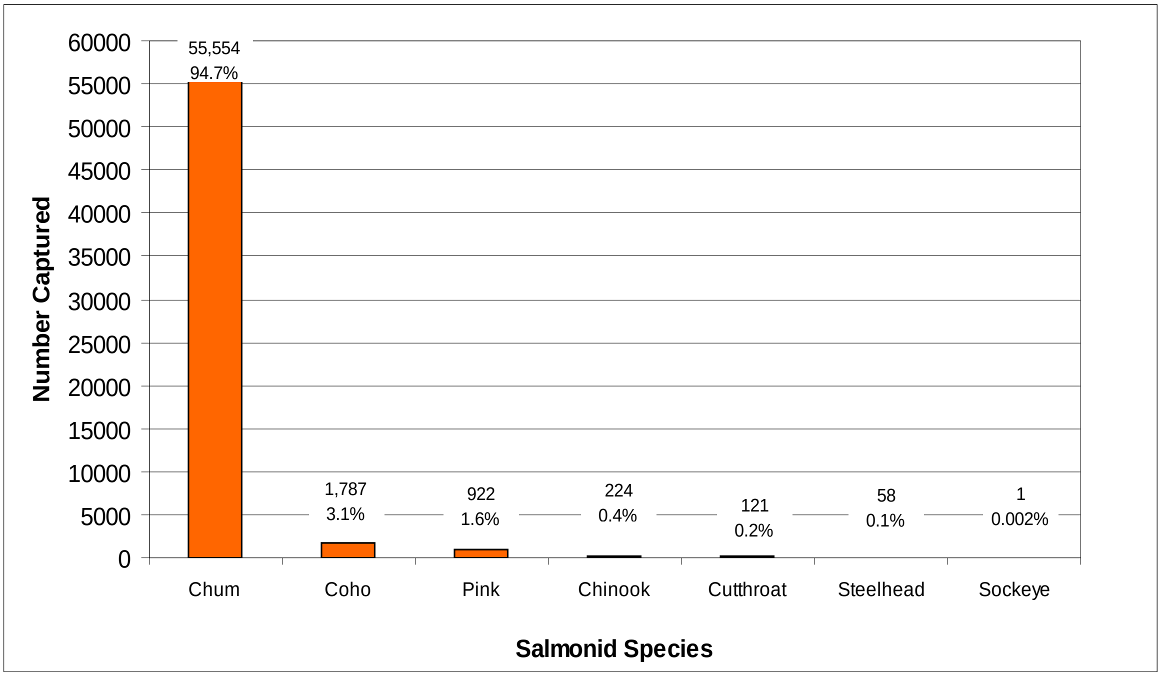
Stock	Time Period Detected in Hood Canal	Spawn Time Period	Spawn Peak
Skokomish	Late August to October	Mid September to October	Mid October
Mid-Hood Canal	Mid August to late October	Early September to late October	October

Source: Healey, 1991; SAIC, 2006; Bhuthimethee et al., 2009



Source: DoN, 2006b.

Figure 3-7 Critical habitat designated for Chinook salmon in Puget Sound



Source: SAIC, 2006; Bhuthimethee et al., 2009.

Figure 3-8 Salmonids, in order of abundance, captured during 2005–2008 Bangor beach seine survey

Hood Canal Summer-run Chum Salmon

Status and Management

Hood Canal summer-run chum salmon (*Oncorhynchus keta*) ESU was federally listed as threatened under the ESA in 1999, and the federally threatened listing was reaffirmed in 2005 (70 FR 37160). The NMFS recovery plan for Hood Canal summer-run chum was adopted 24 May 2007 (72 FR 29121). Hood Canal summer-run chum ESU includes all naturally spawned populations of summer-run chum salmon in Hood Canal and its tributaries. The only active fish hatchery that currently provides summer-run chum salmon to Hood Canal is the Quilcene National Fish Hatchery.

Historically, there were 16 stocks within Hood Canal summer-run chum ESU, eight of which are still in existence (six in Hood Canal and two in eastern Strait of Juan de Fuca), with the remaining eight being extinct (71 FR 47180). Supplementation programs are currently ongoing at three of the extinct stock locations (two in Hood Canal) to effectively reintroduce the summer-run chum back to their historic range, and these stocks are recognized as part of the ESU (HCCC 2005). Reduced viability, lower survival, and listing of extant stocks of summer-run chum and recent stock extinctions in Hood Canal are attributed to the combined impacts of the following three primary factors: (1) habitat loss and degradation, (2) climate change, and (3) increased fishery harvest rates (HCCC, 2005). An additional factor cited is impacts associated with the releases of hatchery salmonids (WDFW and PNPTT, 2000; HCCC, 2005), which compete with naturally spawning stocks for food and other resources.

Critical Habitat

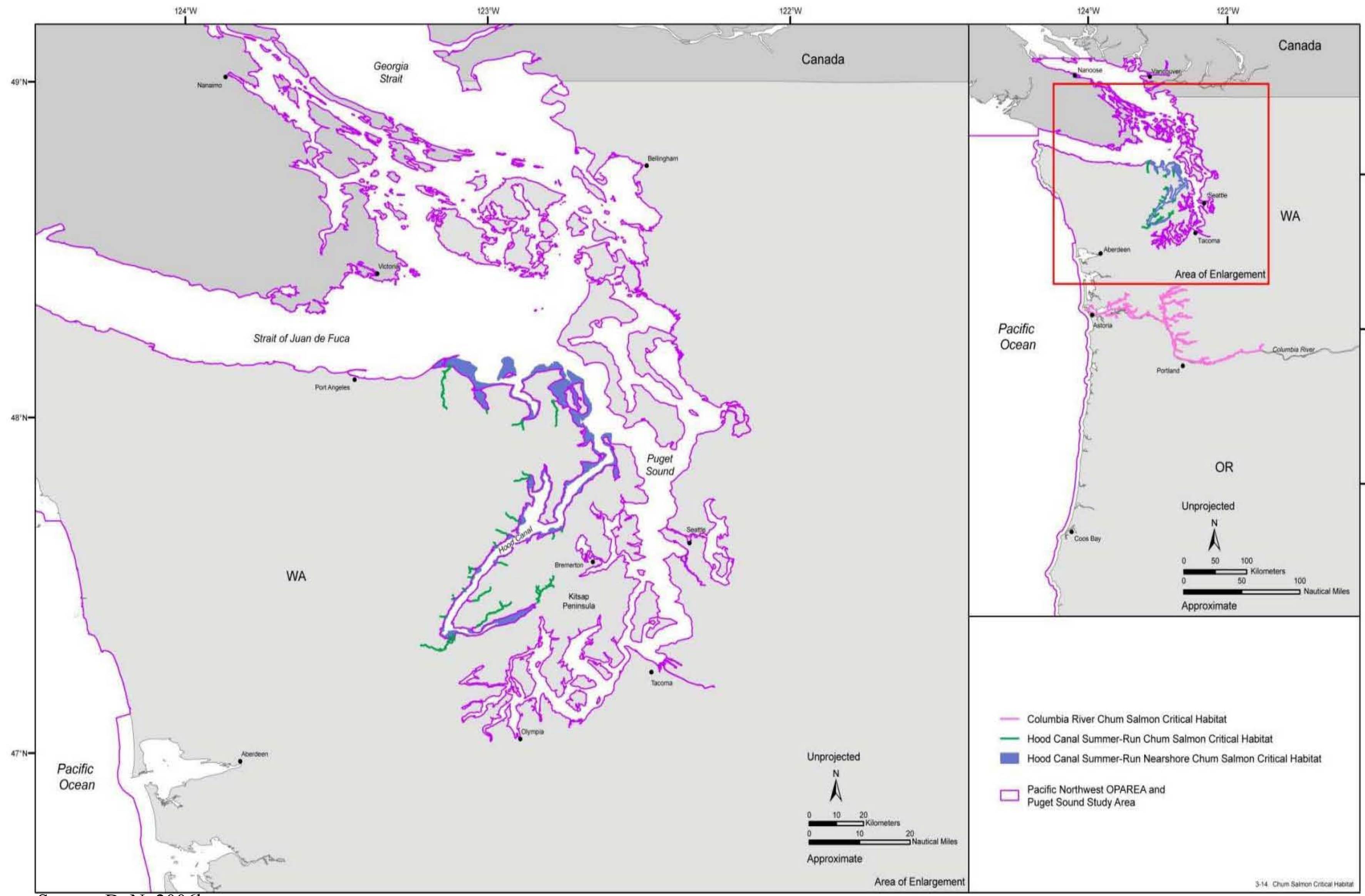
Critical habitat was designated for Hood Canal summer-run chum ESU salmon on September 02, 2005 by NMFS (70 FR 52630), with an effective date of January 02, 2006 (70 FR 52630). Critical habitat extends from extreme high tide to a depth of 30 m relative to MLLW, i.e. habitat typically within the photic zone, which is important for rearing, migrating, and maturing salmon and their prey (primary constituent elements). Nearshore marine waters within Hood Canal were included as part of this designation. Although critical habitat occurs in northern Hood Canal waters adjacent to the base, NBK at Bangor is excluded from critical habitat designation for ESA-listed Hood Canal summer-run chum salmon by federal law (70 FR 52630). As a result, no Hood Canal summer-run chum salmon critical habitat occurs in the immediate vicinity of the project area, although critical habitat does occur within northern Hood Canal as shown in Figure 3-9. The closest critical habitat occurs immediately beyond the northern and southern base boundaries.

Distribution, Behavior, and Ecology

Hood Canal summer-run chum migrate through the intertidal and nearshore waters of NBK at Bangor; however, spawning populations have not been found in base streams (DoN, 2001a). Most summer chum juveniles originate from streams on the western shore of Hood Canal and cross Hood Canal following surface freshwater flows from the tip of Toandos Peninsula to the Bangor waterfront at NBK (Salo et al., 1980). Surveys conducted along the shoreline of NBK at Bangor in 2005 through 2008 found large numbers of chum salmon along the Bangor shoreline (Figure 3-8); however, these chum were identified as part of the fall-run chum population rather than the summer-run.

During out-migration, fry move within the nearshore corridor and into and out of sub-estuaries with the tides, most likely in search of food resources (Hirschi et al., 2003). At a migration rate of 4.4 miles (7 km) per day, the majority of chum emigrants from southern Hood Canal exit the canal to the north 14 days after their initial emergence in seawater (WDFW and PNPTT, 2000). Juvenile summer-run chum are expected to occur near the proposed site from late January through early April, with a peak in late March (Prinslow et al., 1980; Salo et al., 1980; Bax, 1983; WDFW and PNPTT, 2000; SAIC, 2006; Bhuthimethee et al., 2009).

Approximately one month separates peak spawn timing of the early (summer) and later (fall) runs of chum salmon in Hood Canal (Johnson et al., 1997). Summer-run chum are, in part, distinguished from fall chum populations by their exclusive use of nearshore marine habitat early in the run period (early August to October). Summer-run chum adults return to Hood Canal from as early as August and September through the first week in October (WDF et al., 1993; WDFW and PNPTT, 2000) (Table 3.14).



Source: DoN, 2006b.

Figure 3-9 Critical habitat designated for Hood Canal summer-run chum salmon in Puget Sound

TABLE 3.14 SPAWNING PERIOD, PEAK, AND 90 PERCENT SPAWN TIMING OF ADULT STOCKS OF HOOD CANAL SUMMER-RUN CHUM

Stock	Time Period Detected in Hood Canal [1]	Spawn Time Period and Peak	Date at which 90 Percent of Spawning is Complete
Big/Little Quilcene	Early September to Mid-October	Mid-September to Mid-October	10/1 – 10/5
Lilliwaup Creek	Early September to Mid-October	Mid-September to Mid-October	10/10
Hamma Hamma	Early September to Mid-October	Mid-September to Mid-October	10/8 – 10/10
Duckabush	Early September to Mid-October	Mid-September to Mid-October	10/11
Dosewallips	Early September to Mid-October	Mid-September to Mid-October	10/9
Union	Mid-August to Early October	Early September to Early October	9/29 – 9/30

Source: WDFW, 2002; WDFW and PNPTT, 2000
Range of timing estimates from PNPTT and WDFW, in Appendix Report 1.2 (WDFW and PNPTT, 2000).

Puget Sound Steelhead

Status and Management

The Puget Sound steelhead (*Oncorhynchus mykiss)* was listed in May 2007 under the ESA as a federally threatened DPS (72 FR 26722). Stocks of the Puget Sound steelhead DPS are mainly winter-run, although a few small stocks of summer-run steelhead also occur (71 FR 15666). Eight stocks of winter-run and three stocks of summer-run Puget Sound steelhead occur in Hood Canal (WDFW, 2002). Some stocks of Puget Sound steelhead in Hood Canal (i.e., hatchery supplementation or hatchery releases to non-native streams) may not be considered part of the DPS (71 FR 15668).

Critical Habitat

No critical habitat has been designated for Puget Sound steelhead (72 FR 26722); therefore, critical habitat does not currently occur in the vicinity of NBK at Bangor, or within the project area. However, the NMFS issued an advance notice of proposed rulemaking and a request for information concerning the development of critical habitat for Puget Sound steelhead on January 10, 2011 (76 FR 1392).

Distribution, Behavior, and Ecology

Steelhead exhibit the most complex life history of any species of Pacific salmonid. Steelhead can be freshwater residents (referred to as rainbow trout) or anadromous (referred to as steelhead) and, under some circumstances, can yield offspring of the alternate life history form (72 FR 26722). Anadromous forms can spend up to seven years in fresh water prior to smoltification and then spend up to three years in salt water prior to migrating back to their natal streams to spawn (Busby et al., 1996). In addition, steelhead may spawn more than once during their life span, whereas other Pacific salmon species generally spawn once and die.

Steelhead do not occur in large numbers along the Bangor shoreline at NBK (Figure 3-8). Recently, the juvenile steelhead captured in 2005 through 2008 beach seine surveys were one of the least abundant of the salmonids captured along the Bangor waterfront at NBK, accounting for less than one percent of the salmonid catch (SAIC, 2006; Bhuthimethee et al., 2009). Steelhead occur most frequently in the late spring and early summer months.

Winter-run

Limited information is available regarding the timing of juvenile out-migration for winter-run steelhead in Hood Canal. The Washington Department of Fish and Wildlife (WDFW) suggests that juvenile out-migration of steelhead stocks in Hood Canal occurs from March through June, with peak out-migration during April and May (Johnson, 2006, personal communication).

Most stocks of winter-run steelhead in Hood Canal (Skokomish, Hamma Hamma, Duckabush, Quilcene/Dabob Bay, and Dosewallips) spawn from mid-February to early June (WDFW, 2002). Information published to date indicates adult spawn timing occurs from mid-February to early June (NMFS, 2005a; Hard et al., 2007) (Table 3.15).

TABLE 3.15 MIGRATION, SPAWNING PERIOD, AND PEAK WINTER-RUN STOCKS OF PUGET SOUND STEELHEAD

STOCK	TIME PERIOD DETECTED IN HOOD CANAL [1]	SPAWN TIME PERIOD [2]	PEAK SPAWNING
Tahuya winter-run	January through June	Early March to early June	May
Skokomish winter-run	January through mid-July	Mid-February to mid-June	May
Dewatto winter-run	January through June	Mid-February to early June	May
Union winter-run	Not identified	Mid-February to early June	Unknown
Hamma Hamma winter-run	Not identified	Mid-February to early June	Unknown
Duckabush winter-run	Not identified	Mid-February to early June	Unknown
Quilcene/Dabob Bay winter-run	Not identified	Mid-February to early June	Unknown
Dosewallips winter-run	Not identified	Mid-February to early June	Unknown

Source: Busby et al., 1996; WDFW, 2002.
1. Time period detected in Hood Canal, reported in Busby et al. (1996).
2. Spawning time reported in WDFW (2002).

Summer-run

Information regarding the timing of juvenile out-migration for summer-run steelhead in Hood Canal is not currently available. Spawn timing of summer-run steelhead in Hood Canal is not fully understood; however, spawning is believed to occur from February through April (WDFW, 2002).

Bull Trout

Status and Management

Currently, all populations of bull trout in the lower 48 states are listed as federally threatened under the ESA. Bull trout are in the char subgroup of salmonids and have both resident and migratory life histories (64 FR 58910). The Coastal-Puget Sound bull trout DPS reportedly contains the only occurrence of anadromous bull trout in the contiguous United States (64 FR 58912); Hood Canal is one of five geographically distinct regions within this DPS. All Hood Canal bull trout originate in the Skokomish River (WDFW, 2004).

In May 2004, the USFWS released the Draft Recovery Plan for the Coastal-Puget Sound DPS of bull trout. The Test Pile Program project area is located within the Olympic Peninsula Management Unit which includes six core areas important for recovery. A "core area" represents a combination of both suitable habitat as well as a demographically dependent grouping of one or more local populations. Specifically, core areas consist of core habitat that could supply all the necessary elements for every life stage of bull trout (e.g., spawning, rearing, migration, overwintering, foraging) and have one or more populations of bull trout.

Critical Habitat

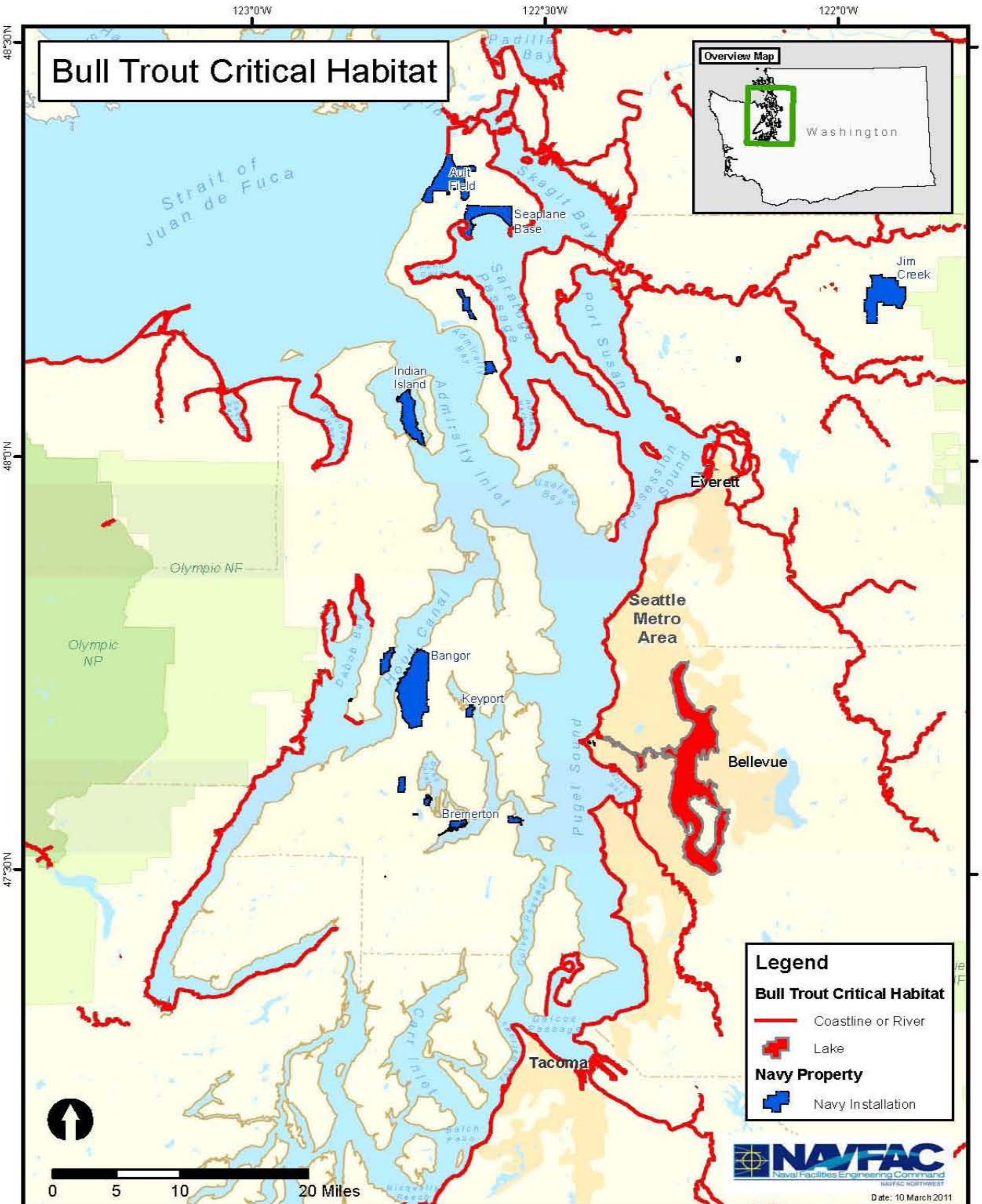
Critical habitat was initially designated for bull trout on 26 September 2005 (70 FR 56212). On October 18, 2010 the critical habitat for bull trout was updated, including the addition of nearshore areas of Hood Canal south of the project area (75 FR 63898). The geographic boundaries of both the original and the updated designations do not overlap with the project area (Figure 3-10). Therefore, there is no designated critical habitat in the project area.

Distribution, Behavior, and Ecology

Bull trout within the Olympic Peninsula Management Unit exhibit all known migratory life history forms of this species, including fluvial (fish that migrate from tributaries to larger rivers to mature), adfluvial (fish that migrate from tributaries to lakes or reservoirs to mature), and anadromous (fish that migrate to the ocean to grow and live as an adult and return to freshwater to spawn). Additional bull trout surveys may document resident life forms (non-migratory fish, living in tributaries for their entire lives) as well, which are not yet documented on the Olympic Peninsula.

Bull trout are known to occur within many of the drainages within the greater Puget Sound area including the Skokomish River in Hood Canal, but are not known to occur in any tributary systems at NBK at Bangor (DoN, 2008). Bull trout require snow-fed glacial streams and since there are none on the Kitsap Peninsula they would not be expected in any streams at NBK at Bangor or in any other streams on the Kitsap Peninsula. Therefore their occurrence in the study area is limited to the marine waters.

The Skokomish River basin (located at the extreme south end of Hood Canal) is made up of three distinct bull trout stocks. Very little information exists regarding the life history of this



Source: DoN, 2006b.

Figure 3-10 Critical habitat designated for bull trout Puget Sound

stock, as well as no harvest, escapement, or run-size data (SAIC, 2001). Bull trout prey upon sand lance, surf smelt, and herring, as well as other species. Sand lance are known to spawn at and near Floral Point, so it is possible that foraging bull trout may be present along the nearshore areas of NBK at Bangor to take advantage of this food source. Due to the distance between Floral Point and the Skokomish River (over 40 miles [64 km]), bull trout occurrence at NBK at Bangor and within the project area is anticipated to be occasional and rare, if it occurs at all (DoN, 2004; DoN, 2005).

Bull trout in the Skokomish River system are believed to spawn from mid-September to December (WDFW, 2004). Although Hood Canal bull trout likely migrate through the Bangor waterfront at NBK, neither historic nor recent juvenile fish surveys (using beach and lampara seines and tow nets) have captured bull trout (Schreiner et al., 1977; Salo et al., 1980; Bax, 1983; SAIC, 2006; Bhuthimethee et al., 2009). For the species as a whole, emergence of fry generally occurs from early April to May (64 FR 59810). Not enough is known to specify the duration of juvenile out-migration specifically for Hood Canal (WDFW, 2004).

Bocaccio

Status and Management

The Puget Sound/Georgia Basin bocaccio DPS was listed as federally endangered throughout all of their range on April 28, 2010 (75 FR 22276). The designation area of Puget Sound/Georgia Basin encompasses the inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia.

Critical Habitat

Critical habitat has not been designated for this species.

Distribution, Behavior, and Ecology

Bocaccio (*Sebastes paucispinis*), a species of rockfish, range from Punta Blanca, Baja California, to the Gulf of Alaska, Alaska (Love et al., 2002). They are believed to have commonly occurred along steep walls in most of Puget Sound prior to fishery exploitations, although they are currently very rare in these Puget Sound habitats (Love et al., 2002). Little is known about the habitat requirements of most rockfishes despite the years of research already performed. Even less is known about bocaccio in Puget Sound (Drake et al., 2008; Palsson et al., 2009). Much of the information presented below on bocaccio life history and habitat use is derived from other areas where bocaccio occur.

Adult bocaccio inhabit waters from approximately 40 – 1,570 feet, but are most common at depths of 160-820 feet (i.e., greater than the project depth). Although bocaccio are typically associated with hard substrate, they may wander into mud flats presumably because they can be located as much as 98 feet off the bottom.

General life history information for Bocaccio is provided in Table 3.16. Bocaccio mature at four years of age with 100 percent maturity occurring at 22 inches (3 years) for males and 24 inches (8 years) for females (Wyllie Echeverria, 1987). Bocaccio can live up to 50 years, growing to 36 inches (91 cm) in size (Palsson et al. 2009). Young bocaccio are preyed upon by least terns, lingcod, other rockfish, Chinook salmon, and harbor seals (Love et al., 2002).

TABLE 3.16 GENERAL LIFE HISTORY OF BOCACCIO OF THE NORTHEAST PACIFIC OCEAN

	Larvae	Pelagic Juvenile	Settling Juvenile to Sub-adult	Mature Adult
Age	0	~1 month	3.5–5.5 months	3–4 years
Size (inches)	0.16–0.2	0.6–1.2	1.5	24
Habitat	pelagic	near water surface; associated with drifting kelp	shallow, over algae covered rocks or sand areas with eelgrass or drift algae; move to deeper water as they age; juvenile seen recruiting to oil platforms in central and southern California	deep water (typically seen at 165–825 feet but as deep as 1,578 feet), over high relief boulder fields and rocks; can be found 100+ feet over substrata; sometimes in caves and crevices
Time period	Dec–April		Feb–Aug, peak May–July	
Diet	microplankton	opportunistic feeder: fish larvae, zooplankton	opportunistic feeder: fish larvae, zooplankton	rockfishes, hake sablefish, northern anchovies, lanternfish, and squid

Source: Phillips, 1964; Matarese et al., 1989; Love et al., 2002.

Bocaccio release larvae in January, continuing through April off the coast of Washington. Larval and pelagic juvenile bocaccio drift into the nearshore, near the water surface, associated with drifting kelp mats (Love et al., 2002).

The young bocaccio settle the nearshore environment at three to four months of age (~1.5 inches in size), where the species prefer shallow waters over algae-covered rocks, or in sandy areas where eelgrass beds or drift algae are present (Love et al., 1991; 2002). As juveniles, bocaccio rockfish inhabit relatively shallow water, compared to adults, and are often found in large schools (Eschemeyer et al., 1983).

As bocaccio grow older, they move into deeper waters with adults found over high relief boulder fields and rocks. They can occur well off the bottom (over 100 feet above the substrata) or as deep as 900 feet [274 meters] (Love et al., 2002).

Larval fish feed upon microplankton, but juveniles are more opportunistic feeders (e.g. fish larvae, copepods, krill) (Love et al., 2002; Phillips, 1964; Sumida and Moser, 1984). Larger juveniles and adults feed upon other rockfishes, hake, sablefish, northern anchovies, lanternfish, and squid (Phillips, 1964; Eschemeyer et al., 1983; Sumida and Moser, 1984).

Adult bocaccio feed exclusively on fish, whereas juveniles consume both smaller fishes and zooplankton. In Puget Sound, most bocaccio are reportedly found near Point Defiance and Tacoma Narrows. Bocaccio have always been rare in northern Puget Sound. An approximate estimate of bocaccio abundance in Puget Sound Proper (Whidbey Island and south, including the project area) was only 100 individuals during the 1980s (74 FR 18516).

Bocaccio have never been observed during WDFW bottom trawl, video, or dive surveys in Puget Sound (Moulton and Miller, 1987; Palsson et al., 2009). However, Palsson et al. (2009) investigated historic fish catch records and reported only two known instances of bocaccio captures in Hood Canal. Note that recreational fishing records reflect observed frequencies, not observed densities. Although there have been no confirmed observations of bocaccio in Puget Sound for approximately seven years (74 FR 18516), Drake et al. (2008) concluded that it is likely that bocaccio occur in low abundances. As a result, bocaccio have the potential to occur within the action area.

Canary Rockfish

Status and Management

On April 28, 2010 the Puget Sound/Georgia Basin canary rockfish DPS was listed as federally threatened under the ESA (75 FR 22276) throughout all of their range. This designation encompasses the inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia.

Critical Habitat

Critical habitat has not been designated for this species.

Distribution, Behavior, and Ecology

Canary rockfish (*Sebastes pinniger*) range from Punta Blanca, Baja California, to the Shelikof Strait of Alaska, and are abundant from British Columbia to central California. Canary rockfish were once considered fairly common in the greater Puget Sound area (Holmberg et al., 1967; Kincaid, 1919); these deepwater species most likely occur in north and south basins to South Sound (Palsson et al., 2009) however, little is known about their habitat requirements and occurrence in the waters in the project area vicinity (Drake et al., 2008; Palsson et al., 2009). Much of the information presented below on canary rockfish life history and habitat use is derived from research from other areas where canary rockfish are more abundant.

Adult canary rockfish can live to be 84 years old and have been measured at 30 inches (76 cm) in size (Palsson et al., 2009). Canary rockfish have been recorded to reach maturity at seven to nine years old (16 to 18 inches [41-46 cm]) in females and seven to twelve years (16 inches [41 cm]) in males (Palsson et al., 2009; Love et al., 2002).

General life history information for canary rockfish is provided in Table 3.17. Adults release larvae (0.1 to 0.2 inches [0.25 – 0.51 cm]) between September and March with peaks in December and January off the Oregon and Washington coasts (Wyllie Echeverria, 1987). Larvae and pelagic juveniles (0.5 to 0.8 inch [1.27 – 2.03 cm]) are found in the upper 330 feet (101 m) of the water column from January until about March when they start to move into intertidal areas (tide pools, rocky reefs, kelp beds, cobble areas), although some juveniles remain pelagic in much deeper water until July (Love et al., 2002). Juveniles may occupy rock-sand interfaces near 50-65 feet (15- 20 m) during the day, and then move to sandy areas at night.

TABLE 3.17 GENERAL LIFE HISTORY OF CANARY ROCKFISH OF THE NORTHEAST PACIFIC OCEAN

	Larvae	Pelagic Juvenile	Settling Juvenile to Sub-adult	Mature Adult
Age	0	1–3 month	3–4 month	7–9 years (female), 7–12 years (male) in Oregon
Size (inches)	0.1–0.2	0.5–0.8		16–20 (female), 16–17 (male)
Habitat	upper 330 feet of water column, pelagic	upper 330 feet of water column, associated with drifting kelp	intertidal tide pools and kelp beds, move to deeper water as they age	deep water (typically 264–660 feet), aggregate around pinnacles and high-relief rock with substantial current, sometimes over flat rock and mixed mud-boulder habitat near the ocean bottom
Time period	Nov–Feb, peak in Jan–Feb		April-July	
Diet	microplankton	opportunistic feeder: fish larvae, zooplankton	opportunistic feeder with open water or benthic prey: fish larvae, copepod, amphipod, krill egg and larvae	krill, gelatinous zooplankton, shortbelly rockfish, anchovy, lanternfish, and sanddab

Source: Phillips, 1964; Matarese et al., 1989; and Love et al., 2002.

Diets of juveniles consist of open water and benthic prey, including copepods, amphipods, and krill eggs and larvae. Juvenile canary rockfish emerge to become long and thin-bodied with large heads, growing into adult fish that are primarily orange on a white background (Phillips, 1964; Love et al., 2002).

Adults and sub-adults feed on krill, gelatinous zooplankton, small lanternfishes, anchovies, sanddabs, and adult shortbelly rockfish (Phillips, 1964). Some juvenile canary rockfish predators include marine birds and mammals, lingcod, other rockfish, Chinook salmon, and other fishes (Love et al., 2002).

Adult canary rockfish typically inhabit waters from 160-820 feet (49 – 250 m), but some may occur at 1,400 feet (427 m) (i.e., greater than the project depth). Larger fish tend to occur in deeper water. Although canary rockfish are sedentary, some have been reported to migrate 435 miles (700 km) over several years.

Canary rockfish were once considered fairly common in the greater Puget Sound area. An approximate estimate of canary rockfish abundance in Puget Sound Proper was only 300 individuals during the 1980s (74 FR 18516). Drake et al. (2008) concluded that canary rockfish occur in low and decreasing abundances in Puget Sound. Therefore, canary rockfish have the potential to occur within the action area.

Yelloweye Rockfish

Status and Management

The Puget Sound/Georgia Basin yelloweye rockfish DPS has been listed as federally threatened under the ESA (75 FR 22276) throughout all of their range on April 28, 2010. The designation area of Puget Sound/Georgia Basin encompasses the inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia.

Critical Habitat

Critical habitat has not been designated for this species.

Distribution, Behavior, and Ecology

Yelloweye rockfish are found from Ensenada, Baja California, to the Aleutian Islands in Alaska. They are abundant from southeast Alaska to central California. Yelloweye rockfish are more common in northern Puget Sound compared with southern Puget Sound presumably because rockier habitat is available in northern Puget Sound. An approximate estimate of yelloweye rockfish abundance in Puget Sound Proper was only 1,200 individuals during the 1980s (74 FR 18516). Hood Canal has the greatest frequency of yelloweye rockfish observed in both trawl and scuba surveys conducted by WDFW (Palsson et al., 2009).

Yelloweye rockfish is a deep-water species that is relatively sedentary living in association with high relief rocky habitats and often near steep slopes (Palsson et al., 2009; Love et al., 2002; Wang, 2005). Yelloweyes move into deeper water as they grow into adults, continuing to associate with caves and crevices and spending large amounts of time lying on the substratum, sometimes at the base of rocky pinnacles and boulder fields (Love et al., 2002).

General life history information for yelloweye rockfish is provided in Table 3.18. Yelloweye become mature at 19-22 years of age, growing up to 91 cm in size. The mean maximum age is 118 years of age (Palsson et al., 2009). Yelloweye release larvae from April to September with a hiatus in June and July (Palsson et al., 2009). Larvae and juveniles remain pelagic for up to 2 months, settling to shallow, high relief zones, crevices, and sponge gardens (Love et al., 2002).

TABLE 3.18 GENERAL LIFE HISTORY OF YELLOW EYE ROCKFISH OF THE NORTHEAST PACIFIC OCEAN

	LARVAE	PELAGIC JUVENILE	SETTLING JUVENILE TO SUB-ADULT	MATURE ADULT
Age	0	1–2 month	2 month	19–22 years
Size (inch)	0.16–0.2	0.2–1	1	18–18.4 (female), 18–21.6 (male)
Habitat	> 48 feet; pelagic	> 48 feet; pelagic	shallow, high relief zones, crevices, and sponge gardens; move to deeper water as they mature	deep water (typically seen at 300–600 feet, but as deep as 1,800 feet), associated with caves and crevices, lying on the substratum; sometimes at the base of rocky pinnacles and boulder fields; all life stages seen around oil platforms in southern California
Time period	Apr–Aug, peak around May–Jun		about 2 months after release	
Diet	microplankton	opportunistic feeder: fish larvae, zooplankton	opportunistic feeder: fish larvae, copepods, amphipods, krill egg and larvae	rockfish, herring, sand lance, flatfish, shrimp, crab, and lingcod egg

Source: Matarese et al., 1989; Love et al., 2002.

Yelloweye larvae and juveniles are opportunistic feeders, preying upon fish larvae, copepods, amphipods, krill eggs, and larvae. Adult diets consist of rockfishes, herring, sand lance, flatfishes, shrimps, crabs, and lingcod eggs (Love et al., 2002). In South Sound, yelloweye rockfish are known to feed on fish, especially walleye pollock (*Theragra chalcogramma*), cottids, poachers, and Pacific cod (*Gadus macrocephalus*) (Washington et al., 1978).

Adult yelloweye rockfish inhabit waters from 80-1,560 feet (24 – 476 m), but they are most common at depths of 300-590 feet (91 – 180 m) (i.e., greater than the project depth). They are typically solitary, but sometimes form aggregations near rocky substrate. Juveniles occur in shallower waters compared with larger adults. Approximately 50% of the fish reach maturity at age-6 (~16 inches [41cm]). Their home range is typically relatively small, but adult rockfish have the potential to move long distances. While it is known that yelloweye rockfish occur in Hood Canal, it is unknown to what extent they occur within the immediate vicinity of NBK at Bangor.

Green Sturgeon

Status and Management

The southern DPS of green sturgeon (*Acipenser medirostris*) was listed as federally threatened on April 7, 2006 (71 FR 17757).

Critical Habitat

On October 9, 2009 NMFS designated critical habitat for the green sturgeon (74 FR 52300). There is no critical habitat established within the vicinity of Hood Canal or NBK at Bangor for green sturgeon.

Distribution, Behavior, and Ecology

Green sturgeon are the most broadly distributed, wide-ranging, and most marine-oriented species of the sturgeon family. The green sturgeon is anadromous and it ranges from Baja California to at least Alaska in marine waters, and is observed in bays and estuaries up and down the west coast of North America (Moyle et al., 1995). The actual historical and current distribution of where this species spawns is unclear because green sturgeon make non-spawning movements into coastal lagoons and bays in the late summer to fall, and because their original spawning distribution may have been reduced due to harvest and other anthropogenic effects (Adams et al., 2007). Green sturgeon spawn in the Rogue River, Klamath River Basin, the Sacramento River, and possibly in a few other tributaries along the west coast. Green sturgeon are not known to spawn in Washington rivers but they may occur in Puget Sound and its estuaries (Adams et al., 2007). A number of green sturgeon were found stranded in mudflat pools of Port Susan as the tide receded in spring 2009.

Green sturgeon congregate in coastal bays and estuaries in late summer and early fall, with particularly large concentrations in the Columbia River Estuary, Willapa Bay, and Grays Harbor. Sturgeon live near bottom substrate where they consume benthic prey, including shrimp, mollusks, amphipods, and small fishes (Moyle et al., 1992). In Puget Sound, sturgeon likely use Admiralty Inlet as a migration corridor as they move to and from Puget Sound estuaries. Low harvests of green sturgeon in Puget Sound suggest they are less abundant there compared with coastal estuaries. Based on available information, green sturgeon are not likely to occur in the project area.

Pacific Eulachon/Smelt

Status and Management

In March 2010, NMFS listed the southern DPS of Pacific eulachon (*Thaleichthys pacificus*) as federally threatened (75 FR 13012). Most spawning runs within the eulachon range have declined in the past 20 years, especially since the mid-1990s (74 FR 10857). The primary factor responsible for the decline of the southern DPS is climate change and its effects on ocean conditions and freshwater hydrology and other environmental factors. Directed commercial fishing for eulachon was identified as a low to moderate threat, whereas bycatch in other commercial fisheries (e.g., shrimp) was a moderate threat to the species. Dams and water diversions are considered moderate threats as well. Although eulachon catch harvests have been limited in response to population declines, these existing regulatory mechanisms may be inadequate to recover stocks (74 FR 10857).

Critical Habitat

Critical habitat was recently proposed for Pacific eulachon on January 05, 2011 (76 FR 515). The proposed listing does not include any marine waters of Puget Sound or tributaries to Puget Sound. Therefore, there is no designated critical habitat for Pacific eulachon in the project area.

Distribution, Behavior, and Ecology

Eulachon are anadromous fish, spawning in freshwater systems and spending their juvenile and adult lives in marine waters. Eulachon are important ecologically, providing a food source for a wide variety of organisms such as birds, marine mammals, and fish in both marine and freshwater ecosystems (WDFW, 2001).

Although eulachon range from northern California to western Alaska, the southern DPS of eulachon consists of populations spawning in rivers south of the Nass River in British Columbia, Canada to, and including, the Mad River in California (74 FR 10857). The major production areas include the Columbia and Fraser Rivers and may have historically included the Klamath River. Historically, the Columbia River supported approximately 50 percent of the total population abundance. However, commercial harvests of eulachon in the Columbia River declined from approximately 500 metric tons during 1915-1992 to less than 5 metric tons in 2005-2008. The Fraser River population also declined sharply. Canada is presently reviewing the status of eulachon in British Columbia to determine whether it deserves protection under its Species at Risk Act (SARA).

Eulachon typically spend three to five years in nearshore marine waters up to 1,000 feet (300 m) in depth, except for the brief spawning runs into their natal (birth) streams from late winter through early summer. Eulachon adults return to freshwater to spawn at three to five years of age and most eulachon die after spawning; however, some eulachon have the ability to spawn repeatedly (WDFW, 2001).

Eulachon occur infrequently in coastal rivers and tributaries to Puget Sound, Washington. Eulachon presence in Hood Canal is rare. NMFS (2010) reported no historical catch records of eulachon in Hood Canal; however, very low numbers of eulachon were caught in the NBK at Bangor shoreline surveys from 2005 through 2008. Based on available information Pacific eulachon may occur in the project area.

3.8.1.3 Non-ESA Listed Fish

Pacific Herring

Pacific herring (*Clupea pallasii*) are small schooling fish distributed along the Pacific coast from Baja California, Mexico, to the Bering Sea and northeast to the Beaufort Sea, Alaska. Adult herring feed primarily on planktonic crustaceans, and juveniles demonstrate a preference for crab and shrimp larvae. Herring are also an important food resource for other species in Puget Sound waters. The majority of herring spawning in Washington State waters occurs annually from late January through early April (Bargmann, 1998). Herring deposit their transparent eggs on intertidal and shallow subtidal eelgrass and marine algae. Although large spawning areas are found elsewhere in Hood Canal (Stick and Lindquist, 2009), there are no documented herring spawning grounds at NBK at Bangor. Based on recent surveys, Pacific herring have been detected in small numbers during late winter months and larger numbers in early summer months at NBK at Bangor (SAIC, 2006; Bhuthimethee et al., 2009). During the 2005 and 2006 beach seine surveys, Pacific herring represented 73 percent of all forage fish captured (SAIC, 2006). However, no herring were captured near the project area.

Surf Smelt

Surf smelt (*Hypomesus pretiosus*) are small schooling fish distributed along the Pacific coast from Long Beach, California, to Chignik Lagoon, Alaska and are most abundant at NBK at Bangor in late spring through summer (SAIC, 2006; Bhuthimethee et al., 2009). During the 2005 through 2006 beach seine surveys, surf smelt were second in abundance for all forage fish captured (20 percent of the forage fish catch) (SAIC, 2006). Adult surf smelt feed primarily on planktonic organisms and have shown a preference for euphausiids (krill). As with herring, these fish are an important component in Puget Sound, both as a food resource in the marine food web and as part of the commercial fishing industry. In surveys conducted from May 1996 through June 1997, Penttila (1997) found no surf smelt spawning grounds at NBK at Bangor; however, juvenile surf smelt have been found to rear in nearshore waters (Bargmann, 1998) and were detected along the shoreline near the Test Pile Program project area from January through the mid-summer months (SAIC, 2006; Bhuthimethee et al., 2009). Although previous surveys have not indicated the presence of spawning grounds near the Test Pile Program project area, surf smelt are believed to spawn throughout the year in Hood Canal, with the heaviest spawn occurring from mid-October through December. It is expected that surf smelt will be present in the project area year round; however, they will most likely be present in larger abundances during the peak spawning time.

Pacific Sand Lance

The Pacific sand lance (*Ammodytes hexapterus*), another small schooling fish, occurs throughout the coastal northern Pacific Ocean between the Sea of Japan and southern California, across Arctic Canada, and throughout the Puget Sound region. All life stages of sand lance feed on planktonic organisms, primarily crustaceans, with juveniles showing a preference for copepods. As with other forage fish, the Pacific sand lance is an important part of the trophic link between zooplankton and larger predators in local marine food webs. Bargmann (1998) indicates that 35 percent of all juvenile salmon diets and 60 percent of the juvenile Chinook diet, in particular, are sand lance. Other regionally important species (such as Pacific cod, Pacific hake, and dogfish) feed heavily on juvenile and adult sand lance.

Pacific sand lance are the third most abundant forage fish at NBK at Bangor, comprising seven percent of the forage fish catch (SAIC, 2006). Excellent documented spawning substrate and nearly pristine backshore (Long et al., 2005) in the vicinity justifies conservation efforts to preserve spawning habitat.

Sand lance spawning activity occurs annually from early November through mid-February. Sand lance deposit eggs on a range of nearshore substrates, from soft, pure, fine sand beaches to beaches armored with gravel up to 1.2 inches (3 cm) in diameter; however, most spawning appears to occur on the finer-grained substrates (Bargmann, 1998). Spawning occurs at tidal elevations ranging from 5 feet (1.5 m) above to about the mean higher high water (MHHW) line. Similar to juvenile surf smelt, juvenile sand lance have been detected near the project area from January through the mid-summer months (SAIC, 2006; Bhuthimethee et al., 2009) (Figure 3-11). Most of these juveniles were captured in sheltered cove-like areas of the nearshore and were in schools mixed with surf smelt and larval sand lance. Adult, juvenile, and larval sand lance are expected to be present in the project area throughout the year.

3.8.2 Environmental Consequences

3.8.2.1 No Action Alternative

Under the No Action Alternative the Test Pile Program would not be conducted. Baseline conditions for fish, as described above, would remain unchanged. Therefore, there would be no significant impacts to fish from implementation of the No Action Alternative.

3.8.2.2 Proposed Action

The evaluation of impacts to marine fish and their habitat considers whether the species is listed under the ESA, the species has important fishery value as a commercial or recreational resource (including EFH protected under the MSFCMA), a specific group has particular sensitivity to the proposed action's activities, and/or a substantial or important component of the group's habitat would be lost under the Test Pile Program.

Marine habitats used by fish species that occur along the Bangor waterfront at NBK include offshore (deeper) habitat, nearshore habitats (intertidal zone and shallow subtidal zone), and other habitats, including piles used for structure and cover. The primary impacts to marine fish from the Test Pile Program would be related to noise associated with impact and vibratory pile driving and changes in turbidity (a component of water quality) in nearshore habitats. The most important impact to fish associated with pile driving would occur when underwater noise is being generated by impact pile driving, and to a lesser extent, vibratory pile driving. Pile driving and removal could impact fish and marine habitats in the project area by the generation of underwater sounds that exceed the thresholds for fish, established for both behavior and injury (Figure 3-12). Pile driving and removal could also locally increase turbidity and disturb benthic habitats and forage fish in the immediate project vicinity, however, these effects would be short-term and localized. However, measures described in Section 4.3 Mitigation Measures and Regulatory Compliance would reduce the likelihood of adverse impacts to these species. These potential impacts to fish and habitats are analyzed in detail below.

3.8.2.2.1 Potential Direct Effects of the Proposed Action

<u>Pile Installation and Removal</u>

As described in Section 3.9.2.2.2 (Underwater Noise), pile installation and removal within the project area would result in increased underwater noise levels. Underwater sound levels likely to result from unattenuated impact pile driving during the Test Pile Program would be 195 dB re:1μPa (RMS), 210 dB re:1μPa (PEAK), and 185 dB re:1μPa^2-sec (SEL) at 10 meters. The use of sound attenuation devices during impact pile driving would reduce these initial sound pressure levels by -10 dB. Underwater sound levels likely to result from vibratory pile driving would be 180 dB re:1μPa (RMS) at 10 meters. Since many fish use their swim bladders for buoyancy, they are susceptible to rapid expansion/decompression due to peak pressure waves from underwater

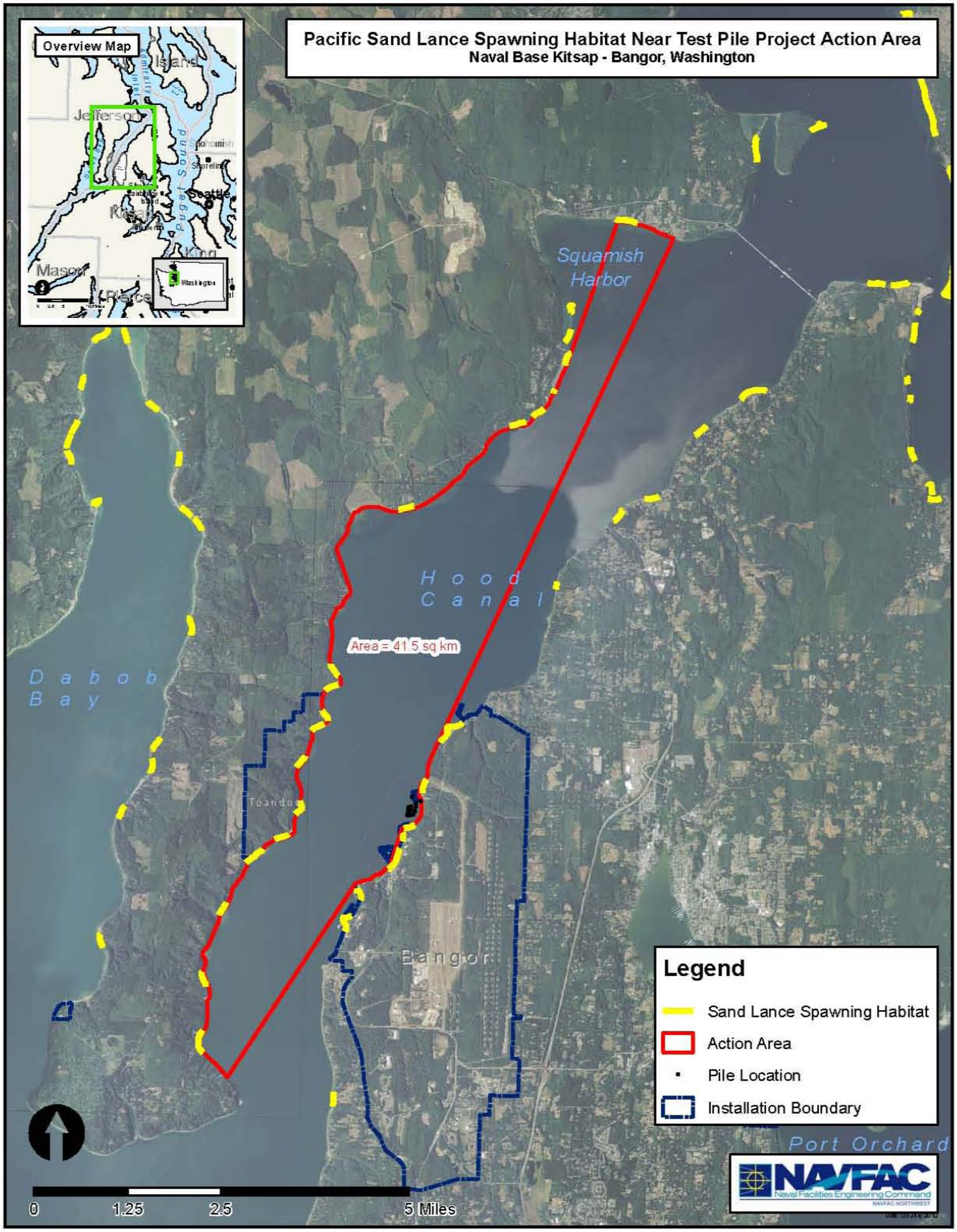


Figure 3-11 Pacific Sand Lance Spawning Habitat

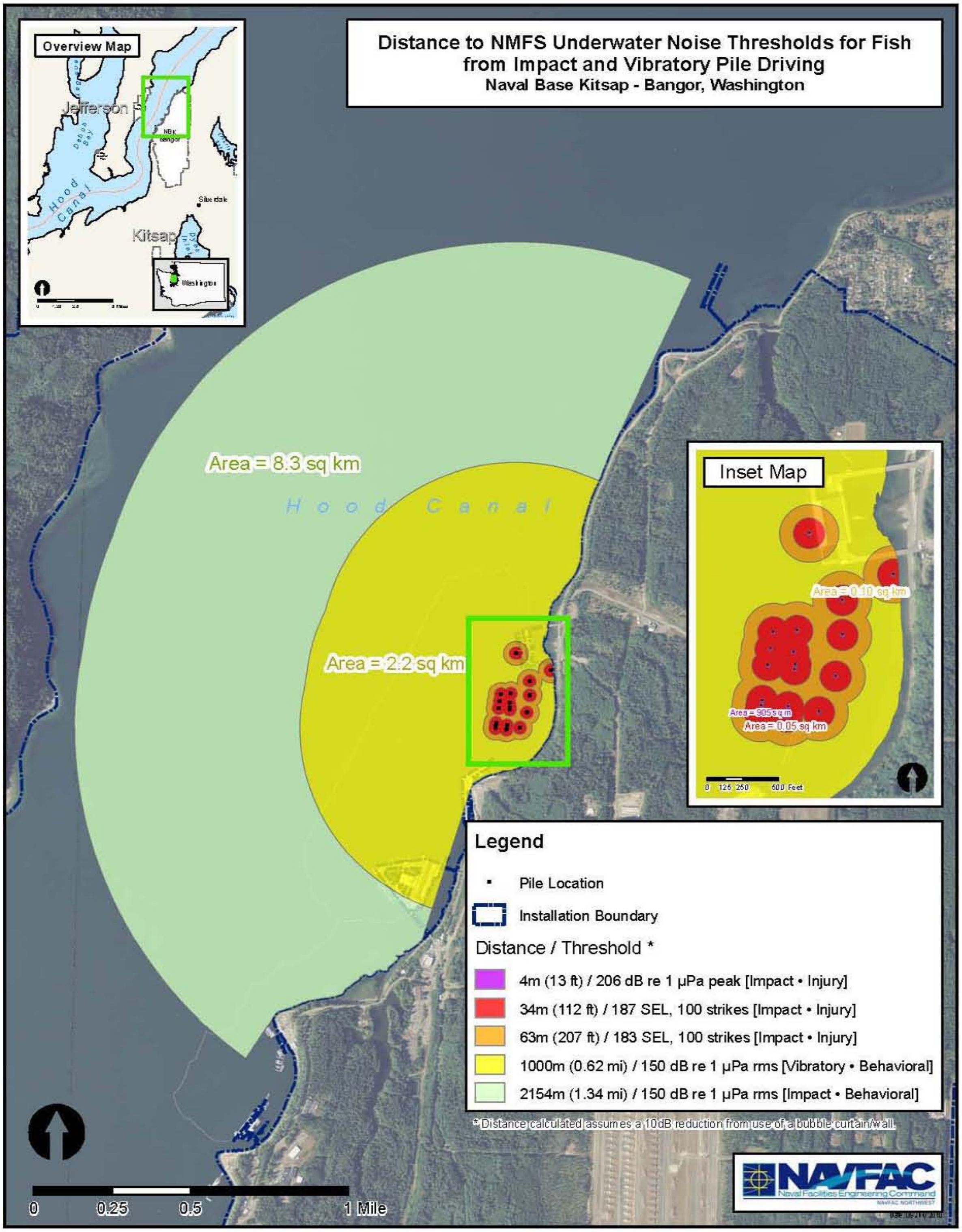


Figure 3-12 Distances to NMFS Underwater Noise Thresholds for Fish from Impact and Vibratory Pile Driving

noises (Hastings and Popper, 2005). At a sufficient level this exposure can be fatal. Recently, underwater noise effects criteria for fish were revised and accepted for in-water projects following a multi-agency agreement that included concurrence from National Oceanic and Atmospheric Administration Fisheries and the USFWS (Fisheries Hydroacoustic Working Group [FHWG], 2008). The underwater noise thresholds for fish for behavioral disturbance and the onset of injury are presented in Table 3.19. The Navy evaluated the distance at which pile driving noise would meet or exceed these thresholds, resulting in zones within the water column where behavioral or injurious effects could occur. However, due to the absence of any data from which the density of fish species could be determined, the Navy was unable to calculate the number or percent of the fish population that may be exposed to these effects within each zone. As a result, the remaining analysis presents the distance(s) from the pile at which these criteria or effects would be experience by fish and a qualitative assessment of the impacts that these sounds would have on the behavior and physiology of these animals.

TABLE 3.19 INTERIM CRITERIA AND DISTANCE TO EFFECT FOR FISH DURING PILE INSTALLATION AND REMOVAL

Effect	Size of Fish	Criteria	Distance (meters) to Effect for Impact Hammer without Attenuation	Distance (meters) to Effect for Impact Hammer with Attenuation	Distance (meters) to Effect for Vibratory Pile Driving
Onset of Injury	All Fish	206 dBpeak re: 1µPa	18	4	N/A
	Fish two grams or greater	187 dBSEL re: 1µPa^2-sec	158	34	N/A
	Fish less than two grams	183 dBSEL re: 1µPa^2-sec	293	63	N/A
Behavioral impacts[1]	All Fish	150 dBrms re: 1µPa	10,000	2,154	1,000

Source: FHWG, 2008
[1]Behaviorial criteria was not set forth by the FHWG, so as a conservative measure, NOAA Fisheries and USFWS generally use 150 dB rms as the threshold for behavioral effects to ESA-listed fish species (salmon and bull trout) for most biological opinions evaluating pile driving, however there are currently no research or data to support this threshold.

For impact pile driving, the underwater noise threshold criteria for fish injury from a single pile strike occurs at a sound pressure level of 206 dB peak pressure re: 1µPa. This sound level may be exceeded during impact pile driving within a circle centered at the location of the driven pile, out to a distance of approximately 60 feet (18 meters). To reduce the amount of sound energy produced and transmitted through the water from impact hammering, a sound attenuation device (i.e. Gunderboom SAS™, TNAP, confined bubble curtain and/or unconfined bubble curtain) will be used during all impact pile driving activities. A properly functioning sound attenuation device will reduce the initial sound pressure levels by -10 dB resulting in a smaller zone of acoustic injury or disturbance. With the use of a properly functioning sound attenuation device (-10 dB reduction), the injury zone would be decreased to a distance of approximately 13 feet (4 m).

Alternatively, fish can also be affected by the cumulative effects of underwater noise, and the extent of effects is evaluated by calculating the accumulated Sound Exposure Level (SEL), based on the number of strikes per day. For this project, an impact hammer could be used for up to 100 impact strikes per day. It is expected that any pile driven using an impact hammer would probably require more than one strike. Therefore, the applicable criteria for injury from impact pile driving to fish would be 187 dB accumulated SEL for a fish greater than or equal to 2 grams in weight, and 183 dB accumulated SEL for fish less than 2 grams in weight. The results of the cumulative noise analysis for this proposed action indicate that the 187 dB accumulated SEL threshold could be exceeded within a circle centered at the location of the driven pile out to a distance of approximately 34 meters (112 feet), and 63 meters (207 feet), respectively. These distances were calculated assuming a properly functioning sound attenuation device is used 9-10 dB reduction included in these distances), and that each pile would require 100 strikes with an impact hammer (FHWG, 2008) (Table 3.19 and Figure 3-12). Without the use of a sound attenuation device, these distances would increase to 158 meters (518 feet) for fish≥ 2 grams (187 dBSEL) and 293 meters (961 feet) for fish ≤ 2 grams (183 dBSEL). During pile driving, the associated underwater noise levels would result in behavioral responses, including avoidance of the project area, and would have the potential to cause injury. Average underwater baseline noise levels acquired along the NBK at Bangor waterfront were measured at a level of 114 dB re: 1μPa (Slater, 2009). Sound during impact pile driving would be detected above the average background noise levels at any nearby location in Hood Canal with a direct acoustic path (e.g., line-of-sight from the driven pile to the receiver location). During impact pile installation, the 150 dBrms re: 1μPa behavioral threshold would be exceeded within a circle centered at the location of the impact driven pile out to a distance of approximately 2,154 meters (1.34 miles) (in a direct line-of-sight manner) assuming properly functioning sound attenuation devices are used (10 dB reduction included for this distance). The affected area includes most of the Bangor waterfront at NBK and portions of the Toandos Peninsula shoreline (Figure 3-12). Locations beyond these points would receive lower noise levels because an interposing land mass would impede propagation of the sound.

Fish in the project area may display a startle response during initial stages of pile driving, and would likely avoid the immediate project vicinity during pile driving activities. However, field investigations of Puget Sound salmonid behavior, when occurring near pile driving projects (Feist, 1991; Feist et al., 1992), found little evidence that normally nearshore migrating salmonids move further offshore to avoid the general project area. In fact, some studies indicate that construction site behavioral responses, including site avoidance, may be as strongly tied to visual stimuli as to underwater sound (Feist, 1991; Feist et al., 1992; Ruggerone et al., 2008). Therefore, it could be assumed that salmonids may alter their normal behavior, including startle response and avoidance of the immediate project area, but occurrence within most of the 2,154 meters (1.34 miles) disturbance area would not likely change.

To further minimize the underwater noise impacts during pile driving, a vibratory hammer would be used to install all piles, with the impact hammer primarily used for proofing the piles to verify bearing load capacity, and not as the primary means to drive piles. When using the vibratory driver method, the distances at which the underwater noise thresholds occur (150 dBrms) would be reduced to 1,000 meters (3,280 feet) for behavioral disruption. There are currently no criteria for injury to fish from vibratory pile driving (Table 3.19 and Figure 3-12).

All pile driving activities would be conducted during July 16 – October 31 of the allowable in-water work period for projects within Washington state (July 16 to February 15) to reduce potential impacts to fish. NBK at Bangor fish surveys in the 1970s and 2005 to 2008 indicate that greater than 95 percent of the juvenile salmonids in this part of Hood Canal occur during the closure period of February 16 through July 15, when in-water work is not allowed (Schreiner et al., 1977; Salo et al., 1980; Bax, 1983; SAIC, 2006; Bhuthimethee et al., 2009).

However, adult salmonids occur in northern Hood Canal waters during the allowable in-water work period of July 16 through February 15. In addition, some juvenile salmonids would similarly occur, and may be impacted by elevated underwater sound during construction activities. To help protect these fish, a soft-start approach using the impact pile driver and vibratory hammer would be utilized to encourage fish to move away from the immediate project area before pile driving is at its maximum level (see Section 4.3), further reducing the number of fish potentially exposed to harmful levels of underwater sound. Section 4.1.1 contains a detailed description of the soft-start approach.

3.8.2.2.2 Potential Indirect Effects of the Proposed Action

Water and Sediment Quality

As discussed in Section 3.3, Water Resources, project-related impacts to water quality would be limited to temporary and localized changes associated with resuspension of bottom sediments during pile installation. Short-term exposure of fish to suspended sediments may occur as the sediment enters the water column. Factors potentially affecting salmonids and marine fish from temporary increases in turbidity could include damage to gill tissue, physiological stress, reduced foraging efficiency, and avoidance behavior.

Although large increases in turbidity have the potential to damage fish gills, the proposed project would only result in minimal and temporary increases of suspended sediments (see Section 3.3), and would not likely result in gill tissue damage to fish. Studies investigating similar impacts to fish (steelhead and coho salmon) from larger scale sediment dredging operations have shown that increased turbidity levels from these activities were insufficient to cause gill damage in salmonids (Redding et al., 1987; Servizi and Martens, 1991). Suspended sediments in high concentrations 9500 to 2,000 mg/L of suspended sediment) have been shown to cause physical stress is salmonids (Redding et al., 1987; Servizi and Martens, 1987). Behavioral responses of salmonids to elevated levels of suspended sediment include feeding disruption and changes in migratory behavior (Martin et al., 1977; Salo et al., 1980; Servizi, 1988). Salmonid foraging behavior can also be impaired by high concentrations of suspended sediment (Bisson and Bilby, 1982; Berg and Northcote, 1985; Redding et al., 1987). Behavioral changes include not rising to the surface to feed, reduction in prey location, and avoidance of areas of increased suspended sediment.

Therefore, while some degree of localized, short-term turbidity would be expected during pile driving and removal activities, unconfined salmonids and other fish are likely to avoid areas with elevated suspended sediment concentrations (Salo et al., 1980). As such, they would not be expected to experience physiological or behavioral stress from the proposed action. Based on these findings from larger scale sediment operations, salmonids and other fish in the immediate project vicinity would not be expected to experience gill tissue damage due to increased turbidity associated with in-water activities. In addition, elevated turbidity could also decrease the availability of prey in the immediate vicinity, as well as reduce the ability of salmonids and other fishes to detect and capture prey species, including forage fish.

As concentrations of organic matter in NBK at Bangor sediments are low, resuspension of these sediments is not expected to alter or depress dissolved oxygen (DO) below levels required by water quality standards. In surveys conducted along the Bangor waterfront at NBK from 2005 to 2006, DO at the Bangor waterfront at NBK was measured at levels below the EQ standard of 7.0 mg/L, but not below the level considered to have adverse impacts to fish (5 mg/L) (Newton et al., 2002). Such measurements were uncommon and occurred in considerably deeper water (20 to 60 meters [66 – 197 ft]). These low DO measurements may be associated with the seasonally low DO levels known for the deeper waters of Hood Canal. The Test Pile Program would result in no measurable decrease to existing DO levels at the NBK at Bangor waterfront or in Hood Canal in general. The proposed action would not result in violations of water quality standards for DO nor a local decrease in DO to a level impacting the health of fish and would, therefore, maintain water quality in the vicinity of the project area. However, existing low DO levels in the deeper waters of Hood Canal, particularly during late summer, could drive some deeper water species (e.g., rockfish) up into shallower waters where they may be more likely to be impacted by the proposed action.

The primary adverse impact to water quality from the Test Pile Program, including pile installation, barge and tug anchoring, and propeller wash, is suspension of bottom sediments and the formation of a turbidity plume in near-bottom waters. Resuspended sediments could cause the release of sediment-bound contaminants to near-bottom waters. However, sediments in the project site contain low concentrations of organic carbon (i.e., TOC) and are characterized as uncontaminated (Hart Crowser, 2000; Foster Wheeler, 2001; Hammermeister and Hafner, 2009). Therefore, increases in chemical contaminant concentrations in marine waters as a result of sediment resuspension during pile installation would be minor. Because suspended sediment and contaminant concentrations would be low, and exposures would be limited to the months from July to October, localized, acute, or chronic toxicity impacts would not occur.

Although some degree of localized changes in sediment grain size is expected during the Test Pile Program, due to fine-grained sediments dispersing and settling outside the project site, these impacts to sediment quality would be limited and localized to the general project area. Pile installation and removal activities would not discharge contaminants or otherwise appreciably alter the concentrations of trace metal or organic contaminants in bottom sediments.

The Test Pile Program would not impact water temperature or salinity because construction activities would not discharge waste into Hood Canal. Steel piles installed as part of the study would be inert and would not contain creosote or other contaminants that could be toxic or biologically available. Therefore, construction activities associated with the Test Pile Program would not result in significant adverse impacts to water temperature or salinity, and would not violate any water quality standards.

Watersheds

The Devil's Hole watershed, the only watershed at NBK at Bangor that drains into Hood Canal and supports returning anadromous salmonids (Bhuthimethee et al., 2009), is located approximately 5,280 feet (1 mile) to the south of the project area and would not be impacted by the project. Due to their distance of Devil's Hole and Cattail Lake (approximately 1.9-3.2 kilometers [1 to 2 miles]) from the project area (, there would be no construction-related impacts to the mixing patterns or locations of either of these systems. The nearest freshwater source to these waters is the Hunter's Marsh system, located immediately behind the EHW-1 structure. Due to the strong tides and currents in the project area, combined with a small outflow from the marsh, the waters in the project vicinity are well-mixed, with no habitat that acts as a sub-estuary.

Impacts to Prey Habitat

The Test Pile Program would result in localized and temporary reductions of the benthic community during pile placement (see discussion of benthic community impacts in Section 3.7). A conservative estimate of total bottom disturbance from the barge anchors, spuds, and the installation and removal of the piles, which includes the potential to disturb bottom habitat one meter surrounding each pile test pile, is approximately 6,970 ft^2 (647 m^2). During the proposed action, juvenile salmonids and other fish species may experience loss of available benthic prey at the project site due to the disturbance of pile installation and removal, and the barges use of spuds and anchors. Benthic organisms lost due to bottom disturbances by pile placement and removal, barges, tugboats, anchors, spuds, and propeller wash would be expected to be reestablished for a few months for some species, and up to over two years for the entire benthic community. Therefore, the Test Pile Program would degrade localized prey availability for migrating salmonids, juvenile rockfish, and other fish species during and for a short time following the proposed action. Pile driving activities would also result in localized increases in total suspended solids. The settling out of fine-grained solids could bury nearby benthic organisms and result in the loss or reduction of localized benthic productivity. Propeller wash from the support vessels may also temporarily disturb benthic habitats. Additionally, plankton and zooplankton which occupy the water column and are the primary prey of forage fish may be negatively affected by increased sound pressure levels and turbidity from construction activities. However, the area impacted by the proposed action that could be used as possible foraging habitat is relatively small compared to that available in the Hood Canal. Potentially a maximum area of ~12.6 ft^2 (based on a 48-inch diameter pile) of foraging habitat may have decreased foraging value as each pile is driven or removed. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish foraging habitat in the Hood Canal and nearby vicinity.

Forage Fish Community

The nearest identified forage fish spawning sites (Pacific Sand Lance) to the test piles are approximately 375 feet (114 m) to the north of the site and 450 feet (137 m) south of the site (Figure 3-11). The temporary increase of suspended solids during pile driving would be expected to remain in the vicinity of the project but would not be high enough to adversely impact the spawning success of the nearest forage fish (sand lance) spawning habitat, at a distance of 375 feet (114 m). However, forage fish that were in the area during this time would be exposed to increased levels of turbidity. In addition, during construction and until the vegetation and benthic communities recovered from disturbance due to pile driving activities, these losses would impact forage fish use of existing prey and refuge habitats. Further, pile driving activities would create underwater noise levels that could injure or disturb fish occurring within the impact threshold zones during the periods of pile driving and removal.

Aquatic Vegetation

The aquatic vegetation habitat of principal concern for foraging and refuge is eelgrass (*Zostera* sp.), as described by Simenstad et al. (1999), Nightingale and Simenstad (2001a, b), and Redman et al. (2005). Although the two largest eelgrass beds along the NBK at Bangor shoreline occur near Devil's Hole and Cattail Lake, a relatively narrow band of eelgrass occurs along nearly the entire shoreline (Morris et al., 2009). Eelgrass in the immediate vicinity of the Test Pile Program project area occurs in a constricted nearshore band, with no large beds of eelgrass within 91 meters (300 feet) of the project area. Marine surveys at NBK at Bangor have shown that eelgrass is only present in water down to 20 feet (6 m) MLLW (Garono and Robinson, 2002; Morris et al., 2009) which is above the location of all of the test piles. All test piles would be in waters deeper than 40 feet, thus eelgrass would be minimally impacted. The area within a 150-foot (46 m) radius of the pile driving footprints could have higher levels of turbidity. Indirect impacts to marine vegetation may result from this turbidity, caused by pile driving and removal, the placement of barge anchors, spuds, and test piles. However, these impacts are minor and temporary in nature. Disturbed sediments would eventually redeposit within a few hours and any disturbed marine vegetation would be expected to recover within a couple of growing seasons. Therefore, the proposed action would have no significant impacts on marine vegetation.

3.8.2.2.3 ESA-Listed Fish

Puget Sound Chinook Salmon

Chinook salmon are one of the least abundant salmonids occurring along the Bangor waterfront at NBK in comparison to chum for example; however they are not entirely absent. Past surveys have found that Chinook are most frequent along the Bangor waterfront at NBK from late May to early July. Generally, Puget Sound Chinook salmon juveniles emigrate from freshwater natal areas for estuarine and nearshore habitats from January through April as fry, and from April through early July as larger subyearlings. Smolts usually migrate to estuarine areas between April and July. Juvenile Puget Sound Chinook salmon are likely present in the action area during the in-water work window; however by July juvenile Puget Sound Chinook salmon are sufficiently large enough to no longer orient to the shoreline. As juveniles increase in size they occupy deeper, offshore waters in search of larger prey. As a result, there is a very low likelihood that individual juvenile Chinook salmon would be in close proximity to project activities for long enough periods of time to result in their exposure to harmful sound pressure levels or concentrations of suspended sediments. Returning adult Chinook migrate past NBK at Bangor from late August to late October. Adults may be present, but typically travel in deeper waters, therefore they would not be expected to be in close proximity to pile installation and removal activities or receive exposures to sound pressure levels or turbidity that could be harmful. However, any adult Chinook or smolts which may be present in close proximity to a pile during pile installation and removal could be exposed to underwater sound pressure levels may result in disturbance, injury, or potentially death. As a result, a may affect, likely to adversely affect determination is warranted. Mitigation measures, however, would further reduce the potential for adverse impacts.

Hood Canal Summer-run Chum Salmon

Surveys conducted along the shoreline of NBK at Bangor between 2005 and 2008 found large numbers of chum salmon. Chum were the most abundant juvenile salmon captured by beach seining. Chum fry inhabit shallow nearshore areas often within 15 cm of the surface. As they mature, chum between 45–50 mm begin to move into slightly deeper water (1.5 – 5 m deep). Juvenile Hood Canal summer-run chum emigrate from natal rivers as fry from mid-February through April, are expected to occur at NBK at Bangor from January through early April with a peak in late March. Migrating Hood Canal summer-run chum salmon are assumed to progress rapidly northward towards coastal water masses, and are estimated to peak in abundance at the mouth of Hood Canal by the beginning of April. Therefore, juvenile summer-run chum salmon would not be expected to be present in the project area during the in-water work period (July – October). Adult summer-run chum return to Hood Canal from early August through the first week in October. Adult summer-run chum are, in part, distinguished from fall chum populations by their exclusive use of the nearshore marine habitat early in the run period. Therefore, while it is unlikely that juvenile chum would be present along the nearshore in the early summer months, it is expected that returning adults would emigrate through the project area during the in-water work period (July – October) for the Test Pile Program. While the adults may utilize the nearshore area, they more typically travel in deeper waters and would not be expected to be in close proximity to pile installation and removal activities. However, depending on their relative position within the vicinity of the project area they could be exposed to underwater sound pressure levels that may result in disturbance, injury, or potentially death. In addition, turbidity plumes resulting from the pile driving activities, while likely not sufficient to cause gill damage, could result in temporary avoidance of portions of their typical habitat. As a result, a may affect, likely to adversely affect determination is warranted. Mitigation measures, however, would further reduce the potential for adverse impacts.

Puget Sound Steelhead

Steelhead do not occur in large numbers along the Bangor waterfront at NBK. Juvenile steelhead caught in beach seines since June of 2006 were the sixth most abundant of the salmonids captured. Puget Sound Steelhead are less likely than other salmonids to use the nearshore. According to WDFW, Puget Sound steelhead juveniles typically emigrate from natal rivers as two year old smolts from March through June, peaking in April and May. In a study conducted in Hood Canal in 2006 and 2007, acoustically tagged steelhead smolts from four Hood Canal rivers emigrated from their respective natal river mouth to the Hood Canal Bridge over an average of 15 to 17 days. By mid-July, most Puget Sound steelhead juveniles from rivers in Hood Canal would have traveled past the Hood Canal Bridge, and would not be present in the project area during the in-water work period (July – October). Returning adult steelhead appear between February and June. Therefore, while perhaps less likely to be present during in-water work than Chinook, the potential still exists for a juvenile or adult steelhead to be present emigrating through the project area further offshore in the deeper water, but still within the zones of behavioral disturbances and/or injury from underwater noise generated from the pile driving activities during the early summer months. Therefore, a may affect, likely to adversely affect determination is warranted. Mitigation measures, however, would further reduce the potential for adverse impacts.

Bull Trout

Bull trout require snow-fed glacial streams and since there are none on the Kitsap Peninsula they would not be expected in any streams on NBK at Bangor nor in any streams on the Kitsap Peninsula. They are present in streams on the Olympia Peninsula which drains to Hood Canal and thus they are present in the marine waters along the western shoreline. They are not known to move as far north as the Toandos Peninsula shoreline due west of NBK at Bangor. Proposed critical habitat ends at the southern tip of Toandos Peninsula. As such, bull trout are not likely to be present in the project area, but cannot be completely dismissed because they are present in southern Hood Canal rivers. Therefore a may affect, not likely to adversely affect determination is warranted.

Rockfish

Rockfish fertilize their eggs internally and the young are extruded as larvae. Rockfish larvae are pelagic, often found near the surface of open waters, under floating algae, detached seagrass, and kelp. It is possible that a few larval yelloweye rockfish, canary rockfish and bocaccio occur within the water column of the project area, and could be harmed or killed from the effects of pile driving. The number of injured or killed ESA-listed rockfish is expected to be very small because larval rockfish are readily dispersed by currents after they are born, making the concentration of larvae in any one location extremely small (NMFS, 2003). Injury or death of individual fish might lower abundance within a specific cohort exposed to the pile driving, but not to the extent that population abundance would be appreciably changed. For instance, larval yelloweye rockfish, canary rockfish and bocaccio have an extremely low survival rate under fluctuating habitat conditions in most years (Love et al., 2002), and the birth of up to two million larvae per female is an adaptation to this high mortality rate. Thus the death of several larvae would not be expected to have consequence to the viability of the DPSs of each species of ESA-listed rockfish. So, while it is anticipated that individual fish in the populations would be negatively affected, it is not expected to reach a level or degree that affects population viability. Although the number of affected fish cannot be reasonably estimated, the percentage would be so small as to not affect the abundance, productivity, or spatial structure of the PS/Georgia Basin DPSs of yelloweye rockfish, canary rockfish or bocaccio.

Juvenile bocaccio and canary rockfish settle onto shallow nearshore water in rocky or cobble substrate with or without kelp at three to six months of age, and move to progressively deeper waters as they grow (Love et al., 2002). Juvenile yelloweye rockfish do not occupy intertidal waters (Love et al., 1991) and are very unlikely to be within the project area. If any juvenile and sub-adult canary rockfish or bocaccio are within the project area, they would be expected to be found near benthic areas with steep slopes, rock, or kelp beds. Any of these types of habitats within the project area are located outside of the 63 meter (207 feet) radius where injury could occur; however, both juvenile and/or subadult canary rockfish and bocaccio are likely to be within the area affected by sound pressure levels that could cause behavioral impacts. Adult yelloweye rockfish, canary rockfish, and bocaccio have been documented in Hood Canal

(Washington, 1977) and typically occupy waters from 131 to 820 feet (40 to 250 meters) (Love et al., 2002). Adult ESA-listed rockfish may be present within the project area during the in-water work window (July – October). However, due to the habitat characteristics of Hood Canal, the closest adult ESA-listed rockfish are likely several thousand feet away within waters deeper than 120 feet (37 m), and are only expected to be minimally affected by project activities due to the distance of the project and the attenuation of sound. Based on the above analysis, the Navy concluded a may affect, likely to adversely affect determination was warranted to all three ESA-listed species of rockfish.

Green Sturgeon

Green sturgeon are present in non-natal estuaries (including those in Washington) from June through October, thus the timing of the proposed project overlaps with the time when green sturgeon would most likely be in the Puget Sound estuary. However, their occurrence in Puget Sound remains rare and they are not expected to be present in Hood Canal. Therefore, the rare occurrence of this species in Puget Sound, along with the limited number of days of pile driving (40 days) and short potential work-window (July- October), makes it unlikely and therefore discountable that they would be exposed to sounds from the project. As such, a no effect determination is warranted because the species is not likely to be in the action area.

Pacific Eulachon/Smelt

Eulachon were thought to be caught in low numbers (six individuals in 2006) along the NBK waterfront in recent forage fish surveys. However, there is currently NMFS uncertainty on the species identification of the fish that were thought to be eulachon. In 2005 no eulachon were identified, in 2006 six were thought to be present, in 2007 there were none identified, and in 2008 two were identified. Assuming that the identifications were correct, their presence in the action area is still rare and would be unexpected during this project. A recent WDFW technical report entitled “Marine Forage Fishes in Puget Sound” presents detailed data on the biology and status and trends of surf smelt and longfin smelt in Puget Sound, but states that “there is virtually no life history information within the Puget Sound Basin” available for eulachon (BRT, 2010).

Therefore, the rare occurrence of this species in Hood Canal, along with the limited number of days of pile driving (40 days) and short potential work-window (July – October), makes it unlikely and therefore discountable that they would be exposed to sounds from the project. As such, a no effect determination is warranted because the species is not likely to be in the action area.

3.8.2.2.4 Non-ESA Listed Fish

Marine fish species that are found near the project area and share the same habitats as salmonids and would experience project-related impacts from operation of the Test Pile Program similar to those described for salmonids above.

The underwater noise thresholds for fish behavior, adopted by NMFS and U.S. Fish and Wildlife Service (USFWS) (FHWG, 2008), are presented in Table 3.19. During the allowable in-water work period, some of the most abundant non-salmonid or forage fish species captured in the waters include Pacific herring, surf smelt, juvenile and adult shiner perch, juvenile English sole, gunnels, pricklebacks, sticklebacks, and sculpin (SAIC, 2006). To help protect these fish, a soft-start approach, would be utilized to encourage fish to move away from the immediate project area before pile driving is at its maximum level (see Section 4.3), potentially further reducing the number of fish potentially exposed to harmful levels of underwater sound. In addition, sound attenuation devices (i.e. Gunderboom SAS™, TNAP, confined bubble curtain and/or unconfined bubble curtain) would be used during impact pile driving to reduce the level of potentially harmful sounds being transmitted through the water.

Average underwater baseline noise levels acquired near the NBK at Bangor Marginal Wharf facility, which is near the project area, were measured at a level of 114 dB rms re 1μPa (Slater, 2009). Sound during impact pile driving would be detected above the average background noise levels at any location in Hood Canal with a direct acoustic path (i.e., "line of sight" from the driven pile to the receiver location). To the west of the project area, Toandos Peninsula bounds the extent of sound travel within the construction area; thus, geography would not allow direct sound path propagation south of Brown Point, nor north of Termination Peninsula at the western terminus of Hood Canal Bridge adjacent to Squamish Harbor. Locations beyond these points would receive substantially lower noise levels since there is no direct sound path, and thus no impacts would be observed.

Some fish may avoid the area, particularly closer to pile driving activities, or alter their normal behavior while in this area. However, studies have shown that some salmonids may habituate to underwater noise (Feist, 1991; Feist et al., 1992; Ruggerone et al., 2008), and would continue to occur within the behavioral disturbance zone (out to a distance of 1.34 miles [2,154 m] for impact pile driving and a distance of 0.62 miles [1,000 m] for vibratory pile driving). In addition to the use of sound attenuation devices and a soft-start approach, these impacts would be further minimized through the adherence to the in-work window (July 16 to October 31) and allowable pile driving times (between two hours post-sunrise and two hours prior to sunset from July 16 through September 15 and during all daylight hours from September 16 through October 31).

3.8.2.2.5 Essential Fish Habitat

The Pacific Fisheries Management Council (PFMC) is responsible for designating essential fish habitat (EFH) for all federally managed species occurring in the coastal and marine waters off the coasts of Washington, Oregon, and California, including the Puget Sound. The PFMC designated EFH for these species within the fishery management plans (FMPs) for each of the four primary fisheries that they manage: Pacific Coast Groundfish, Pacific Coast Salmon, Coastal Pelagic Species, and West Coast Fisheries for Highly Migratory Species (PFMC, 1998; 2003; 2007; 2008). Of these fisheries, only three (groundfish, salmon, and coastal pelagic species) contain species for which EFH has been designated within Hood Canal or in the vicinity of NBK at Bangor.

The Navy has prepared an Essential Fish Habitat Assessment for the Test Pile Program at the Bangor waterfront at NBK. This assessment can be found in Appendix E of this document. A summary of the designated EFH within the vicinity of NBK at Bangor and the conclusions regarding potential impacts to EFH are described below.

Groundfish

Pacific coast groundfish species are considered sensitive to over-fishing, the loss of habitat, and water and sediment quality (PFMC, 2008). The groundfish EFH consists of the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem (PFMC, 2008). The PFMC (2008) identifies the overall area designated as groundfish EFH for all species covered in the FMP as all waters and substrate within “depths less than or equal to ~ 11,500 feet [3,500 m] to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow.” Furthermore, the PMFC (2008) has also designated EFH for each individual groundfish species by life stage. These designations are contained within Appendix B of the Pacific Groundfish FMP (PFMC, 2008). Using the Pacific Habitat Use Relational Database (HUD) developed by the PFMC, it was determined which groundfish species and life stages have EFH designated within the vicinity of the Test Pile Program site. The management unit in the Pacific Coast Groundfish FMP includes 83 groundfish species (PFMC, 2008). Of these, 32 were identified through the analysis of the HUD as having EFH designated in the vicinity of NBK at Bangor. Based on the analysis, the primary habitats designated as EFH for these species include:

- The epipelagic zone of the water column, including macrophyte canopies and drift algae;
- Unconsolidated sediments consisting of mud, sand, or mixed mud/sand;
- Hard bottom habitats composed of boulders, bedrock, cobble, gravel, or mixed gravel/cobble;
- Mixed sediments composed of sand and rocks; and
- Vegetated bottoms consisting of algal beds, macrophytes, or rooted vascular plants.

Salmon

The salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters of Washington, Oregon, and California north of Point Conception out to the exclusive economic zone (200 miles) offshore (PFMC, 2003). In addition to the marine and estuarine waters, salmon species have a defined freshwater EFH, which includes all lakes, streams, ponds, rivers, wetlands, and other bodies of water that have been historically accessible to salmon (PFMC, 2003), including the waters of NBK at Bangor. For the Pacific salmon fishery, EFH (which includes Hood Canal), is identified using U.S. Geological Survey (USGS) hydrologic units, as well as habitat association tables and life history descriptions of each life stage (PFMC, 2003). Pacific salmon species EFH is primarily affected by the loss of suitable spawning habitat, barriers to fish migration (habitat access), reduction in water and sediment quality, changes in estuarine hydrology, and decreases in prey food source (PFMC, 2003).

Coastal Pelagic Species

The EFH designations for coastal pelagic species are based on the geographic range and in-water temperatures where these species are present during a particular life stage (PFMC, 1998).

Specific EFH boundaries (i.e., the habitat necessary to provide sufficient fishery production) are based on best available scientific information and described in the Coastal Pelagic Species Fishery Management Plan (PFMC, 1998). These boundaries include the waters of NBK at Bangor. Two species identified as coastal pelagic species are known to occur in Hood Canal waters: northern anchovy and market squid (SAIC, 2006; Bhuthimethee et al., 2009). Aside from their value to commercial Pacific fisheries, coastal pelagic species are also recognized for their importance as food for other fish, marine mammals, and birds (63 FR 13833). Coastal pelagic species are considered sensitive to overfishing, the loss of habitat, reduction in water and sediment quality, and changes in marine hydrology, including entrainment through water intakes (PFMC, 1998).

Habitat Areas of Particular Concern Designations

In addition to designating EFH, the PMFC is also responsible for identifying Habitat Areas of Particular Concern (HAPC) for federally managed species. Out of the four fisheries managed by the PFMC, HAPC have only been identified for groundfish. The four HAPC designated for these species include seagrass, canopy kelp, rocky reef, and estuarine habitats along the Pacific coast, including Puget Sound. Two of these HAPC, estuarine habitats and seagrass, are located within the vicinity of the Test Pile Program project area.

Impacts to Essential Fish Habitats

The primary impact during the proposed Test Pile Program would be the level of increased sound energy in the water which would temporarily reduce the quality of water column EFH. This impact to the water column EFH caused by the increased noise levels may result in disturbance, avoidance, injury, and even death for the fish for which this habitat was designated. The level of impact is directly proportionate to the distance between the fish and the sound source. The Navy has adopted a number of mitigation measures and operational guidelines to reduce the level of impact pile driving operations would have on marine fish in the vicinity. Because the piles being driven are hollow steel piles, in accordance with the conservation measures set forth by NMFS (2004), the Navy would use a vibratory hammer to drive each pile into the sediment to the deepest extent possible. However, due to the need to conduct load bearing tests, each pile could be driven the final 10 to 15 feet (3 to 4.5 m) using an impact hammer. To limit the amount of ensonification of the water resulting from the impact hammering, sound attenuation devices (i.e. Gunderboom SAS™, TNAP, confined bubble curtain and/or unconfined bubble curtain) would be utilized during all impact hammering operations to reduce the transmission of the sound through the water column. Furthermore, the use of impact hammers would be limited to 100 strikes per day. In addition to these measures, all work would be occur between July 16 through October 31 within the in-water work window of July 16 through February 15 when juvenile salmon are not typically present within the vicinity of the proposed project area. These measures, in conjunction with the short duration of the proposed project (40 days) should greatly reduce the impact of the noise levels as a result of the pile driving activities.

The installation and subsequent removal of the piles will have a localized impact on marine vegetation and the benthic epifauna/infauna within the immediate vicinity of each pile or anchoring site. However, to minimize impacts to marine vegetation, all of the test piles have been placed to avoid eelgrass beds along the Bangor waterfront at NBK. While some disruption to marine vegetation and benthic communities is unavoidable as a result of the placement and recovery of the test piles, these impacts will be temporary in duration, with a minimal and localized zone of influence. Areas of disruption are expected to recover to pre-disruption levels within a single growing season.

The water column may experience increased sedimentation and turbidity during operational periods. However, due to the relatively low levels of organic contaminants and metals contained within the sediments at NBK at Bangor, there will be temporary and minimal degradation of the water column, with little to no impact on DO levels in the vicinity of the proposed project area.

Based on the Navy’s existing EFH policy at the time of consultation, and due to the overall temporary nature of the activities and the minimal level of impact, in light of the proposed mitigation measures and work guidelines for the project, the Navy concluded the activities associated with the proposed Test Pile Program will not have an adverse affect on designated EFH or marine fish species within the vicinity of NBK at Bangor and Hood Canal.

3.8.2.2.6 Summary of Effects

Individual fish may be exposed to sound pressure levels during pile driving operations at NBK at Bangor which may result in behavioral disturbance or injury depending on the distance of the fish to the sound source. Fish that occur in the immediate project area would be exposed to underwater noise that could injury or disturb fish or their larvae during pile driving activity. Because vibratory pile driving is the primary installation and removal method, the most likely impact to fish from pile driving activities at the project area would be behavioral disturbance. Any fish which are behaviorally disturbed may change their normal behavior patterns (i.e., swimming speed or direction, foraging habits, etc.) or be temporarily displaced from the area of construction. Any exposures would likely have only a minor effect and temporary impact on individuals and would not result in population level impacts. Adherence to mitigation measures and regulatory compliance will likely avoid most potential adverse underwater impacts to fish from pile driving. Nevertheless, some level of impact is unavoidable. Impacts to fish from changes in water quality as a result of pile driving operations are expected to be minor and temporary. Dissolved oxygen levels are not expected to drop to level that would result in harm to fish species. Some degree of localized short-term increase in turbidity is expected to occur during installation and removal of the piles. Fish species are expected to avoid areas with elevated sediments or experience minor behavioral effects due to changes in turbidity.

Endangered Species Act Conclusions

The following factors do allow one to conclude that the numbers of fish exposed to underwater noise, and thus to potential injury and death, would be very small: (1) The activity would occur when few Chinook salmon, steelhead, and Hood Canal summer chum are present; (2) steelhead do not use nearshore habitat in the project area; (3) there would be very few juvenile or larval yelloweye rockfish, canary rockfish, and bocaccio near the proposed project area during the proposed implementation period; and (4) the project area would be a very small proportion of the total area occupied by the listed fish. Given these considerations, the Navy expects very small numbers of Puget Sound Chinook salmon, Puget Sound steelhead, Hood Canal summer-run chum, and ESA-listed rockfish would be present during the proposed in-water work window, and only a small percentage of those present would be exposed to sound levels that would elicit adverse behavioral or physical responses. The bull trout should not be affected as a result of the proposed action, but on the off-chance some may be present in the vicinity of the project site during pile-driving activities, a may affect, not likely to adversely affect determination has been made. For those species more likely to be within the study area, including Puget Sound Chinook salmon, Hood Canal Summer-run chum salmon, Puget Sound Steelhead, and the rockfish (yelloweye, canary, and bocaccio) a may affect, likely to adversely affect determination has been made.

In accordance with the ESA, the Navy consulted with the National Marine Fisheries Service (NMFS) Northwest Regional Office and the United States Fisheries and Wildlife Service (USFWS) Washington Office regarding the impacts of the Test Pile Program on federally listed fish species. The Navy submitted a Biological Assessment (BA) to the NMFS Northwest Regional Office and the USFWS Washington Office on August 17, 2010. The analysis in the BA and incorporated into this EA concluded a may affect, likely to adversely affect finding for the following species under NMFS jurisdiction: the federally threatened Pacific Sound Chinook salmon, the federally threatened Hood Canal Summer-run chum salmon, the federally threatened Puget Sound steelhead, the federally threatened yellow eye rockfish, the federally threatened canary rockfish, and the federally endangered bocaccio rockfish. The analysis found that underwater sound level pressures may injure or behaviorally affect these federally threatened and endangered fish species if they are present in the study area during pile driving. The Navy concluded that the proposed action would have no effect on the North American green sturgeon and the Pacific eulachon, both under NMFS jurisdiction, based on these species lack of occurrence within the Hood Canal. The analysis concluded a may affect, not likely to adversely affect finding for the federally threatened bull trout, which is under USFWS jurisdiction. Proposed mitigation for fish is described in Chapter 4 of this EA.

Critical habitat for bull trout and green sturgeon is designated, but does not occur in the immediate vicinity of the project area (i.e. Hood Canal). Therefore, under federal law, there would be no effect to critical habitat for these species. Critical habitat for the Puget Sound Chinook salmon and the Hood Canal summer-run chum salmon is designated in northern Hood Canal waters adjacent to the base. However, NBK at Bangor has been excluded from designated critical habitat. The Navy concluded that the proposed action may affect, but would not adversely affect critical habitat for these species. Critical habitat has not been designated for Puget Sound steelhead, bocaccio rockfish, canary rockfish, or yelloweye rockfish. As a result, there would be no impact to critical habitat. Critical habitat has been proposed for the Pacific eulachon, but the location of the proposed critical habitat is outside of the project area, therefore there would not be any impact to the proposed critical habitat.

A Biological Opinion was received from the NMFS Northwest Regional Office on April 28, 2011 and concurred with the Navy's affect determinations for all species and critical habitat within their jurisdiction. A letter of concurrence was received from the USFWS Washington Office on April 19, 2011 and a subsequent letter clarifying the initial letter on May 11, 2011 in which the Service concurred with the Navy's affect determination for the bull trout, the only fish species under their jurisdiction.

Magnuson-Stevens Fishery Conservation and Management Act Conclusions

The Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) requires federal agencies to consult with the NMFS on activities that may adversely affect EFH or when the NMFS independently learns of a federal activity that may adversely affect EFH. The Navy completed an EFH Assessment to evaluate how the proposed action may affect EFH designated within the action area by the Pacific Fishery Management Council (PFMC) and implemented by the NMFS Northwest Regional Office. The EFH Final Rule (67 FR 2354) states that, "Federal agencies retain the discretion to make their own determinations as to what actions may fall within NMFS' definition of "adverse effect". The Navy developed the EFH Assessment in accordance with existing Navy policy (OPNAVINST 5090.1B), at the time of consultation, which had determined that temporary or minimal impacts are not considered to adversely affect EFH. The EFH Final Rule (67 FR 2354) and 50 CFR 600.815 (a)(2)(ii) were used as guidance for this determination. The Navy's EFH Assessment determined that impacts to essential fish habitat (EFH) designated by the Magnuson-Stevens Fishery Conservation and Management Act would be minimal. However, while some disruption to marine vegetation and benthic communities are unavoidable as a result of the placement and recovery of the test piles. These impacts would be temporary, with a minimal and localized zone of influence. Areas of disruption would be expected to recover to pre-disruption levels within a few growing season. Overall, due to the temporary nature of the activities, the minimal level of impact, and in light of the proposed mitigation measures and work guidelines for the project, the Navy concluded in the EFH Assessment that the activities associated with the proposed Test Pile Program would not adversely affect essential fish habitat.

In the Biological Opinion received by the Navy on April 28, 1011from the NMFS Northwest Regional Office, NMFS included the results of their analysis of the proposed action's effect on essential fish habitat (EFH), pursuant to Section 305 (b) of the MSFCMA. The NMFS Northwest Regional Office concluded that the proposed action "will degrade EFH due to elevated underwater sound". Therefore, the Service included in their analysis three EFH conservation recommendations the Navy must implement necessary to avoid, mitigate, or offset the potential adverse effects on EFH. The NMFS Northwest Regional Office requested the Navy's reply to the EFH portion of the consultation to identify which conservation recommendations have been accepted. The Navy will provide written receipt of the Services Biological Opinion and acceptance of all of the proposed EFH conservations measures.

National Environmental Policy Act Conclusions

The analysis presented above indicates that pile driving activities associated with the Navy's proposed Test Pile Program at NBK at Bangor may have impacts to individual fish species, but any impacts observed at the population, stock, species, or evolutionary significant unit level would be negligible. Therefore, in accordance with NEPA, there would be no significant impact to fish from the Test Pile Program with implementation of mitigation measures in Section 4.3.

3.9 MARINE MAMMALS

There are ten marine mammal species, six cetaceans and four pinnipeds, which inhabit the inland waters of Washington State. Of these, only six may inhabit or transit through the waters nearby NBK at Bangor in Hood Canal. These include the killer whale, harbor porpoise, Dall's porpoise, Steller sea lion, California sea lion, and the harbor seal. The Steller sea lion is the only marine mammal that occurs within the Hood Canal which is listed under the Endangered Species Act (ESA); The U.S. Eastern stock/ DPS is listed as federally threatened. While the Southern Resident killer whale (SRKW), which is listed as federally endangered under the ESA, is resident to the inland waters of Washington State and British Columbia, it has not been observed in the Hood Canal in decades. However, due to the occurrence of its primary prey species (salmonids) within the Hood Canal, this species has been carried forward in the analysis. All marine mammal species are protected under the Marine Mammal Protection Act (MMPA).

The other four marine mammal species – the humpback whale, the gray whale, the minke whale, and the Northern elephant seal – are more prevalent off the coast of Washington or in the Strait of Juan de Fuca or Puget Sound. Their occurrence within Hood Canal has been limited to an occasional sighting over the last several decades. As such, these species will not be considered further in this analysis. Table 3.20 lists the marine mammal species that could occur in the vicinity of NBK at Bangor and their estimated densities within the project area.

TABLE 3.20 MARINE MAMMALS HISTORICALLY SIGHTED IN HOOD CANAL IN THE VICINITY OF NBK AT BANGOR

Species	Stock(s) Abundance [1]	Relative Occurrence in Hood Canal, Washington	Season(s) of Occurrence	Density in the Pile Driving Window (Individuals per Km^2)[a]
Steller sea lion *Eumetopias jubatus* Eastern U.S. stock/DPS	45.095 – 55.832[2]	Rare to occasional use	Fall to late spring (Nov – mid April)	0.00
California sea lion *Zalophus californianus* U.S. Stock	238,000[4]	Common	Fall to late spring (Aug – May)	0.410[c]
Harbor seal *Phoca vitulina* WA inland waters stock	14,612[3] (CV = 0.15)	Common	Year-round; resident species in Hood Canal	1.31[b]
Killer whale *Orcinus orca* West Coast transient stock	314[5]	Rare to occasional use	Year-round	0.038[d]
& Eastern North Pacific Southern Resident stock	88[3, 8]	Not present in Hood Canal	Not applicable	0.00
Dall's porpoise *Phocoenoides dalli* CA/OR/WA stock	48,376[3] (CV = 0.24)	Rare to occasional use	Year-round	0.043[e]
Harbor porpoise *Phocoena phocoena* WA inland waters stock	10,682[3] (CV=0.38)	Rare to occasional use	Year-round	0.011 [e]

Sources: [1] NMFS marine mammal stock assessment reports at: http://www.nmfs.noaa.gov/pr/sars/species.htm [2] Allen and Angliss, 2010; [3] Carretta *et* al., 2008; [4] Carretta *et* al., 2007; [5] NMFS 2010 – OPR website; [a]Pile driving window refers to the period from July-October; [b] Jeffries et al., 2003 and Huber et al., 2001; [c] DoN, 2010a and Jeffries et al., 2000; [d] London, 2006; [e] Agness and Tannenbaum, 2009a.

3.9.1 Affected Environment

3.9.1.1 Regulatory Overview

Endangered Species Act

See Section 3.8.1.1 for a description of the ESA. The Navy conducted consultations with NMFS Northwest Regional Office under Section 7 of the ESA for marine mammals that may be present during the Test Pile Program

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The Act further regulates "takes" of marine mammals in the global commons (i.e., the high seas) by vessels or persons under U.S. jurisdiction. The term "take," as defined in Section 3 (16 USC 1362) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of "harassment," Level A (potential injury) and Level B (potential disturbance).

In terms of the proposed action, the MMPA defines ''harassment'' as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (50 C.F.R, Part 216, Subpart A, Section 216.3-Definitions).

Level A is the more severe form of harassment because it may result in injury, whereas Level B only results in disturbance without the potential for injury (Norberg pers. 3-85arbo., 2007a).

Section 101(a) (5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing), if certain findings are made and regulations are issued. Permission will be granted by the Secretary for the incidental take of marine mammals if the taking will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses. The Navy has applied for an incidental harassment authorization (IHA) under the MMPA for marine mammals that may be present during the Test Pile Program and will receive an IHA in June 2011.

3.9.1.2 ESA-Listed Marine Mammals

Steller Sea Lion

Status and Management

The Steller sea lion is protected under the MMPA and was originally listed as federally threatened under the ESA in 1990. In 1997, NMFS re-classified Steller sea lions as two subpopulations. There are two distinct populations of Steller sea lions based on genetics and population trends, separated at 144°W longitude (Loughlin, 1997; Angliss and Outlaw, 2005). Steller sea lions west of 144°W longitude residing in the central and western Gulf of Alaska, Aleutian Islands, as well as those that inhabit coastal waters and breed in Asia (e.g. Japan and Russia) are part of the Western U.S. Stock. The Eastern U.S. stock, which is the population that may occur within the project area, includes the animals east of Cape Suckling, Alaska (144°W) (NMFS, 1997; Loughlin, 2002; Angliss and Outlaw, 2005). The Eastern U.S. stock breeds on rookeries (places where they give birth and mate) located in southeast Alaska, British Columbia, Oregon, and California; there are no rookeries located in Washington. The re-classification in 1997, listed the Western Stock listed as federally endangered under the ESA, and maintained the federally threatened status for the Eastern stock (NMFS, 1997). There is a final revised species recovery plan that addresses both stocks (NMFS, 2008d).

Critical Habitat

Critical habitat has been designated for the Steller sea lion (NMFS, 1993). Critical habitat includes so-called “aquatic zones” that extend 3,000 feet (1 km) seaward in state and federally managed waters from the baseline or basepoint of each major rookery in Oregon and California (NMFS, 2008d). Three major rookery sites in Oregon (Rogue Reef, Pyramid Rock; and Long Brown Rock and Seal Rock on Orford Reef at Cape Blanco) and three rookery sites in California (Ano Nuevo I; Southeast Farallon I; and Sugarloaf Island and Cape Mendocino) are designated critical habitat (NMFS, 1993). There is no designated critical habitat for the species in Washington.

Distribution

Steller sea lions are found along the coasts of Washington, Oregon, and northern California where they occur at breeding rookeries and numerous haulout locations along the coastline (Jeffries et al., 2000; Scordino, 2006). From breeding rookeries in northern California (St. George Reef) and southern Oregon (Rogue Reef), male Steller sea lions often disperse widely outside of the breeding season (Scordino, 2006). Based on mark recapture sighting studies, males migrate back into these Oregon and California locations from winter feeding areas in Washington, British Columbia, and Alaska (Scordino, 2006).

In Washington, Steller sea lions use haulout sites primarily along the outer coast from the Columbia River to Cape Flattery, as well as along the Vancouver Island side of the Strait of Juan de Fuca (Jeffries et al., 2000). Numbers vary seasonally in Washington with peak numbers present during the fall and winter months (Jeffries et al., 2000). Steller Sea lions are occasionally present in the Puget Sound at the Toliva Shoals haul-out site in south Puget Sound (Jeffries et al., 2000). At NBK at Bangor, Steller sea lions were observed hauled out on submarines at Delta Pier on several occasions from 2008 through 2010 during winter and spring months (Bhuthimethee, 2008, personal communication; Walters, 2010, personal communication). Steller sea lions likely occupy habitats in Hood Canal similar to those of the California sea lion and harbor seal, which include marine water habitats for foraging and manmade structures for haul out.

Population Abundance

The U.S. Eastern stock was estimated to number between 46,000 and 58,000 animals in 2002, and has been increasing approximately 3 percent per year since the late 1970s (NMFS, 2008d; Pitcher et al., 2007). Angliss and Outlaw (2008) estimated the Eastern North Pacific stock of the Steller sea lion, which occurs along the WA coast and Puget Sound, is 48,519 individuals. An update to this estimate was recently provided by Allen and Angliss (2010) which provided a range in population size from 45,095 – 55,832. Although Steller sea lions have been documented in Hood Canal, the numbers (at least at present) are still fairly low. Steller sea lions are present in Hood Canal, but are only expected as far as the project area during November through mid-April. The Navy conducted daily waterfront surveys during April 2008-June 2010 off the docks at NBK at Bangor and recorded the number of sea lions hauled out on the submarines. The monthly average number hauled out ranged from 1 – 5 individuals during November through April, with a daily maximum of 6 sea lions hauled out during the cold season (DoN, 2010a). No in-water abundance estimates are available for the project area.

Behavior and Ecology

Steller sea lions are opportunistic predators, feeding primarily on fish and cephalopods, and their diet varies geographically and seasonally (Merrick et al., 1997). Foraging habitat is primarily shallow, nearshore and continental shelf waters; some Steller sea lions feed in freshwater rivers (Reeves et al., 1992; Robson, 2002). They also are known to feed in deep waters past the continental shelf break (Jefferson, 2005). Steller sea lions are gregarious animals that often travel or haul out in large groups of up to 45 individuals (Keple, 2002). At sea, groups usually consist of female and subadult males; adult males are usually solitary while at sea (Loughlin, 2002). Haulout and rookery sites are located on isolated islands, rocky shorelines, and jetties. Steller sea lions also haul out on buoys, rafts, floats, and Navy submarines in Puget Sound (Jeffries et al., 2000; DoN, 2001a). In the Pacific Northwest, breeding rookeries are located in British Columbia, Oregon, and northern California. There are no rookeries in Washington (NMFS, 1992; Angliss and Outlaw, 2005).

Acoustics

On land, territorial male Steller sea lions regularly use loud, relatively low-frequency calls/roars to establish breeding territories (Schusterman et al., 1970; Loughlin et al., 1987). The calls of females range from 0.03 to 3 kHz, with peak frequencies from 0.15 to 1 kHz; typical duration is 1.0 to 1.5 sec (Campbell et al., 2002). Mulsow and Reichmuth (2008) measured the unmasked aerial hearing sensitivity of one male Steller sea lion. The range of best hearing sensitivity was between 5 and 14.1 kHz (Mulsow and Reichmuth, 2008). Maximum sensitivity was found at 10 kHz, where the subject had a mean threshold of 7 dB re: 20 μPa.

The underwater hearing of two Steller sea lions have been tested, the hearing threshold of the male was significantly different from that of the female. The range of best hearing for the male was from 1 to 16 kHz, with maximum sensitivity (77 dB re: 1 μPa-m) at 1 kHz. The range of best hearing for the female was from 16 to above 25 kHz, with maximum sensitivity (73 dB re: 1 μPa-m) at 25 kHz. However, because of the small number of animals tested, the findings could not be attributed to individual differences in sensitivity or sexual dimorphism (Kastelein et al., 2005).

Southern Resident Killer Whale

Status and Management

Based on appearance, feeding habits, vocalizations, social structure, and distribution and movement patterns, there are three types of populations of killer whales (Wiles, 2004; NMFS, 2005a). The three distinct forms or types of killer whales recognized in the North Pacific Ocean are: 1) Residents, 2) Transients, and 3) Offshores. Resident killer whales in the North Pacific consists of the following populations; (1) Southern residents; (2) Northern residents; (3) Southern Alaska residents; and (4) Western Alaska North Pacific residents. The Southern Resident killer whale (SRKW) stock occurs in the inland waters of Washington and southern British Columbia, but not within Hood Canal, and is comprised of three pods, identified as the J, K, and L pods. The SRKW is protected under the MMPA and was listed as federally endangered under the ESA in 2005 (NMFS, 2005b; 70 FR 69903). A recovery plan was approved for the SRKWs in 2008 (NMFS 2008a; 73 FR 4176).

Critical Habitat

Critical habitat was designated for the SRKW in 2006 (NMFS, 2006; 71 FR 69054). Critical habitat was designated for the following three specific areas: (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca, which comprises approximately 2,560 sq. miles (6,630 sq. km) of marine habitat (NMFS, 2006). There is no designated critical habitat for the species in the Hood Canal.

Distribution

The geographical range of SRKW includes the inland waters of Washington State and British Columbia (Strait of Georgia, Strait of Juan de Fuca, and Puget Sound), principally during the later spring, summer, and fall (Bigg, 1982; Ford et al., 2000). The complete winter range of this stock is uncertain. The J pod spends much of the winter and early spring in inland waters, while the K and L pods tend to move to coastal areas during this period (Ford et al., 2000). The three pods visit coastal sites off Washington, and Vancouver island, but travel as far south as central California and as far north as the Queen Charlotte Islands. Offshore movements and distribution are largely unknown for the SRKWs (NMFS, 2006).

Southern Resident killer whales (J pod) have been documented in the Hood Canal in the past. They were identified in the Hood Canal by sound recordings in 1958 (Ford, 1991) and 1995 (Unger, 1997), a photograph from 1973, and anecdotal accounts of historical use, but these latter sightings may have been transient whales (NMFS, 2008d). It is not known whether these sightings reflect evidence of regular use or whether J Pod only rarely strayed into Hood Canal. Therefore, since NMFS could not confirm any evidence of SRKWs in Hood Canal waters since 1995, the agency concluded that available evidence did not support Hood Canal as “within the geographical area occupied by the species at the time of listing” (NMFS, 2008d).

Population Abundance

The Southern Resident killer whale stock is a trans-boundary stock, including killer whales in inland Washington and southern British Columbia waters. According to the most recent NMFS stock assessment report, the 2007 population survey recorded 86 whales amongst the three pods (Caretta et al., 2008). Two additional calves have been observed since the fall 2007 surveys resulting in a total maximum population of 88 individuals (NMFS, 2010).

Behavior and Ecology

While in the inshore waters of southern British Columbia and Washington, the SRKWs spend 95 percent of their time underwater, nearly all of which is between the surface and a depth of 30 meters (Baird, 2000; Baird et al., 2003; 2005). Fish are the major dietary component of resident killer whales in the northeastern Pacific, with 22 species of fish and one species of squid (*Gonatopsis borealis*) known to be eaten (Scheffer and Slipp, 1948; Ford et al., 1998; 2000; Saulitis et al., 2000; Ford and Ellis, 2005). Known feeding records for the SRKWs suggest a strong preference for Chinook salmon (78 percent of identified prey) during late spring to fall (Hanson et al., 2005; Ford and Ellis, 2006). Chum salmon were also taken in significant amounts (11 percent), especially in the autumn. Other species such as coho (5 percent), steelhead (*O. mykiss*, 2 percent), sockeye (*O. nerka*, 1 percent), and non-salmonids (*e.g.* Pacific herring and quillback rockfish [*Sebastes maliger*] 3 percent combined) are also consumed. Little is known about the winter and early spring foods of SRKWs (NMFS, 2008d). Resident killer whales travel in small, matrilineal groups, which contain one to seventeen (mean = 5.5) individuals spanning one to five generations. In the North Pacific, most mating is believed to occur from April to October (Nishiwaki, 1972; Olesiuk et al., 1990; 2005; Matkin et al., 1997). Estimates of calving intervals in SRKW population average between 4.9-7.7 years. The gestation period lasts about 17 months, with births peaking in late Fall (Sept. to Dec.) (Olesiuk et al., 2005). Calves are dependent on their mothers for the first couple years of their lives.

Acoustics

Killer whales produce a wide variety of clicks and whistles, but most of their sounds are pulsed with frequencies ranging from 0.5 to 25 kHz (dominant frequency range: 1 to 6 kHz) (Thomson and Richardson, 1995; Richardson et al., 1995). Source levels of echolocation signals range between 195 and 224 dB re: 1 μPa-m peak-to-peak, dominant frequencies ranging from 20 to 60 kHz, and durations of about 0.1 sec (Au et al., 2004). Source levels associated with social sounds have been calculated to range between 131 to 168 dB re: 1 μPa-m and vary with vocalization type (Veirs, 2004).

Both behavioral and auditory brainstem response technique indicate killer whales can hear in a frequency range of 1 to 100 kHz and are most sensitive at 20 kHz. This is one of the lowest maximum-sensitivity frequencies known among toothed whales (Szymanski et al., 1999).

3.9.1.3 Non-ESA Listed Marine Mammals

California Sea Lion

Status and Management

The California sea lion is protected under the MMPA. Three geographic regions are used to separate this species into stocks: (1) the United States stock, which begins at the U.S./Mexico border and extends northward into Canada; (2) the Western Baja California stock which extends from the U.S./Mexico border to the southern tip of the Baja California Peninsula; and (3) the Gulf of California stock which includes the Gulf of California from the southern tip of the Baja California Peninsula and across to the mainland, extending into southern Mexico (Lowry et al., 1991). Only the United States stock is expected to occur in the vicinity of NBK at Bangor.

Distribution

The geographic distribution of California sea lions includes a breeding range from Baja California to southern California. During the summer, California sea lions breed on islands from the Gulf of California to the Channel Islands and seldom travel more than about 31 miles (50 km) from the islands (Bonnell et al., 1983). The primary rookeries are located on the California Channel Islands of San Miguel, San Nicolas, Santa Barbara, and San Clemente (Le Boeuf and Bonnell, 1980; Bonnell and Dailey, 1993). Their distribution shifts to the northwest in fall and to the southeast during winter and spring, probably in response to changes in prey availability (Bonnell and Ford, 1987).

The non-breeding distribution extends from Baja California north to Alaska for males, and encompasses the waters of California and Baja California for females (Reeves et al., 2008; Maniscalco et al., 2004). In the non-breeding season, adult and sub-adult males migrate northward along the coast to central and northern California, Oregon, Washington, and Vancouver Island from September to May (Jeffries et al., 2000) and return south the following spring (Mate, 1975; Bonnell et al., 1983).

During the most recent aerial survey population counts for California sea lions within the inland waters of Washington state, no regular haulouts were documented to exist within Hood Canal (Jeffries et al., 2000). However, recent anecdotal information, such as observations by Navy personnel at Bangor waterfront at NBK, document that they haul out opportunistically at areas within the Hood Canal. Within their geographic range, California sea lions have been known to utilize man-made structures such as piers, jetties, offshore buoys, and oil platforms (Riedman, 1990). California sea lions in the Puget Sound even haul out on log booms and U.S. Navy submarines, and are often seen rafted off river mouths (Jeffries et al., 2000; DoN, 2001a). As many as 40 California sea lions have been observed hauled out at NBK at Bangor on manmade structures – submarines, the floating security fence, and barges (Agness and Tannenbaum, 2009a; Tannenbaum et al., 2009a; Walters, 2009, personal communication). However, the closest opportunistic haul-out location at NBK at Bangor is approximately 1 mile south of the EHW-1 facility. California sea lions have also been observed swimming in Hood Canal in the vicinity of the project area on several occasions and likely forage in both nearshore marine and inland marine deeper waters (DoN, 2001).

Population Abundance

The U.S. stock of California sea lions is the stock that may occur in the marine waters nearby NBK at Bangor. The estimated stock is 238,000 and the minimum population size of this stock is 141,842 individuals (Carretta et al., 2007). These numbers are from counts during the 2001 breeding season of animals that were ashore at the four major rookeries in southern California and at haulout sites north to the Oregon/California border. Sea lions that were at-sea or hauled out at other locations were not counted (Carretta et al., 2007). An estimated 3,000 to 5,000 California sea lions migrate to Washington and British Columbia waters during the non-breeding season from September to May (Jeffries et al., 2000). Peak numbers of up to 1,000 sea lions occur in Puget Sound (including Hood Canal) during this time period (Jeffries et al., 2000).

Behavior and Ecology

California sea lions feed on a wide variety of prey, including many species of fish and squid (Everitt et al., 1981; Roffe and Mate, 1984; Antonelis et al., 1990; Lowry et al., 1991). In the Puget Sound region, they feed primarily on fish such as hake, walleye pollock, herring, and spiny dogfish (Calambokidis and Baird, 1994; London, 2006). In some locations where sea lions and salmon runs exist, California sea lions also feed on returning adult and out-migrating juvenile salmonids (London, 2006). California sea lions are gregarious during the breeding season and social on land during other times.

Acoustics

In air, California sea lions make incessant, raucous barking sounds; these have most of their energy at less than 2 kHz (Schusterman et al., 1967). Males vary both the number and rhythm of their barks depending on the social context; the barks appear to control the movements and other behavior patterns of nearby conspecifics (Schusterman, 1977). Females produce barks, squeals, belches, and growls in the frequency range of 0.25 to 5 kHz, while pups make bleating sounds at 0.25 to 6 kHz. California sea lions produce two types of underwater sounds: clicks (or short-duration sound pulses) and barks (Schusterman et al., 1966; 1967, Schusterman and Baillet, 1969). All underwater sounds have most of their energy below 4 kHz (Schusterman et al., 1967).

The range of maximal hearing sensitivity underwater is between 1 and 28 kHz (Schusterman et al., 1972). Functional underwater high frequency hearing limits are between 35 and 40 kHz, with peak sensitivities from 15 to 30 kHz (Schusterman et al., 1972). The California sea lion shows relatively poor hearing at frequencies below 1 kHz (Kastak and Schusterman, 1998). Peak hearing sensitivities in air are shifted to lower frequencies; the effective upper hearing limit is approximately 36 kHz (Schusterman, 1974). The best range of sound detection is from 2 to 16 kHz (Schusterman, 1974). Kastak and Schusterman (2002) determined that hearing sensitivity generally worsens with depth—hearing thresholds were lower in shallow water, except at the highest frequency tested (35 kHz), where this trend was reversed. Octave band noise levels of 65 to 70 dB above the animal’s threshold produced an average temporary threshold shift (TTS), a short-term effect possibly including temporary hearing loss, of 4.9 dB in the California sea lion (Kastak et al., 1999). Center frequencies were 1,000 hertz (Hz) for corresponding threshold testing at 1000 Hz and 2,000 Hz for threshold testing at 2,000 Hz; the duration of exposure was 20 minutes.

Harbor Seal

Status and Management

The Harbor seal is protected under the MMPA. Harbor seals inhabit coastal and estuarine waters and shoreline areas from Baja California to western Alaska. Three distinct stocks exist: 1) inland waters of Washington State (including Hood Canal, Puget Sound, and the Strait of Juan de Fuca out to Cape Flattery), 2) outer coast of Oregon and Washington, and 3) California (Carretta et al., 2007). The inland waters of Washington state stock is the only stock that may occur in the marine waters near NBK at Bangor.

Distribution

Harbor seals occur throughout Hood Canal and are seen relatively commonly in the area. They are year-round, non-migratory residents, and pup (give birth) in Hood Canal. Surveys in Hood Canal from the mid-1970s to 2000 show a fairly stable population between 600-1,200 seals (Jeffries et al., 2003). Harbor seals have been observed swimming in the waters along NBK at Bangor in every month of surveys conducted from 2007 to 2010 (Agness and Tannenbaum, 2009b; Tannenbaum et al., 2009b). On the Bangor waterfront at NBK, harbor seals have not been observed hauling out in the intertidal zone, but have been observed hauled out on manmade structures such as the floating security fence, buoys, barges, marine vessels, and logs (Agness and Tannebaum, 2009a; Tannenbaum et al., 2009a). The closest opportunistic haul out location at NBK at Bangor is approximately 1 mile south of the EHW-1 facility. The main haul-out locations for harbor seals in Hood Canal are located on river delta and tidal exposed areas at Quilcene, Dosewallips, Duckabush, Hamma Hamma, and Skokomish River mouths, with the closest dedicated haul-out area to the project area being 10 miles southwest of NBK at Bangor at Dosewallips River Mouth (London, 2006).

Population Abundance

Estimated population numbers for the inland waters of Washington, including Hood Canal, Puget Sound, and the Strait of Juan de Fuca out to Cape Flattery are 14,612 (CV = 0.15) individuals (Carretta et al., 2007). The Harbor seal is the only species of marine mammals that is consistently abundant and considered resident in Hood Canal (Jeffries et al., 2003). The population of harbor seals in Hood Canal is a closed population, meaning they do not have much movement outside of Hood Canal (London, 2006). The abundance of harbor seals in Hood canal has stabilized, and the population may have reached its carrying capacity in the mid-1990s with an approximate abundance of 1,000 harbor seals (Jeffries et al., 2003).

Behavior and Ecology

Harbor seals are rarely found more than 12 miles (20 km) from shore, and frequently occupy bays, estuaries, and inlets (Baird, 2001). Individual seals have been observed several miles upstream in coastal rivers. Harbor seals are typically seen in small groups resting on tidal reefs, boulders, mudflats, man-made structures, and sandbars. Harbor seals are opportunistic feeders that adjust their patterns to take advantage of locally and seasonally abundant prey (Payne and Selzer, 1989; Baird, 2001; Bjørge, 2002). Diet consists of fish and invertebrates (Bigg, 1981; Roffe and Mate, 1984; Orr et al., 2004). Although harbor seals in the Pacific Northwest are common in inshore and estuarine waters, they primarily feed at sea (Orr et al., 2004) during high tide. Researchers have found that they complete both shallow and deep dives during hunting depending on the availability of prey (Tollit et al., 1997). Their diet in Puget Sound consists of many of the prey resources that are present in the nearshore and deeper waters of NBK at Bangor, including Pacific hake and Pacific herring and adult and out-migrating juvenile salmonids. Harbor seals in Hood Canal are known to feed on returning adult salmon, including federally threatened summer-run chum. Over a five year study of harbor seal predation in Hood Canal, the average percent escapement of summer-run chum consumed was 8 percent (London, 2006).

Ideal harbor seal habitat includes haulout sites, shelter during the breeding periods, and sufficient food (Bjørge, 2002). Haulout areas can include intertidal and subtidal rock outcrops, sandbars, sandy beaches, peat banks in salt marshes, and manmade structures such as log booms, docks, and recreational floats (Wilson, 1978; Prescott, 1982; Schneider and Payne, 1983; Gilber and Guldager, 1998; Jeffries et al., 2000). Human disturbance can affect haul-out choice (Harris et al., 2003). Harbor seals mate at sea and females gave birth during the spring and summer; although the “pupping season” varies by latitude. In coastal and inland regions of Washington, pups are born from April through January. Pups are generally born earlier in the coastal areas and later in the Puget Sound/Hood Canal region (Calambokidis and Jeffries, 1991; Jeffries et al., 2000). Suckling harbor seal pups spend as much as 40 percent of their time in the water (Bowen et al., 1999).

Acoustics

In air, harbor seal males produce a variety of low-frequency (<4 kHz) vocalizations, including snorts, grunts, and growls. Male harbor seals produce communication sounds in the frequency range of 100 to 1,000 Hz (Richardson, 1995). Pups make individually unique calls for mother recognition that contain multiple harmonics with main energy below 0.35 kHz (Bigg, 1981; Thomson and Richardson, 1995). Harbor seals hear nearly as well in air as underwater and had lower thresholds than California sea lions (Kastak and Schusterman, 1998). Kastak and Schusterman (1998) reported low frequency (100 Hz) sound detection thresholds in air at 65.4 dB re: 20 μPa for harbor seal. In air, they hear frequencies from 0.25 kHz to 30 kHz and are most sensitive from 6 to 16 kHz (Richardson, 1995; Terhune and Turnbull, 1995; Wolski et al., 2003).

Adult males also produce underwater sounds during the breeding season that typically range from 0.025 to 4 kHz (duration range: 0.1 s to multiple seconds; Hanggi and Schusterman, 1994). Hanggi and Schusteman (1994) found that there is individual variation in the dominant frequency range of sounds between different males, and Van Parijs et al. (2003) reported oceanic, regional, population, and site-specific variation that could be vocal dialects. In water, they hear frequencies from 1 to 75 kHz (Southall et al., 2007) and can detect sound levels as weak as 60 to 85 dB re: 1 μPa within that band. They are most sensitive at frequencies below 50 kHz; above 60 kHz sensitivity rapidly decreases.

West Coast Transient Killer Whale

Status and Management

Three distinct forms of killer whales, termed residents, transients, and offshores are recognized in the northeastern Pacific Ocean (NMFS, 2006). Within the transient ecotype, association data (Ford et al., 1994; Ford and Ellis, 1999; Matkin et al., 1999), acoustic data (Saulitis, 1993; Ford and Ellis, 1999) and genetic data (Hoelzel et al., 1998; 2002; Barrett-Lennard, 2000) confirms that three communities of transient whales exist and represent three discrete populations: 1) Gulf of Alaska, Aleutian Islands, and Bering Sea transients, 2) AT1 transients, and 3) West Coast transients. Among the genetically distinct assemblages of transient killer whales, only the West Coast Transient stock, which occurs from southern California to southeastern Alaska, may occur in the project area. The transient killer whale is protected under the MMPA.

Distribution

The geographical range of transient killer whales includes the northeast Pacific, with preference for coastal waters of southern Alaska and British Columbia (Krahn et al., 2002). Transient killer whales in the eastern North Pacific spend most of their time along the outer coast, but visit Hood Canal and the Puget Sound in search of harbor seals, sea lions, and other prey. Transient occurrence in inland waters appears to peak during August and September (Morton, 1990; Baird and Dill, 1995; Ford and Ellis, 1999) which is the peak time for harbor seal pupping, weaning, and post-weaning (Baird and Dill, 1995). In 2003 and 2005, small groups of transient killer whales (11 and 6 individuals, respectively) visited Hood Canal to feed on harbor seals and remained in the area for significant periods of time (59 and 172 days, respectively) between the months of January and July.

Population Abundance

The West Coast Transient stock is a trans-boundary stock, with minimum counts for the population of “transient” killer whales coming from various photographic datasets. Combining these counts of cataloged “transient” whales gives a minimum number of 314 individuals for the West Coast Transient stock (Allen and Angliss, 2010). However, the number in Washington waters at any one time is probably fewer than 20 individuals (Wiles, 2004).

Behavior and Ecology

Transient killer whales show greater variability in habitat use, with some groups spending most of their time foraging in shallow waters close to shore while others hunt almost entirely in open water (Felleman et al., 1991; Baird and Dill, 1995; Matkin and Saulitis, 1997). Transient killer whales feed on marine mammals and some seabirds, but apparently no fish (Morton, 1990; Baird and Dill, 1996; Ford et al., 1998; Ford and Ellis, 1999; Ford et al., 2005). While present in Hood Canal in 2003 and 2005, transient killer whales preyed on harbor seals in the subtidal zone of the nearshore marine and inland marine deeper water habitats (London, 2006). Other observations of foraging transient killer whales indicate they prefer to forage on pinnipeds in shallow, protected waters (Heimlich-Boran, 1988; Saulitis et al., 2000). Transient killer whales travel in small, matrilineal groups, but they typically contain fewer than 10 animals and their social organization generally is more flexible than the resident killer whale (Morton, 1990; Ford and

Ellis, 1999). These differences in social organization probably relate to differences in foraging (Baird and Whitehead, 2000). There is no information on the reproductive behavior of killer whales in this area.

Acoustics

Killer whales produce a wide variety of clicks and whistles, but most of their sounds are pulsed with frequencies ranging from 0.5 to 25 kHz (dominant frequency range: 1 to 6 kHz) (Thomson and Richardson, 1995; Richardson et al., 1995). Source levels of echolocation signals range between 195 and 224 dB re: 1 μPa-m peak-to-peak, dominant frequencies ranging from 20 to 60 kHz, and durations of about 0.1 sec (Au et al., 2004). Source levels associated with social sounds have been calculated to range between 131 to 168 dB re: 1 μPa-m and vary with vocalization type (Veirs, 2004).

Both behavioral and auditory brainstem response technique indicate killer whales can hear in a frequency range of 1 to 100 kHz and are most sensitive at 20 kHz. This is one of the lowest maximum-sensitivity frequencies known among toothed whales (Szymanski et al., 1999).

Dall's Porpoise

Status and Management

The Dall's porpoise is protected under the MMPA. Based on NMFS stock assessment reports, Dall's porpoises within the Pacific U.S. Exclusive Economic Zone (EEZ) are divided into two discrete, noncontiguous areas: 1) waters off California, Oregon, and Washington, and 2) those in Alaskan waters (Carretta et al., 2008). Only individuals from the CA/OR/WA stock may occur within the project area.

Distribution

The Dall's porpoise is found from northern Baja California, Mexico, north to the northern Bering Sea and south to southern Japan (Jefferson et al., 1993). The species is only common between 32°N and 62°N in the eastern North Pacific (Morejohn, 1979; Houck and Jefferson, 1999). North-south movements in California, Oregon, and Washington have been suggested. Dall's porpoises shift their distribution southward during cooler-water periods (Forney and Barlow, 1998). Norris and Prescott (1961) reported finding Dall's porpoise in southern California waters only in the winter, generally when the water temperature was less than 15°C. Seasonal movements have also been noted off Oregon and Washington, where higher densities of Dall's porpoises were sighted offshore in winter and spring and inshore in summer and fall (Green et al., 1992).

In Washington, they are most abundant in offshore waters. They are year-round residents in Washington (Green et al., 1992), but their distribution is highly variable between years likely due to changes in oceanographic conditions (Forney and Barlow, 1998). Dall's porpoise are observed throughout the year in the Puget Sound north of Seattle (Osborne et al., 1998) and are seen occasionally in southern Puget Sound. Dall's porpoises may also occasionally occur in Hood Canal (Jeffries, 2006, personal communication). Nearshore habitats used by Dall's porpoise could include the marine habitats found in the inland marine waters of Hood Canal. A

Dall's porpoise was observed in the deeper water at NBK at Bangor in summer 2008 (Tannenbaum et al., 2009a).

Population Abundance

The NMFS population estimate, recently updated in 2008 for the California/Oregon/Washington stock, is 48,376 (CV – 0.24) which is based on vessel line transect surveys by Barlow and Forney (2007) and Forney (2007) (Carretta et al., 2008). Additional numbers of Dall's porpoise occur in the inland waters of WA state, but the most recent estimate obtained in 1996 (900 animals; CV = 0.40) is over 10 years old (Calambokidis et al., 1997) and is not included in the overall estimate of abundance for this stock due to the need for more up-to-date information.

Behavior and Ecology

Dall's porpoises can be opportunistic feeders but primarily consume schooling forage fish. They are known to eat squid, crustaceans, and fishes such as eelpout, herring, Pollock, whiting, and sand lance (Walker et al., 1998). Groups of Dall's porpoises generally include fewer than 10 individuals and are fluid, probably aggregating for feeding (Jefferson, 1990; 1991, Houck and Jefferson, 1999). Breeding and calving typically occurs in the spring and summer (Angell and Balcomb, 1982). In the North Pacific, there is a strong summer calving peak from early June through August (Ferrero and Walker, 1999), and a smaller peak in March (Jefferson, 1989). Resident Dall's porpoise breed in Puget Sound from August to September.

Acoustics

Only short duration pulsed sounds have been recorded for Dall's porpoise (Houck and Jefferson, 1999); this species apparently does not whistle often (Richardson et al., 1995). Dall's porpoises produce short duration (50 to 1,500 μs), high-frequency, narrow band clicks, with peak energies between 120 and 160 kHz (Jefferson, 1988). There is no published data on the hearing abilities of this species.

Harbor Porpoise

Status and Management

The Harbor porpoise is protected under the MMPA. Based on genetic data and density discontinuities identified from aerial surveys, NMFS identifies eight stocks in the Northeast Pacific Ocean. Pacific coast harbor porpoise stocks include: 1) a Monterey Bay stock, 2) a San Francisco-Russian River stock, 3) a northern California/southern Oregon stock, 4) an Oregon/Washington coast stock, 5) an Inland Washington stock, 6) a Southeast Alaska stock, 7) a Gulf of Alaska stock, and 8) a Bering Sea stock. Only individuals from the Inland waters of Washington stock may occur in the project area.

Distribution

Harbor porpoise are generally found in cool temperature to subarctic waters over the continental shelf in both the North Atlantic and North Pacific (Read, 1999). This species is seldom found in waters warmer than 17°C (63°F) (Read, 1999) or south of Point Conception (Hubbs, 1960;

Barlow and Hanan, 1995). Harbor porpoises can be found year-round primarily in the coastal shallow waters of harbors, bays, and river mouths (Green et al., 1992). Along the Pacific coast, harbor porpoises occur from Monterey Bay, California to the Aleutian Islands and west to Japan (Reeves et al., 2002). Harbor porpoises are known to occur in Puget Sound year round (Osmek et al., 1996; 1998; Carretta et al., 2007), and may occasionally occur in Hood Canal (Jeffries, 2006, personal communication). Harbor porpoise observations in northern Hood Canal have increased in recent years (Calambokidis, 2010, personal communication). A harbor porpoise was seen in deeper water at NBK at Bangor during 2010 field observations (SAIC staff observations, 2010).

Population Abundance

Aerial surveys of the inside waters of Washington and southern British Columbia were conducted during August of 2002 and 2003 (J. Laake, unpubl. Data). These aerial surveys included the Strait of Juan de Fuca, San Juan Islands, Gulf Islands, and Strait of Georgia, which includes waters inhabited by the Washington Inland Waters stock of harbor porpoise as well as harbor porpoise from British Columbia. An average of the 2002 and 2003 estimates of abundance in U.S. waters resulted in an uncorrected abundance of 3,123 (CV= 0.10) harbor porpoises in Washington inland waters (J. Laake, unpubl. Data). When corrected for availability and perception bias, using a correction factor of 3.42 (1/g(0); g(0)=0.292, CV=0.366) (Laake et al., 1997), the estimated abundance for the Washington Inland Waters stock of harbor porpoise is 10,682 (CV=0.38) animals (Carretta et al., 2008).

Behavior and Ecology

Harbor porpoises are non-social animals usually seen in small groups of two to five animals. Little is known about their social behavior. Harbor porpoises can be opportunistic foragers but primarily consume schooling forage fish (Osmek et al., 1996; Bowen and Siniff, 1999; Reeves et al., 2002). Along the coast of Washington, harbor porpoise primarily feed on Pacific herring (*Clupea pallasii*), market squid and smelts (Gearin et al., 1994). Females may give birth every year for several years in a row; calves are born in late spring (Read, 1990; Read and Hohn, 1995). Dall's and harbor porpoises appear to hybridize relatively frequently in the Puget Sound area (Willis et al., 2004).

Acoustics

Harbor porpoise vocalizations include clicks and pulses (Ketten, 1998), as well as whistle-like signals (Verboom and Kastelein, 1995). The dominant frequency range is 110 to 150 kHz, with source levels of 135 to 177 dB re: 1 μPa-m (Ketten, 1998). Echolocation signals include one or two low-frequency components in the 1.4 to 2.5 kHz range (Verboom and Kastelein, 1995).

A behavioral audiogram of a harbor porpoise indicated the range of best sensitivity is 8 to 32 kHz at levels between 45 and 50 dB re: 1 μPa-m (Andersen, 1970); however, auditory-evoked potential studies showed a much higher frequency of approximately 125 to 130 kHz (Bibikov, 1992). The auditory-evoked potential method suggests that the harbor porpoise actually has two frequency ranges of best sensitivity. More recent psycho-acoustic studies found the range of best hearing to be 16 to 140 kHz, with a reduced sensitivity around 64 kHz (Kastelein et al., 2002). Maximum sensitivity occurs between 100 and 140 kHz (Kastelein et al., 2002).

3.9.2 Environmental Consequences

3.9.2.1 No Action Alternative

Under the No Action Alternative the Test Pile Program would not be conducted. Baseline conditions, as described above, for marine mammals would remain unchanged. Therefore, there would be no significant impacts to marine mammals from implementation of the No Action Alternative.

3.9.2.2 Proposed Action

The evaluation of impacts to marine mammals considers the importance of the resource, the proportion of the resource impacted relative to its occurrence in the region, the particular sensitivity of the resource to project activities, and the duration of environmental impacts or disruption. In general, pile installation and removal activities in the project area would include elevated underwater noise levels, increased human activity and noise, and changes in prey availability within the project area. In particular, underwater and airborne noise generated from pile installation and removal activities associated with the Test Pile Program have the potential to disrupt marine mammals that may be traveling through, foraging or resting in the vicinity of the project area. Impacts to marine mammals are anticipated to be highly localized because marine mammals are wide-ranging in Hood Canal, relative to the area that might be impacted by pile driving within the project area.

3.9.2.2.1 Direct Effects of Pile Driving Activities

3.9.2.2.1.1 Background on Acoustics

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water. Sound is generally characterized by several factors, including frequency and intensity. Frequency describes the sound’s pitch and is measured in hertz (Hz), while intensity describes the sound’s loudness. Due to the wide range of pressure and intensity encountered during measurements of sound, a logarithmic scale is used. In acoustics, the word “level” denotes a sound measurement in decibels. A decibel (dB) expresses the logarithmic strength of a signal relative to a reference. Because the decibel is a logarithmic measure, each increase of 20 dB reflects a ten-fold increase in signal amplitude (whether expressed in terms of pressure or particle motion), i.e., 20 dB means ten times the amplitude, 40 dB means one hundred times the amplitude, 60 dB means one thousand times the amplitude, and so on. Because the decibel is a relative measure, any value expressed in decibels is meaningless without an accompanying reference. In describing underwater sound pressure, the reference amplitude is usually 1 microPascal (μPa, or 10^{-6} Pascals), and is expressed as “dB re: 1 μPa.” For in-air sound pressure, the reference amplitude is usually 20 μPa and is expressed as “dB re: 20 μPa.”

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called A-weighting, and the decibel level measured is called the A-weighted sound level (dBA). A filtering method that reflects hearing of marine mammals has not yet been developed. Therefore, underwater sound levels are not weighted and measure the entire frequency range of interest. In the case of marine construction work, the frequency range of interest is 10 to 10,000 Hz. The bulk of acoustic energy generated underwater due to pile driving ranges between 50 and 1,000 Hz (WSDOT 2010b). This range was confirmed by recent pile driving acoustic reports in Puget Sound, which show the majority of observed energy to be below 1,000 Hz (Carlson et al. 2005; Laughlin 2005b).

Table 3.21 summarizes commonly used terms to describe underwater sounds. Two common descriptors are the instantaneous peak sound pressure level (SPL) and the root mean square (rms) SPL (dB rms) during the pulse or over a defined averaging period. The peak pressure is the instantaneous maximum or minimum overpressure observed during each pulse or sound event and is presented in Pascals (Pa) or dB referenced to a pressure of one microPascal (dB re: 1 µPa). The rms level is the square root of the energy divided by a defined time period. All underwater sound levels throughout the remainder of this application are presented in dB re: 1 µPa unless otherwise noted.

TABLE 3.21 DEFINITIONS OF ACOUSTICAL TERMS

Term	Definition
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 microPascal (µPa) and for air is 20 µPa (approximate threshold of human audibility).
Sound Pressure Level, SPL	Sound pressure is the force per unit area, usually expressed in microPascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressure exerted by the sound to a reference sound pressure. Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as hertz (Hz). Typical human hearing ranges from 20 Hz to 20,000 Hz.
Peak Sound Pressure (unweighted), dB re: 1 µPa	Peak sound pressure level is based on the largest absolute value of the instantaneous sound pressure over the frequency range from 20 Hz to 20,000 Hz. This pressure is expressed in this application as dB re: 1 µPa.
Root-Mean-Square (rms), dB re: 1 µPa	The rms level is the square root of the energy divided by a defined time period. For pulses, the rms has been defined as the average of the squared pressures over the time that comprise that portion of waveform containing 90 percent of the sound energy for one impact pile driving impulse.[11]

[11] Underwater sound measurement results obtained by Illingworth & Rodkin (2001) for the Pile Installation Demonstration Project in San Francisco Bay indicated that most impact pile driving impulses occurred over a 50 to 100 millisecond (ms) period. Most of the energy was contained in the first 30 to 50 ms. Analyses of that underwater acoustic data for various pile strikes at various distances demonstrated that the acoustic signal measured using the standard "impulse exponential time-weighting" on the sound level meter (35-ms rise time) correlated to the rms level measured over the duration of the pulse.

TABLE 3.21 DEFINITIONS OF ACOUSTICAL TERMS (continued)

Term	Definition
Sound Exposure Level (SEL), dB re: 1 μPa^2 sec	Sound exposure level is a measure of energy. Specifically, it is the dB level of the time integral of the squared-instantaneous sound pressure, normalized to a 1-second period. It can be an extremely useful metric for assessing cumulative exposure because it enables sounds of differing duration, to be compared in terms of total energy.
Waveforms, μPa over time	A graphical plot illustrating the time history of positive and negative sound pressure of individual pile strikes shown as a plot of μPa over time (i.e., seconds).
Frequency Spectra, dB over frequency range	A graphical plot illustrating the 6 to 12 Hz band-center frequency sound pressure over a frequency range (e.g., 10 to 10,000 Hz in this application).
A-Weighting Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A- or C-weighting filter network. The A-weighting filter de-emphasizes the low and high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise.
Ambient Noise Level	The background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

3.9.2.2.1.2 Potential Acoustic Effects of Pile Driving on Marine Mammals

Potential Effects of Underwater Noise

The effects of pile driving on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile installation and removal activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, substrates which are soft (i.e. sand) will absorb or attenuate the sound more readily than hard substrates (rock), which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

Impacts to marine species are expected to be the result of physiological responses to both the type and strength of the acoustic signature (Viada et al., 2008). Behavioral impacts are also expected, though the type and severity of these effects are more difficult to define due to limited studies addressing the behavioral effects of impulsive sounds on marine mammals. Potential effects from impulsive sound sources can range from brief acoustic effects such as behavioral disturbance, tactile perception, physical discomfort, slight injury of the internal organs and the auditory system, to death of the animal (Yelverton et al., 1973; O'Keefe and Young, 1984; DoN, 2001b).

Physiological Responses

Direct tissue responses to impact/impulsive sound stimulation may range from mechanical vibration or compression with no resulting injury, to tissue trauma (injury). Because the ears are the most sensitive organ to pressure, they are the organs most sensitive to injury (Ketten, 2000). Sound related trauma can be lethal or sub-lethal. Lethal impacts are those that result in immediate death or serious debilitation in or near an intense source (Ketten, 1995). Sub-lethal impacts include hearing loss, which is caused by exposure to perceptible sounds. Severe damage, from a pressure wave, to the ear can include rupture of the tympanum, fracture of the ossicles, damage to the cochlea, hemorrhage, and cerebrospinal fluid leakage into the middle ear (NMFS, 2008c). Moderate injury implies partial hearing loss. Permanent hearing loss can occur when the hair cells are damaged by one very loud event, as well as prolonged exposure to noise. Instances of TTS and/or auditory fatigue are well documented in marine mammal literature as being one of the primary avenues of acoustic impact. Temporary loss of hearing sensitivity (TTS) has been documented in controlled settings using captive marine mammals exposed to strong sound exposure levels at various frequencies (Ridgway et al., 1997; Kastak et al., 1999; Finneran et al., 2005), but it has not been documented in wild marine mammals exposed to pile driving. While injuries to other sensitive organs are possible, they are less likely since pile driving impacts occur almost entirely through acoustic pathways, versus explosive sounds which also include a shock wave which can result in damage.

No physiological responses are expected within the project area from pile installation and removal operations proposed to occur during the Test Pile Program for several reasons. First, vibratory pile driving which would be utilized as the primary installation and removal method, does not generate high enough peak sound pressure levels that are commonly associated with physiological damage. Any use of impulsive pile driving would only occur for a short period of time (~15 minutes per pile) and only to proof the piles. Additionally, the mitigation measures which the Navy will be employing (see Chapter 4) would greatly reduce the chance that a marine mammal may be exposed to sound pressure levels that could cause physical harm. During impact pile driving, the Navy would employ a sound attenuation system (i.e. Gunderboom SAS™, TNAP, confined bubble curtain and/or unconfined bubble curtain) to reduce initial sound pressure levels (-10 dB reduction assumed), thus decreasing the chance of physiological impacts. Furthermore, the Navy would have trained biologists monitoring a shutdown zone equivalent to the Level A Harassment zone (inclusive of the 180 dB re: 1 μ Pa (cetaceans) and 190 dB re: 1 μ Pa (pinnipeds) isopleths) to ensure no marine mammals are injured.

Behavioral Responses

Behavioral responses to sound are highly variable and context specific. For each potential behavioral change, the magnitude of the change ultimately determines the severity of the response. A number of factors may influence an animal's response to noise, including its previous experience, its auditory sensitivity, and its biological and social status (including age and sex), and its behavioral state and activity at the time of exposure. With regard to pile driving, in most instances the severity of the response would be minimal and could result in temporary, short-term changes in the animal's typical behavior. For instance, a marine mammal may swim further away from the sound source or become startled by the noise. Other potential behavioral changes could include increased swimming speed, increased surfacing time, and decreased foraging.

Controlled experiments with captive marine mammals have shown pronounced behavioral reactions to noise, including avoidance of loud sound sources (Ridgway et al., 1997; Finneran et al., 2003). Observed responses of wild marine mammals to loud sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; Gordon et al., 2004; Wartzok et al., 2004; and Nowacek et al., 2007). Responses to continuous noise, such as vibratory pile installation and removal, have not been documented as well as responses to pulsed sounds. With regard to pile driving, it is likely that the onset of pile driving could result in temporary, short-term changes in the animal's typical behavior and/or avoidance of the affected area. A marine mammal may show signs that it is startled by a noise and/or may swim away from the sound source and avoid the area. Other potential behavioral changes could include increased swimming speed, increased surfacing time, and decreased foraging. Since pile driving will likely only occur for a few hours a day, over a short period of time, it is unlikely to result in permanent displacement. Any potential impacts from pile driving activities could be experienced by individual marine mammals but would not ultimately result in population level impacts, or affect the long-term fitness of the species.

Potential Effects of Airborne Noise

Marine mammals that occur in the project area could be exposed to airborne sounds associated with pile driving that have the potential to cause harassment, depending on their distance from pile driving activities. Airborne pile driving noise would have less impact on cetaceans than pinnipeds because noise from atmospheric sources does not transmit well underwater (Richardson et al., 1995); thus airborne noise would only be an issue for hauled-out pinnipeds in the project area. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater noise. For instance, anthropogenic sound could cause hauled out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon their habitat and move further from the source. Marine mammal observations during pile driving associated with the San Francisco-Oakland Bay Bridge provide realistic information regarding potential effects of airborne noise. Harbor seals and California sea lions monitored during pile driving which were hauled out 0.9 miles from pile driving barges did not react to pile driving noise, although the number of hauled out individuals increased during periods of construction activity, suggesting that noise could be disturbing them while in the water. Some harbor seals were noted moving away after the initiation of pile driving. In most observations, the seals in the vicinity at the onset of pile driving responded by looking toward the barges and exhibiting other signs of alertness and swimming away (Caltrans, 2001; 2006). Conversely, studies by Blackwell et al. (2004) and Moulton et al. (2005) indicate a tolerance or lack of response to unweighted airborne sounds as high as 112 dBpeak and 96 dB rms. Based on these observations marine mammals could exhibit temporary behavioral reactions to airborne noise, however, exposure is not likely to result in population level impacts. Injury or Level A harassment is not expected to occur from airborne noise due to the low airborne source levels produced by impact and vibratory hammers.

3.9.2.2.1.3 Thresholds and Criteria for Pile Driving

Since 1997, NMFS has used generic sound exposure thresholds to determine when an activity in the ocean that produces sound might result in impacts to a marine mammal such that a take by harassment might occur (70 FR 1871). To date, no studies have been conducted that examine impacts to marine mammals from pile driving sounds from which empirical noise thresholds have been established. Current NMFS practice regarding exposure of marine mammals to high level sounds is that cetaceans and pinnipeds exposed to impulsive sounds of 180 and 190 dB rms or above, respectively, are considered to have been taken by Level A (i.e., injurious) harassment. Behavioral harassment (Level B) is considered to have occurred when marine mammals are exposed to sounds at or above 160dB rms for impulse sounds (e.g., impact pile driving) and 120dB rms for continuous noise (e.g., vibratory pile driving), but below injurious thresholds. The application of the 120 dB rms threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. In fact, there is no evidence that pinnipeds will react to continuous sounds at this level and more research is needed (Hollingshead, 2008, pers. 3-103arbo.). As a result, these levels are considered precautionary (NMFS, 2009; 74 FR 41684). NMFS is developing new science-based thresholds to improve and replace the current generic exposure level thresholds, but the criteria have not been finalized (Southall et al., 2007). The current Level A (injury) and Level B (disturbance) thresholds are provided in Table 3.22.

As described above for underwater sound injury and harassment thresholds, NMFS uses generic sound exposure thresholds to determine when an activity in the ocean that produces airborne sound might result in impacts to marine mammals (70 FR 1871). Pile driving airborne noise would have little impact to cetaceans because noise from airborne sources would not transmit well underwater (Richardson et al., 1995); thus, noise would primarily affect only hauled-out pinnipeds near the Project Area. NMFS has identified behavioral harassment threshold criteria for airborne noise generated by pile driving for pinnipeds protected under the MMPA. Level A injury threshold criteria for airborne noise have not been established. The Level B behavioral harassment threshold for harbor seals is 90 dB rms (unweighted) re: 20 μPa and for all other pinnipeds is 100 dB rms (unweighted) re: 20 μPa. These thresholds are provided in Table 3.22.

3.9.2.2.1.4 Determining Expected Sound Pressure Levels

In-water construction activities associated with the Test Pile Program would include the use of impact pile driving and vibratory pile hammers. The sounds produced by these activities fall into one of two sound types: pulsed and non-pulsed (defined below). Impact pile driving produces pulsed sounds, while vibratory pile driving produce non-pulsed (or continuous) sounds. The distinction between these two general sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (e.g. Ward, 1997 as cited in Southall et al., 2007).

Pulsed sounds (e.g. explosions, gunshots, sonic booms, seismic airgun pulses, and impact pile driving) are brief, broadband, atonal transients (ANSI, 1986; Harris, 1998) and occur either as isolated events or repeated in some succession (Southall et al., 2007). They are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a decay period that may include a period of diminishing, oscillating maximal and minimal pressures

(Southall et al., 2007). Pulsed sounds generally have an increased capacity to induce physical injury as compared with sounds that lack these features (Southall et al., 2007).

TABLE 3.22 INJURY AND DISTURBANCE THRESHOLDS FOR UNDERWATER AND AIRBORNE SOUNDS

Marine Mammals	**Airborne Marine Construction Criteria** (Impact & Vibratory Pile Driving) **(re 20 µPa)**	**Underwater Vibratory Pile Driving Criteria** (*e.g.* non-pulsed/continuous sounds) **(re 1 µPa)**		**Underwater Impact Pile Driving Criteria** (*e.g.* pulsed sounds) **(re 1 µPa)**	
	Disturbance Guideline Threshold (Haulout)[1]	**Level A Injury Threshold**	**Level B Disturbance Threshold**	**Level A Injury Threshold**	**Level B Disturbance Threshold**
Cetaceans (whales, dolphins, porpoises)	N/A	180 dB rms	120 dB rms	180 dB rms	160 dB rms
Pinnipeds (seals, sea lions, walrus; except harbor seal)	100 dB rms (unweighted)	190 dB rms	120 dB rms	190 dB rms	160 dB rms
Harbor seal	90 dB rms (unweighted)	190 dB rms	120 dB rms	190 dB rms	160 dB rms

[1] Sound level at which pinniped haulout disturbance has been documented. Not an official threshold, but used as a guideline.
dB = decibel; N/A = not applicable; rms = root mean square

Non-pulse (intermittent or continuous sounds) can be tonal, broadband, or both (Southall et al., 2007). Some of these non-pulse sounds can be transient signals of short duration but without the essential properties of pulses (e.g. rapid rise time) (Southall et al., 2007). Examples of non-pulse sounds include vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems (Southall et al., 2007). The duration of such sounds, as received at a distance, can be greatly extended in highly reverberant environments (Southall et al., 2007).

Underwater Noise from Pile driving

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. A large quantity of literature regarding sound pressure levels recorded from pile driving projects is available for consideration. In order to determine reasonable sound pressure levels and their associated affects on marine mammals that are likely to result from pile driving at NBK at Bangor, studies with similar properties to the proposed action were evaluated. Sound levels associated with vibratory pile removal are the same as those during vibratory installation (Caltrans, 2007) and have been taken into consideration in the modeling analysis. Studies which met the following parameters were considered:

1. Pile materials – steel pipe piles (30-72” diameter);
2. Hammer machinery – vibratory and impact hammers; and
3. Physical environment – shallow depth (<100 feet [30 m]).

Table 3.23 details representative pile installation/removal sound pressure levels that have been recorded from similar construction activities in recent years. Due to the similarity of these actions and the Navy’s proposed action, they represent reasonable sound pressure levels which could be anticipated, and these values were used in the acoustic modeling and analysis.

TABLE 3.23 UNDERWATER SOUND PRESSURE LEVELS FROM SIMILAR IN-SITU MONITORED CONSTRUCTION ACTIVITIES

Project & Location	Pile Size &Type	Installation Method	Water Depth	Measured Sound Pressure Levels
Mukilteo Test Piles, WA[1]	36-inch Steel Pipe	Impact	7.3 m (24 feet)	195 dB re: 1 µPa (rms) at 10 m
Richmond-San Rafael Bridge, CA[2]	66-inch Steel CISS Pile	Impact	4.0 m (13.1 feet)	195 dB re: 1 µPa (rms) at 10 m
Unknown Location, CA[2]	72-inch Steel Pipe Pile	Vibratory	~5 m (16.4 feet)	180 dB re: 1 µPa (rms) at 10 m

Sources: [1]WSDOT, 2007; [2] Caltrans, 2007

Airborne Noise from Pile Driving

Pile driving can generate airborne noise that could potentially result in disturbance to marine mammals (pinnipeds) which are hauled out or at the water’s surface near the project area. In order to determine reasonable airborne sound pressure levels and their associated affects on marine mammals that are likely to result from pile driving operations at NBK at Bangor, studies with similar properties to the proposed action were evaluated. Studies which met the following parameters were considered:

1. Pile materials – steel pipe piles (30-72” diameter);
2. Hammer machinery – vibratory and impact hammers; and
3. Physical environment – shallow depth (<100 foot).

Table 3.24 details representative airborne pile driving sound pressure levels that have been recorded from similar construction activities in recent years. Due to the similarity of these actions and the Navy’s proposed action, they represent reasonable sound pressure levels which could be anticipated, and these values were used in the acoustic modeling and analysis. A spherical spreading loss model, assuming average atmospheric conditions, was used to estimate the distance to the 100 dB and 90 dB re: 20 µPa rms (unweighted) airborne thresholds.

TABLE 3.24 AIRBORNE SOUND PRESSURE LEVELS FROM SIMILAR IN-SITU MONITORED CONSTRUCTION ACTIVITIES

Project & Location	Pile Size &Type	Installation Method	Water Depth	Measured Sound Pressure Levels
Northstar Island, AK[1]	42- inch Steel Pipe Pile	Impact	~12 m (40 feet)	97 dB re: 20 µPa (rms) at 525 feet
Keystone Ferry Terminal, WA[2]	30- inch Steel Pipe Pile	Vibratory	~9 m (30 feet)	98 dB re: 20 µPa (rms) at 36 feet

Sources**:** [1]Blackwell et al., 2004; [2]WSDOT, 2010

3.9.2.2.1.5 Distance(s) to Sound Thresholds

<u>*Underwater Noise from Pile Driving*</u>

Pile driving would generate underwater noise that potentially could result in disturbance to marine mammals swimming by the project area. Transmission loss (TL) underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The formula for transmission loss is:

$$TL = B * \log_{10}© + C * R,$$

Where:

B = logarithmic (predominantly spreading) loss
C = linear (scattering and absorption) loss
R = range from source in meters

For all underwater calculations in this assessment, linear loss © was not used (i.e. C=0) and transmission loss was calculated using only logarithmic spreading. Under open ocean conditions, unimpeded underwater noise would spread spherically from the source with sound waves spreading out equally in all directions. This type of sound transmission assumes a logarithmic spreading loss (B) equal to 20 in the above formula. In shallow water environments, waves spread out cylindrically. Under these conditions sound waves on the horizontal axis would spread equally, but those spreading on the vertical axis would be impeded by the seafloor or water's surface. This type of sound transmission assumes a logarithmic spreading loss (B) equal to 10 in the above formula. The nearshore environment of the project site has areas of both shallow bathymetry close to shore where sound would likely propagate following cylindrical spreading and deeper bathymetry further offshore where sound would likely propagate following spherical spreading. As a result, to take into account these varied bathymetric conditions and recommendations from the regulatory agencies (NMFS and USFWS), the Navy utilized the "practical spreading loss" model in the underwater acoustic analyses which assumes a spreading loss constant (B) of 15 which is between spherical and cylindrical spreading. Therefore, using practical spreading (B=15), the revised formula for transmission loss is TL = 15 log10 ©.

For the Test Pile Program, the Navy intends to employ noise reduction techniques during impact pile driving, including the use of sound attenuation devices (i.e. Gunderboom SAS™, TNAP, confined and/or unconfined bubble curtain). Additionally, vibratory pile driving will be the primary installation method. The calculations of the distances to the marine mammal noise thresholds were calculated for impact installation with and without consideration for mitigation measures. Distances calculated with consideration for mitigation assumed a 10 dB reduction in source levels from the utilization of sound attenuation devices (e.g. Gunderboom SAS™, TNAP, confined and/or unconfined bubble curtain). The Navy will be using the mitigated distances for impact pile driving for all further analysis in this EA, except during temporary periods of unattenuated impact pile driving to test the effectiveness of sound attenuation devices used during the Test pile Program. Calculations for the marine mammal noise criteria for vibratory installation were done based on in-situ recordings of vibratory installation/extraction data from Caltrans (2007) which indicated a SPL of 180 db re: 1μPa at 10m. This concurred with published literature from other studies which have in the past used a 15 dB reduction factor from source levels from impact driving recordings to calculate sources levels for vibratory pile driving. Sound levels associated with vibratory pile removal are the same as those during vibratory installation (Caltrans, 2007) and have been taken into consideration in the modeling analysis. All calculated distances to and the total area encompassed by the marine mammal noise thresholds are provided in Table 3.25.

TABLE 3.25 CALCULATED DISTANCES(S) TO, AND THE AREA ENCOMPASSED BY THE UNDERWATER MARINE MAMMAL NOISE THRESHOLDS FROM PILE DRIVING OPERATIONS

Species	Threshold	Without Mitigation (m)[1]	-10 dB Mitigation (m)[1]	Distance in (km)	Area in (km^2)
Pinnipeds	Impact Driving Injury (190 dB rms)	22	5	0.005	0.000
Cetaceans	Impact Driving Injury (180 dB rms)	100	22	0.022	0.002
All Marine Mammals	Impact Driving Disturbance (160 dB rms)	2154	464	0.464	0.676
Pinnipeds	Vibratory Driving Injury (190 dB rms)	2	N/A	0.002	0.000
Cetaceans	Vibratory Driving Injury (180 dB rms)	10	N/A	0.010	0.000
All Marine Mammals	Vibratory Driving Disturbance (120 dB rms)	100,000	N/A	100[2]	31,416[2]

All sound levels expressed in dB re: 1 μPa rms. dB = decibel; rms = root-mean-square; μPa = microPascal; N/A = not applicable
Practical spreading loss (15 log, or 4.5 dB per doubling of distanced) used for calculations.
[1]Sound pressure levels used for calculations were: 195 dB re: 1 μPa @ 10m for impact and 180 dB re: 1 μPa @ 10m for vibratory
[2]Range calculated is greater than what would be realistic. Hood Canal average width at site is 2.4 km, and is fetch limited from N to S at 20.3 km.

The calculations presented in Table 3.25 assumed a field free of obstruction, which is unrealistic, however, because Hood Canal does not represent open water conditions (free field) and therefore, sounds would attenuate as they encountered land masses or bends in the canal. As a result, some of the distances and areas of impact calculated cannot actually be attained at the project area. The actual distances to the behavioral disturbance thresholds for both impact and vibratory pile driving (464 m and 100,000 m, respectively) may be shorter than those calculated due to the irregular contour of the waterfront, the narrowness of the canal, and the maximum fetch (furthest distance sound waves travel without obstruction [i.e. line of site]) at the project area. Table 3.26 and Figures 3-13 and 3-14 depict the actual distances and area encompassed by each underwater sound threshold that may actually occur at the project area due to pile installation and removal for cetaceans and pinnipeds, respectively.

TABLE 3.26 ACTUAL AREA ENCOMPASSED (PER PILE) BY THE UNDERWATER MARINE MAMMAL THRESHOLDS FROM PILE DRIVING

Species	Threshold	Distance with Mitigation (m)	Distance in (km)	Predicted Area in (km^2)	Actual Area in (km^2)
Pinnipeds	Impact Driving Injury (190 dB rms)	5	0.005	0.000	0.000
Cetaceans	Impact Driving Injury (180 dB rms)	22	0.022	0.002	0.002
All Marine Mammals	Impact Driving Disturbance (160 dB rms)	464	0.464	0.676	0.509
Pinnipeds	Vibratory Driving Injury (190 dB rms)	2	0.002	0.000	0.000
Cetaceans	Vibratory Driving Injury (180 dB rms)	10	0.010	0.000	0.000
All Marine Mammals	Vibratory Driving Disturbance (120 dB rms)	100,000	100	31,416	41.5

Airborne Noise from Pile Driving

Pile driving would generate airborne noise that potentially could result in disturbance to marine mammals hauled out or at the surface in the vicinity of the project area. Transmission loss (TL) in air is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. A spherical spreading loss model, assuming average atmospheric conditions, was used to estimate the distance to the 100 dB and 90 dB re: 20 µPa rms (unweighted) airborne thresholds for all pinnipeds (except harbor seals) and harbor seals, respectively. The formula for calculating spherical spreading loss is:

$$TL = 20\log r$$

Where:

TL = Transmission loss
r = Distance from source to receiver

*Spherical spreading results in a 6 dB decrease in sound pressure level per doubling of distance

All calculated distances to and the total area encompassed by the marine mammal noise thresholds are provided in Table 3.27. These distances are all less than the distances calculated for underwater sound thresholds. Since protective measures are in place out to the distances calculated for the underwater thresholds, the distances for the airborne thresholds will be covered fully by monitoring. All construction noise associated with the project area would not extend beyond the buffer zone that would be established to protect seals and sea lions. For pinnipeds, figures 3-15 and 3-16 depict the actual distances to each airborne sound threshold that are predicted to occur at the project area due to pile driving.

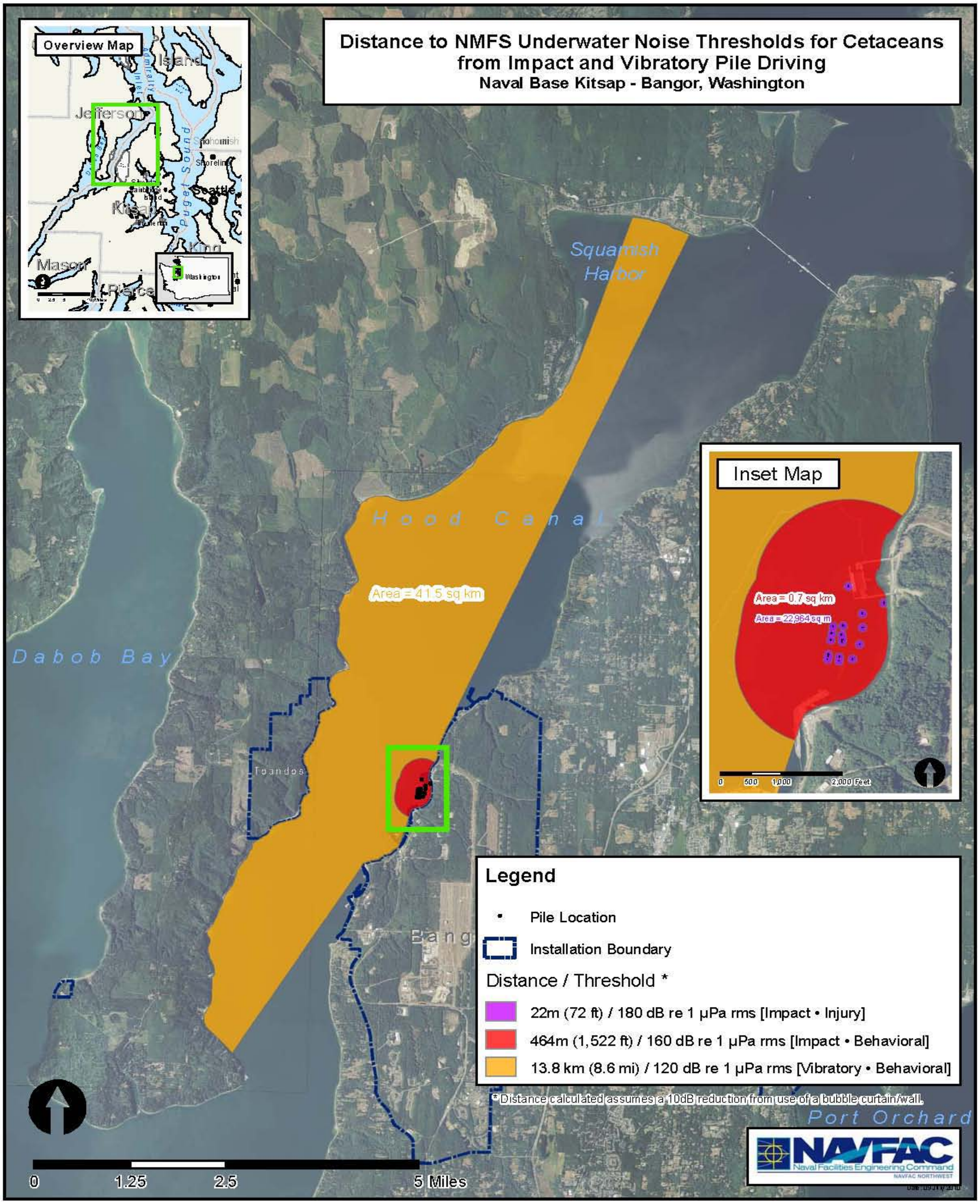


Figure 3-13 Distance(s) (m) to NMFS Underwater Sound Threshold for Cetaceans from Impact and Vibratory Pile Driving

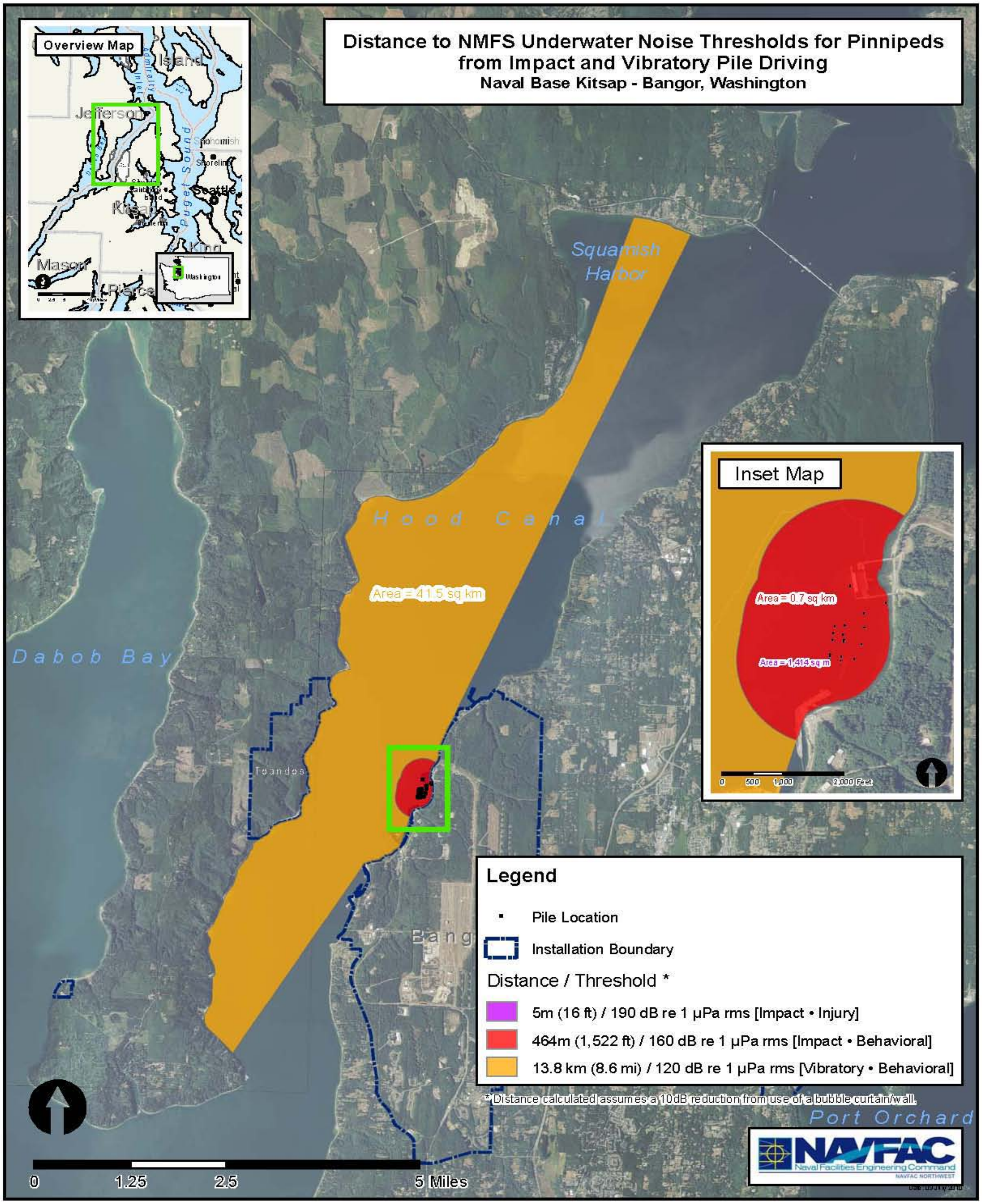


Figure 3-14 Distance(s) (m) to NMFS Underwater Sound Thresholds for Pinnipeds from Impact and Vibratory Pile Driving

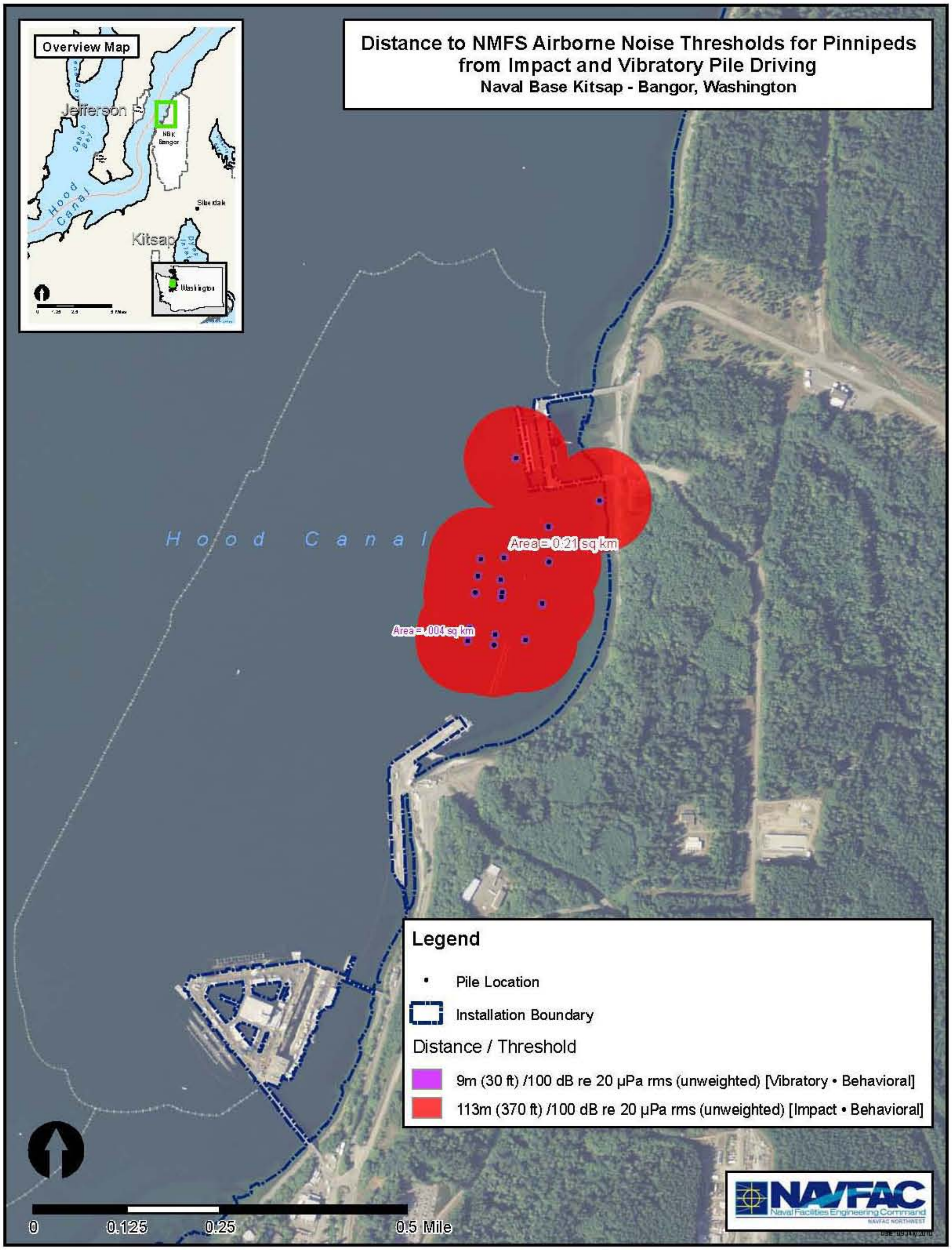


Figure 3-15 Distance(s) (m) to NMFS Airborne Sound Thresholds for Pinnipeds (except harbor seals) from Impact and Vibratory Pile Driving

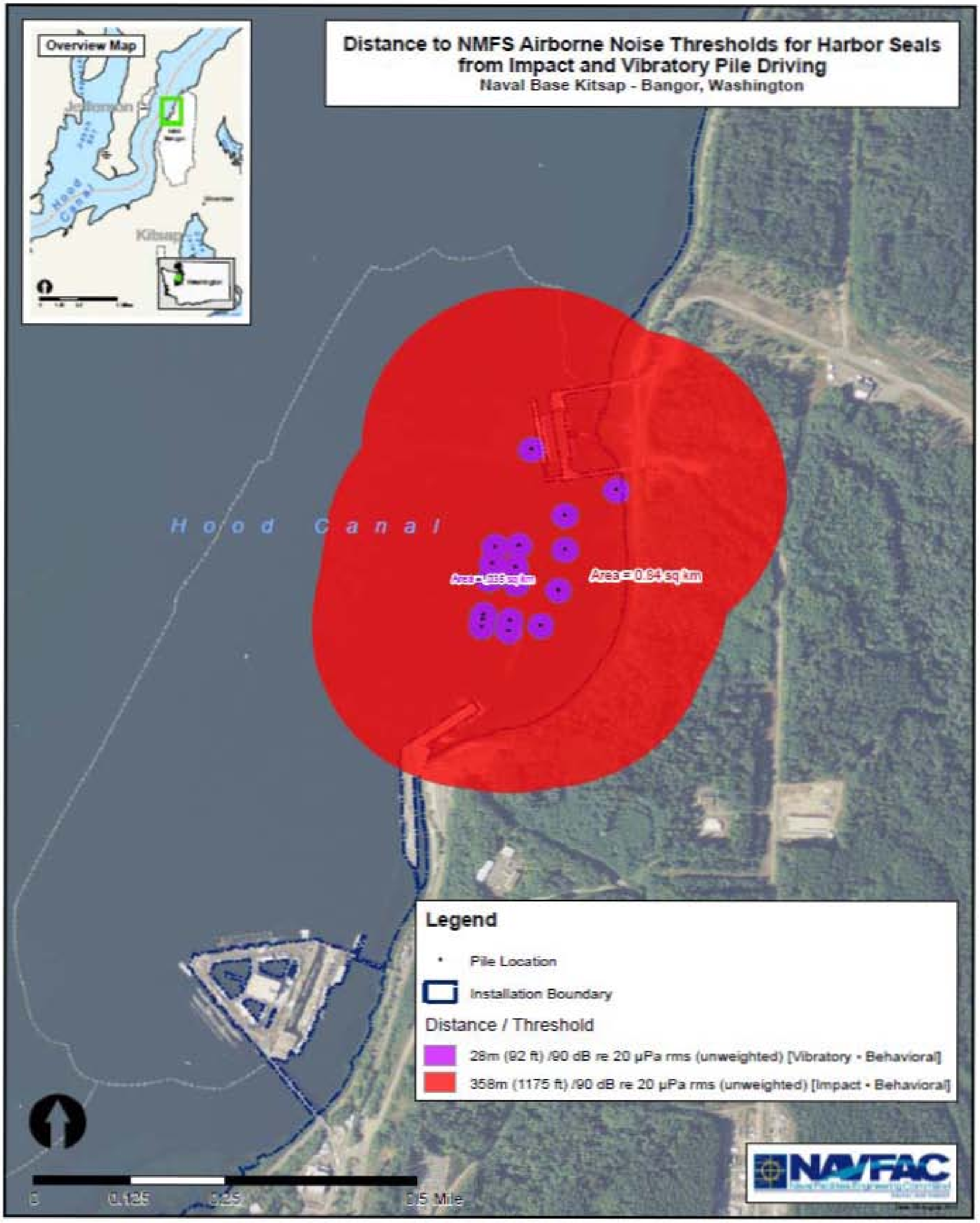


Figure 3-16 Distance(s) (m) to NMFS Airborne Sound Thresholds for Harbor Seals from Impact and Vibratory Pile Driving

TABLE 3.27 CALCULATED DISTANCES(S) TO AND AREA ENCOMPASSED BY THE MARINE MAMMAL THRESHOLD IN AIR FROM PILE OPERATIONS

Species	Threshold	Airborne Behavioral Disturbance		
		Distance (m)	Distance (km)	Area (km^2)
Pinnipeds (except harbor seal)	100dB rms (impact disturbance)	113 m (371 feet)	0.113	0.040
Pinnipeds (except harbor seal)	100dB rms (vibratory disturbance)	9 m (30 feet)	0.009	0.000
Harbor seal	90dB rms (impact disturbance)	358 m (1175 feet)	0.358	0.403
Harbor seal	90dB rms (vibratory disturbance)	28 m (92 feet)	0.028	0.002

3.9.2.2.1.6 Sound Exposure Modeling

The exposure calculations presented here relied on the best available data currently available for marine mammal populations in Hood Canal. The population data used is discussed within Sections 3.9.1.2 and 3.9.1.3. A formula was developed for calculating exposures due to pile installation and removal operations, and was applied to each marine mammal group specific noise impact threshold. The formula is founded on the following assumptions:

- Each species population is at least as large as any previously documented highest population estimate.
- All pilings to be installed would have a noise disturbance distance equal to the piling that causes the greatest noise disturbance (i.e. the piling furthest from shore).
- Pile installation and removal could potentially occur every day of the 40 day in-water work window. However it is estimated that an average of 2 piles will be installed and removed per day. Therefore, a best estimate of the number of days during which pile installation and removal would occur is 15 days, and this was used in all modeling calculations.
- Sound attenuation devices (e.g. Gunderboom SAS™, TNAP, confined and/or unconfined bubble curtain) will be used during all impact pile driving. The only exception is during tests to ensure these devices are functioning properly and are achieving a reduction in the initial sound pressure levels of -10 dB.
- During the Test Pile Program, the amount of unattenuated pile driving will be limited to a maximum of seven minutes. Each test will require one minute of unattenuated pile driving, and only one test would occur in any one day, with a maximum of seven tests allowed during the Test Pile Program.
- All periods of unattenuated pile driving were accounted for by determining the potential for exposure to occur to each marine mammal species in a one minute interval.

- An individual can only be taken once per method of installation/removal during a 24 hour period.

The calculation for marine mammal exposures is estimated by:

Attenuated Pile Driving

Exposure estimate = (n *ZOI) * 15 days of pile installation/removal

Where:

n = density estimate used for each species/season
ZOI[12] = noise threshold zone of influence (ZOI) impact area
n * ZOI produces an estimate of the abundance of animals that could be present in the area for exposure (each day), this must be a whole number, therefore, this value was rounded (down if <0.5, up if >0.5).

Unattenuated Pile Driving

Exposure estimate = ((n *ZOI) / X) * 7 minutes of unattenuated pile driving

Where:

X = minutes of pile driving in a day. Assuming an 8 hr day this is 480 minutes.
(n * ZOI/ X) produces an estimate of the potential number of exposures that could occur during one minute of pile driving. To be conservative, any value above 0.01 (i.e. greater than a 1% chance of take occurring in a minute) will be rounded up to a whole number.

The ZOI impact area is the estimated range of impact to the noise criteria. The formula for determining the area of a circle ($\Pi * radius^2$) was used to calculate the ZOI around each pile, for each threshold. The distances specified in Tables 3.25, 3.26 and 3.27 were used for the radius in the equations. Underwater impact pile driving exposures were calculated for the periods of both attenuated and unattenuated pile driving. The calculations during attenuated impact pile driving were based on the estimated threshold ranges (Table 3.26) using a sound attenuation device with 10 dB attenuation as a mitigation measure. The calculations during unattenuated impact pile driving were based on the estimated threshold ranges (Table 3.25) without the use of sound attenuations devices. The total number of potential underwater exposures from impact pile driving would be the sum of these two calculations. Airborne exposures from impact pile driving were calculated using the threshold ranges provided in Table 3.27, without the use of sound attenuation devices. The ZOI impact areas took into consideration the possible effected area of Hood Canal from the furthest from shore pile driving site with attenuation due to land shadowing from bends in the canal. As described earlier with regard to the distances, because of the close proximity of some of the piles to the shore, the narrowness of the canal at the project area, and the maximum fetch, the ZOIs for each threshold aren't necessarily spherical and may be truncated.

[12] Zone of Influence (ZOI) is the area encompassed by all locations where the sound pressure levels equal or exceed the threshold being evaluated.

Forty days of total in-water work time is proposed, however only a “fraction” of that is actual pile driving time. Some days there will be only 30 minutes of pile driving, other days several hours. The contractor estimates that pile installation could occur at a maximum rate of four piles per day, however, it’s more likely that an average of two piles will be installed and removed per day. For each pile installed, vibratory pile driving is expected to be no more than one hour. The impact driving portion of the project is anticipated to take approximately 15 minutes per pile with no more than 100 blows executed per day. All piles will be extracted using a vibratory hammer. Extraction is anticipated to take approximately 30 minutes per pile. Overall, this results in a maximum of two hours of pile driving per pile, or approximately four hours per day.

An average work day (two hours post-sunrise and two hours prior to sunset from July 16 through September 15 and during all daylight hours from September 16 through October 31, 2011) is approximately 8-9 hours, depending on the month. While it is anticipated that only 4 hours would need to be spent pile driving per day, to take into account deviations from the estimated times for pile installation and removal and to account for the additional use of the impact pile driver in case of failure of the vibratory hammer to reach the desired embedment depth the Navy modeled potential impacts as if the entire day (~ 8 hrs) could be spent pile driving.

Based on the proposed action, the total pile driving time from vibratory pile driving would be less than 15 days (29 piles at minimum of two per day). Therefore, impacts were modeled as if the action were to occur throughout the duration of 15 days. The number of strikes with an impact hammer will be limited to no more than 100 strikes per day (~15 minutes), which results in a total of 1500 strikes during the Test Pile Program.

The exposure assessment methodology is an estimate of the numbers of individuals exposed to the effects of pile driving activities exceeding NMFS established thresholds. Of significant note in these exposure estimates, additional mitigation methods (i.e. visual monitoring and the use of shutdown zones) were not quantified within the assessment and successful implementation of this mitigation is not reflected in exposure estimates. Results from acoustic impact exposure assessments should be regarded as conservative estimates that are strongly influenced by limited biological data. While the numbers generated from the pile driving exposure calculations provide conservative overestimates of marine mammal exposures for consultation with NMFS Headquarters, the short duration and limited geographic extent of test pile project would further limit actual exposures.

Steller Sea Lion

Although Steller sea lions have been documented in Hood Canal, the numbers (at least at present) are still fairly low and their presence is only expected in the project area during November through mid-April. Because pile installation and removal will occur between July 16 and October 31, 2011, when Steller sea lions are not likely to be present in the project area, no acoustic impacts from pile driving operations are expected for this species.

Southern Resident Killer Whale

Southern Resident killer whales have not been documented in the Hood Canal since 1995, and recent sightings may have been of transient killer whales (NMFS, 2008d). As a result, the Hood

Canal is not considered within the current geographic range occupied by the species. As such, there will be no acoustic impacts from pile driving operations on this species.

California Sea Lion

During the most recent aerial survey population counts for California sea lions in the inland waters of Washington State, no regular haul-outs were documented to exist within the Hood Canal (Jeffries et al., 2000). However, recent anecdotal information from sightings of opportunistic animals hauled out at NBK at Bangor indicates that California sea lions are present in Hood Canal almost year-round with the exception of mid-June through August. In order to assess the size of the population currently present on base property, the Navy conducted year round waterfront surveys for marine mammals at NBK at Bangor in 2008 and 2009 (DoN, 2010a). The surveys were conducted by NBK staff/biologists from land utilizing binoculars and the naked eye, along nearly the entire NBK waterfront. Surveys were attempted to be conducted daily, though inclement weather, holidays, and security restrictions sometimes precluded surveying. The number of surveys conducted each month varies, however surveys were conducted an average of 13 times per month (range: 10 -17 surveys) during the months proposed for the Test Pile Program (July – October). The surveys recorded observations of California sea lions at known opportunistic haul-out locations on the NBK waterfront and those that were visible swimming within the nearshore waters (i.e. within the water restricted area [WRA]). These surveys at NBK at Bangor represent the only data for California sea lion abundance within the Hood Canal.

During these surveys, the daily maximum number of California sea lions hauled out for the months July – October (the timeframe of the Test Pile Program), were 0, 0, 12, and 47 in 2008 and 0, 1, 32, and 44 in 2009, respectively. Because the proportion of pile driving that could occur in a given month is dependent on several factors (i.e. availability of materials, weather, etc.) the Navy assumed that pile driving operations could occur at any time in the construction window. Therefore, an average of the maximum number of California sea lions observed per day across the months of July – October was used in the modeling analysis. The monthly average of the maximum number of California sea lions observed per day was 17 individuals. Since all of the observations were of hauled out individuals, the only way to generate a realistic in-water density for the sound exposure modeling was for the Navy to determine a reasonable area that this population could be expected to utilize when swimming/foraging. Research by Costa et al. (2007) regarding the foraging behavior of adult females (32 individuals) in California indicated that they travel an average of 66.3 km ± 11 km (41 miles ± 7 miles) from their rookery. Data by Wright et al. (2010) of wintering males (14 individuals) from the Columbia River indicate they travel a maximum of 70 km from shore. Additional data from 12 adult makes from mixed stocks in WA had a maximum travel speed of 99 km (62 miles) per day (Wright et al., 2010). Given these distances, the Navy assumed that it was reasonable that California sea lions could travel between 55 – 100 km (34 – 62 miles) when foraging. Since these were straight-line distances, the area encompassed may be slightly smaller. The project area was defined by the maximum extent of sound pressure levels or furthest line of sight that sound waves could travel from the proposed action. This area was determined to be 41.5 sq. km (16 sq. miles). The Navy felt that given California sea lion foraging distances, this area was representative of a reasonable area in which these animals could be expected to occur. Additionally, by constraining the in-water area in which these animals may occur to the project's action area, this ensured that the populations would always be available to exposure from the proposed action, which is a conservative measure.

Therefore, the density used in the exposure analysis was derived from the average daily maximum number of California sea lions for Hood Canal (17 individuals), divided by the area encompassed by the maximum fetch of the project area (41.5 km^2 [16 sq. miles]). This methodology produced a density of California sea lions of 0.410 animals per sq. km. Exposures were calculated using this density and the formula presented in *Sound Exposure Modeling*. Table 3.28 depicts the number of acoustic harassments that are estimated from vibratory and impact pile installation and removal both underwater and in-air.

TABLE 3.28 NUMBER OF POTENTIAL EXPOSURES OF CALIFORNIA SEA LIONS WITHIN VARIOUS ACOUSTIC THRESHOLD ZONES

Season	Density of California Sea Lions	Underwater			Airborne
		Impact Injury Threshold (190dB)	Impact Disturbance Threshold (160dB)	Vibratory Disturbance Threshold (120dB)	Impact & Vibratory Disturbance Threshold (100dB)*
July-Oct	0.410	0	15**	255	0

Note: The take estimates include both those from impact and vibratory pile installation and removal.
* The airborne exposure calculations assumed that 100% of the in-water densities were available at the surface to be exposed to airborne sound.
** The modeling indicated that zero California sea lions were likely to be exposed to sounds that would qualify as behavioral harassment during both attenuated and unattenuated impact pile driving (160 dB zone). However, the Navy feels based on the abundance of this species in the waters along NBK, including their presence at nearby opportunistic haulouts, that it's likely that an individual could pass through this zone in transit to or from a haulout, Therefore, the Navy is requesting a behavioral take of California sea lion by impact pile driving each day of pile driving, for a total of 15 takes over the course of the proposed action.

Potential takes would likely involve sea lions that are moving through the area en route to a submarine haulout or during the return trip to the ocean when pile driving would occur. California sea lions that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, California sea lions may move away from the sound source and be temporarily displaced from the areas of pile driving. Disturbance from underwater noise impacts is not expected to be significant because it is estimated that only a small number of California sea lions may be affected by acoustic harassment. Additionally, marine mammal observers will be monitoring the shutdown and buffer zones (see Chapter 4 for a detailed discussion of mitigation measures) for the presence of marine mammals, and will alert work crews when to begin or stop work due to presence of sea lions in or near the shutdown and buffer zones, reducing the potential for acoustic harassment. Based on the exposure analysis, no California sea lions are anticipated to experience airborne sound pressure levels that would qualify as harassment. With the absence of any major rookeries and only a few isolated haul-out areas near or adjacent to the project area, potential takes by disturbance will have a negligible short-term effect on individual California sea lions and would not result in population-level impacts.

Harbor Seal

Harbor seals are present year-round and are the most abundant marine mammal in Hood Canal. The Navy conducted boat surveys of the waterfront area in 2008 from July to September (Agness and Tannenbaum, 2009a). Harbor seals were sighted during every survey and were found in all marine habitats including near and hauled out on man-made objects such as piers and buoys. The data used for harbor seal abundance and density for the Test Pile Program is from Jeffries et al. (2003). This study summarizes data gathered from comprehensive, dedicated aerial surveys that were conducted for harbor seals hauled out in the inland waters of Washington by the Washington State Department of Fish and Wildlife from 1978-1999. Jeffries et al. (2003) did a stock assessment of Hood Canal in 1999, which is the most recent survey data for this area, and counted 711 harbor seals hauled out. The study adjusted this abundance with a correction factor of 1.53 to account for seals in the water and not counted to provide a population estimate of 1,088 harbor seals in Hood Canal (Jeffries et al., 2003). The correction factor (1.53) was based on the proportion of time seals spend on land versus in the water over the course of a day. The correction factor was derived by dividing one by the percentage of time harbor seals spent on land. The data came from tags (VHF transmitters) applied to harbor seals at six areas (Grays Harbor, Tillamook Bay, Umpqua River, Gertrude Island, Protection/Smith Islands, and Boundary Bay, BC) within two different stocks (the coastal stock and the inland waters of WA stock) over four survey years. Hood Canal is part of the inland waters stock, and while not specifically sampled, Jeffries et al. (2003) found the VHF data to be broadly applicable to the entire stock. The tagging research in 1991 and 1992 was conducted by Huber et al. (2001). Jeffries et al. (2003) used the same methodology for the 1999 and 2000 survey years. The data loggers in these studies ran for 24 hours a day. Battery life for the data loggers varied amongst each year of the study from 63-365 days. The studies indicated that approximately 35% of harbor seals are in the water versus on land on a daily basis (Huber et al., 2001; Jeffries et al., 2003).

In order to estimate the underwater exposures from pile driving operations, the Navy had to determine what proportion of the total population could be in the water for exposure on a daily basis. Jeffries et al. (2003) applied the correction factor on an annual basis, thereby assuming that the proportion of harbor seals on land versus in-water was consistent on a daily basis for the entire year. Similarly, the Navy therefore assumed that the proportion of the population available to be exposed to underwater sound on a daily basis was 35% of the total population (35% of 1,088 individual or ~381 individuals). The Navy used the data from the tagging studies conducted by Huber et al. (2001) and Jeffries et al. (2003) in making this determination. The Navy acknowledges that over the course of the day, while the ultimate proportion of animals in the water may remain constant, that different individuals may enter and exit the water to swim/forage. However, fine-scale data which depicts harbor seal movements within the project area on time durations of less than a day (i.e. on an hourly basis) are unavailable. However, assuming that foraging is the primary reason for harbor seals to be in the water, information about foraging trip durations provided some context to support the Navy's assumptions that only 35% of the population was available to be exposed to underwater sound each day.

Recent tagging studies of harbor seals at Sable Island, Nova Scotia and within the Puget Sound-Georgia Basin indicate that harbor seals spend between 2-6 hours foraging in the water in between haul-out intervals (Boness et al., 1994; Bowen et al., 1999; Reuland, 2008). The data which is probably most applicable to the EHW-1 project location in the Hood Canal is that from Reuland (2008), which is the most comprehensive study of harbor seal foraging patterns to date. Reuland (2008) examined the differential foraging habitats of harbor seals at three haul-out locations within the Puget Sound-Georgia Basin. The three locations were at Bird Rocks, Belle Chain Islets, and Padilla Bay. The study also examined seasonal change in foraging habits between pre-pupping (April – June) and pupping (July – September) seasons. Sufficient data was available from seventeen tagged harbor seals (4 at Bird Rocks, 2 at Bell Chain Islets, and 11 at Padilla Bay). The foraging trip was defined as the period between entering the water after extended periods of dry time and returning to haul out on land (Austin et al., 2006). The average foraging trip duration across all three locations and seasons was 6.2 ± 0.13 hours. The foraging trip duration decreased from pre-pupping to pupping season. This decrease was probably in response to adult females spending less time in the water so that pups aren't left unattended for long periods of time on shore. The duration of foraging trips during the pupping season across the three locations was ~5.75 hours (Figure 7: Reuland, 2008). The foraging trip duration also varied between the haul-out sites. All three sites exhibited a decrease in foraging trip duration between pre-pupping and pupping season, however the decrease at Bird Rocks was particularly severe with a reduction in foraging time of approximately 50%. The shortest foraging duration at any of the three locations during pupping season was ~4.5 hours at Padilla Bay (Figure 8: Reuland, 2008).

Based on the above data sources, the average foraging trip duration across the literature is 4.5 hours (2.5 hr – Bowen et al., 1999; 4.8 hrs- Boness et al., 1994; 6.2 hrs – Reuland, 2008). Therefore, if the Navy assumes that any harbor seals in the water at the start of each day of pile driving had just initiated a foraging trip; they would be assumed to remain in the water for ~4.5 hours prior to hauling out. During the Test Pile Program it is estimated that vibratory pile driving will occur for ~1 hour per pile during installation and 30 minutes per pile during removal for a total of 1.5 hours steel per pile. Assuming the installation and removal of steel piles occurs at a rate of two piles per day the vibratory hammer would be used for approximately 3 hours per day. This duration of use falls with the average foraging trip durations for harbor seals, therefore the Navy feels that assuming 35% of the population is available for exposure each day, from each installation method is reasonable. As a result, for the underwater exposure analysis, exposures were calculated using an abundance of harbor seals derived from only those that are present in the water in a day (35% of 1,088 of ~381 individuals). The density was calculated by dividing this abundance by the area of the Hood Canal (291 km^2), since the harbor seal population in this area is resident to the Hood Canal (London, 2006). This resulted in a density of 1.31 animals per sq. km. Exposures were calculated using this density and the formula presented in *Sound Exposure Modeling*. Table 3.29 depicts the number of acoustic harassments that are estimated from vibratory and impact pile installation and removal both underwater and in-air.

In order to analyze the potential for harbor seals to be disturbed by airborne noise associated with pile installation/removal activities associated with the Test Pile Program the Navy looked at the likelihood for harbor seals to be hauled out and/or swimming with their heads of out the water in the vicinity of the project area. While Huber et al.'s (2001) data suggests that harbor seals typically spend 65% of their time hauled out; the Navy's waterfront surveys found that it is extremely rare for harbor seals to haul out in the vicinity of the Test Pile Program project area. While in-water sightings are fairly common, available haul out locations that would fall within the maximum airborne acoustic zone of influence (358 m [1175 ft) estimates for the proposed action are limited. Harbor seals' ideal haul out locations in clued intertidal or sub-tidal rock outcrops, sandbars, sandy beaches, peat banks in salt marshes, and manmade structures such as log booms, docks, and recreational floats (Wilson, 1978; Prescott, 1982; Schneider and Payne, 1983; Gilber and Guldager, 1998; Jeffries et al., 2000). The lack of any of these suitable haul out habitats in the immediate vicinity of the Test Pile Action area makes it extremely unlikely that a harbor seal would be hauled out in range of sounds that could cause acoustic disturbance. The only structures within the largest airborne zone of influence (358 m [1175 ft]) are the EHW-1 wharf and Marginal Wharf. Both of these structures are elevated more than (16 ft [5 m]) about Mean High High Water (MHHW) mark to handle the tidal range which occurs at NBK at Bangor. Because they are elevated there is no opportunity for harbor seals to haul out on these structures, even at high tide. Secondly, while a small intertidal/shoreline zone is present between these structures, it also does not represent favorable haulout habitat. The shoreline located between EHW-1 and Marginal Wharf is extremely narrow since it is backed by a steep cliff face that is heavily vegetated with trees. Additionally, any portion of the intertidal zone that may be exposed at low tide is also vegetated with eelgrass beds and macroalgae, neither of which is a known haulout attractant to harbor seals. Lastly, even haulouts located outside of the airborne acoustic zone of influence, but still on Base property and that are used by sea lions, are not frequented by harbor seals. While the reasoning behind this is unknown, differences in the morphology of their appendages and therefore their ability to haul out on these manmade structures at Delta pier may play a part. That being said, these structures are located at Delta pier or further south, with the closest location being approximately one mile from EHW-1, well outside of the airborne acoustic zone of influence.

As a result, the Navy determined that the only population of harbor seals that could potentially be exposed to airborne sounds are those that are in-water but at the surface. Based on the diving cycle of tagged harbor seals near the San Juan Islands we can estimate that seals are on the surface approximately 16.4 percent of the of their total in-water duration (Suryan and Harvey, 1998). Therefore, by multiplying the percentage of time spent at the surface (16.4%) by the total in-water population of harbor seals at any one time (~381 individuals), the population of harbor seals with the potential to experience airborne impacts (~63 individuals) can be obtained. Airborne exposures were calculated using a density derived from the maximum number of harbor seals available at the surface (~63 individuals), divided by the area of Hood Canal (291 km^2) and the formula presented in *Sound Exposure Modeling*. Table 3.29 depicts the number of acoustic harassments that are estimated from vibratory and impact pile installation and removal both underwater and in-air.

Potential takes would likely involve seals that are moving through the area on foraging trips when pile driving would occur. Harbor seals that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, harbor seals may move away from the sound source and be temporarily displaced from the areas of pile driving. Disturbance from underwater noise impacts is not expected to be significant because it is estimated that only a small number of harbor seals may be affected by acoustic harassment. Additionally, marine mammal observers will be monitoring the shutdown and buffer zones (see Chapter 4 for a detailed discussion of mitigation measures) for the presence of marine mammals, and will alert work crews when to begin or stop work due to presence of seals in or near the shutdown and buffer zones, reducing the potential for acoustic harassment. Based on the exposure analysis, no harbor seals are anticipated to experience airborne sound pressure levels that would qualify as harassment. With the absence of any major rookeries and only a few potential haul-out areas near the project area, potential takes by disturbance will have a negligible short-term effect on individual harbor seals and would not result in population-level impacts.

TABLE 3.29 NUMBER OF POTENTIAL EXPOSURES OF HARBOR SEALS WITHIN VARIOUS ACOUSTIC THRESHOLD ZONES

Season	Density of Harbor Seals	Underwater			Airborne
		Impact Injury Threshold (190dB)	Impact Disturbance Threshold (160dB)	Vibratory Disturbance Threshold (120dB)	Impact & Vibratory Disturbance Threshold (90 dB)*
July-Oct	1.31	0	22**	810	0

Note: The take estimates include both those from impact and vibratory pile installation and removal.
*Airborne densities were base on the percentage (16.4%) of in-water density available on surface to be exposed (Suryan and Harvey, 1998).
**The modeling for underwater exposures indicated that 15 behavioral exposures of harbor seals were likely to result from attenuated impact pile driving and an additional 7 behavioral exposures were likely to result from unattenuated impact pile driving.

Transient Killer Whale

Transients are uncommon visitors to Hood Canal, but may be present anytime during the year. In 2003 and 2005, small groups of transient killer whales (6 – 11 individuals per event) visited Hood Canal to feed on harbor seals and remained in the area for significant periods of time (59 – 172 days) between the months of January and July (London, 2006). These whales used the entire expanse of Hood Canal for feeding. Subsequent aerial surveys suggest that there has not been a sharp decline in the local seal population from these sustained feeding events (London, 2006). Based on this data, the density for Transient killer whales in Hood Canal for January to July is $0.038/km^2$ (11 individuals divided by the area of Hood Canal [291 km^2]). Since this timeframe overlaps the period in which the Test Pile Program will occur (July – Oct), this density was used for all exposure calculations. Exposures were calculated using the formula presented in *Sound Exposure Modeling*. Table 3.30 depicts the number of acoustic harassments that are estimated from vibratory and impact pile installation and removal activities.

Potential takes would likely involve transient killer whales that are moving through the area on foraging trips when pile driving would occur. Killer whales that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, killer whales may move away from the sound source and be temporarily displaced from the areas of pile driving. Disturbance from underwater noise impacts is not expected to be significant because it is estimated that only a small number of killer whales may be affected by acoustic harassment. Additionally, marine mammal observers will be monitoring the shutdown and buffer zones (see Chapter 4 for a detailed discussion of mitigation measures) for the presence of marine mammals, and will alert work crews when to begin or stop work due to presence of killer whales in or near the shutdown and buffer zones, reducing the potential for acoustic harassment. Potential takes by disturbance will have a negligible short-term effect on individual killer whales and would not result in population-level impacts.

TABLE 3.30 NUMBER OF POTENTIAL EXPOSURES OF KILLER WHALES WITHIN VARIOUS ACOUSTIC THRESHOLD ZONES

Season	Density of Killer Whales	Underwater		
		Impact Injury Threshold (180dB)	Impact Disturbance Threshold (160 dB)	Vibratory Disturbance Threshold (120dB)
July-Oct	0.038	0	9*	30

Note: The take estimates include both those from impact and vibratory pile installation and removal.
* The modeling indicated that zero killer whales were likely to be exposed to sounds that would qualify as behavioral harassment underwater during both attenuated and unattenuated impact pile driving (160 dB zone). However, while Transient killer whales are rare in the Hood Canal, when these animals are present they occur in pods, so their density in the project area is unlikely to be uniform, as was modeled. If they are present during impact pile driving it's possible that one or more individuals within a pod could travel through the behavioral harassment zone. Therefore, the Navy is requesting nine behavioral takes of Transient killer whales-based on the average size of pods seen previously in the Hood Canal – by impact pile driving over the course of the proposed action.

Dall's Porpoise

Dall's porpoise may be present in Hood Canal year-round and may be expected as far south in the Hood Canal as the project area. Their use of inland Washington waters, however, is mostly limited to the Strait of Juan de Fuca. The Navy conducted boat surveys of the waterfront area in 2008 from July to September (Agness and Tannenbaum, 2009a). During one of the surveys a single Dall's porpoise was sighted in August in the deeper waters off Carlson Spit. In the absence of an abundance estimate for the entire Hood Canal, a seasonal density (warm season only) was derived from the waterfront survey by the number of individuals seen divided by total number of kilometers of survey effort (six surveys with approximately 3.9 km^2 of effort each), assuming strip transect surveys. In absence of any other survey data for Hood Canal, this density is assumed to be throughout the project area. Exposures were calculated using the formula presented in *Sound Exposure Modeling*. Table 3.31 depicts the number of acoustic harassments that are estimated from vibratory and impact pile installation and removal activities.

Potential takes would likely involve Dall's porpoise that are moving through the area on foraging trips when pile driving would occur. Dall's porpoise that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, Dall's porpoise may move away from the sound source and be temporarily displaced from the areas of pile driving. Disturbance from underwater noise impacts is not expected to be significant because it is estimated that only a small number of Dall's porpoises may be affected by acoustic harassment. Additionally, marine mammal observers will be monitoring the shutdown and buffer zones (see Chapter 4 for a detailed discussion of mitigation measures) for the presence of marine mammals, and will alert work crews when to begin or stop work due to presence of porpoises in or near the shutdown and buffer zones, reducing the potential for acoustic harassment. Potential takes by disturbance will have a negligible short-term effect on individual Dall's porpoise and would not result in population-level impacts.

TABLE 3.31 NUMBER OF POTENTIAL EXPOSURES OF DALL'S PORPOISE WITHIN VARIOUS ACOUSTIC THRESHOLD ZONES

Season	Density of Dall's Porpoise	Underwater		
		Impact Injury Threshold (190 dB)	Impact Disturbance Threshold (160dB)	Vibratory Disturbance Threshold (120 dB)
July-Oct	0.043	0	1*	30

Note: The take estimates include both those from impact and vibratory pile installation and removal.
* The modeling indicated that zero Dall's porpoise were likely to be exposed to sounds that would qualify as behavioral harassment underwater during both attenuated and unattenuated impact pile driving (160 dB zone). Dall's porpoises are rare in the Hood Canal. Only one animal, seen located in deep waters offshore the base has been seen in the project area in the past few years. However, it's possible that additional animals exist or that this single individual could pass through the underwater behavioral harassment zone (160 dB) while transiting along the waterfront. Therefore, the Navy is requesting a single behavioral take of Dall's porpoise by impact pile driving over the course of the proposed action.

Harbor Porpoise

Harbor porpoises may be present in the Hood Canal year-round, however their presence is rare. The Navy has conducted boat surveys of the waterfront area from July to September over the past few years (2008 – present) (Agness and Tannenbaum, 2009a). During one of the surveys a single Dall's porpoise was sighted in the deeper waters offshore the waterfront. In the absence of an abundance estimate for the entire Hood Canal, a seasonal density (warm season only) was derived from the waterfront survey by the number of individuals seen divided by total number of kilometers of survey effort (24 surveys with approximately 3.9 km^2 of effort each), assuming strip transect surveys. In the absence of any other survey data for the Hood Canal, this density is assumed to be throughout the project area. Exposures were calculated using the formula presented in *Sound Exposure Modeling*. Table 3.32 depicts the number of acoustic harassments that are estimated from vibratory and impact pile installation and removal.

Potential takes could occur if harbor porpoises move through the area on foraging trips when pile driving would occur. Harbor porpoise that are taken could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, harbor porpoises may move away from the sound source and be temporarily displaced from the areas of pile driving. Disturbance from underwater noise impacts is not expected to be significant Additionally, marine mammal observers will be monitoring the shutdown and buffer zones (see Chapter 4 for a detailed discussion of mitigation measures) for the presence of marine mammals, and will alert work crews when to begin or stop work due to presence of marine mammals in or near the shutdown zones, reducing the potential for acoustic harassment. Potential takes by disturbance would have a negligible short-term effect on individual harbor porpoises and would not result in population-level impacts.

TABLE 3.32 NUMBER OF POTENTIAL EXPOSURES OF HARBOR PORPOISE WITHIN VARIOUS ACOUSTIC THRESHOLD ZONES

Season	Density of Harbor Porpoise	Underwater		
		Impact Injury Threshold (190 dB)	Impact Disturbance Threshold (160dB)	Vibratory Disturbance Threshold (120 dB)
July-Oct	0.011	0	0	15*

Note: The take estimates include both those from impact and vibratory pile installation and removal.
* The modeling indicated that zero harbor porpoise were likely to be exposed to sounds that would qualify as behavioral harassment during vibratory pile driving (120 dB zone). However, while harbor porpoises are rare, one has been sighted in surveys over the last few years in the deep waters offshore the base. It's possible this offshore region is encapsulated within the vibratory disturbance zone due to its size (41.5 sq. km), Therefore, the Navy feels based on the possibility of this animal to be present in the offshore waters during every day of construction, the Navy is requesting a single behavioral take of a harbor porpoise from the use of the vibratory hammer each day of pile installation and removal, for a total of 15 takes over the course of the proposed action.

All Species

Based on the modeling results presented above, a summary of the total number of exposures that may occur within the project area are presented below in Table 3.33. During the Test Pile Program, there is the potential for 47 Level B disturbance exposures (160 dB) of various species from impulsive pile driving operations, and an additional 1,140 Level B disturbance exposures (120 dB) of various species from vibratory pile operations due to underwater sound. This results in a total of 1,187 Level B disturbance exposures from vibratory and impact installation and removal activities associated with the Test Pile Program. The following species and numbers of Level B disturbance exposures could occur due to underwater sound as a result of impact pile operations: 15 California sea lions, 22 harbor seals, 9 transient killer whales, and 1 Dall's porpoise. The following species and number of Level B disturbance takes could occur due to underwater sound as a result of vibratory pile operations: 255 California sea lions, 810 harbor seals, 30 transient killer whales, 30 Dall's porpoises, and 15 harbor porpoises. Due to their lack of presence within the project area during the timeframe for the Test Pile Program (July 16 – Oct 31), no ESA-listed Steller sea lions would be acoustically harassed. Also, due to their lack of presence within the Hood Canal, no ESA-listed Southern Resident killer whales would be acoustically harassed. Lastly, no species of pinnipeds are expected to be exposed to airborne sound pressure levels that would cause harassment.

TABLE 3.33 SUMMARY OF POTENTIAL EXPOSURES FOR ALL SPECIES BETWEEN JULY AND OCTOBER

Species	Underwater				Airborne	
	Impact Injury Threshold (190 dB)	Impact Injury Threshold (180dB)	Impact Disturbance Threshold (160dB)	Vibratory Disturbance Threshold (120dB)	Impact & Vibratory Disturbance Threshold (100dB)	Impact & Vibratory Disturbance Threshold (90dB)
California sea lion	0	N/A	15	255	0	N/A
Harbor seal	0	N/A	22	810	N/A	0
Transient killer whale	N/A	0	9	30	N/A	N/A
Dall's porpoise	N/A	0	1	30	N/A	N/A
Harbor porpoise	N/A	0	0	15	N/A	N/A
Total	**0**	**0**	**47**	**1140**	**0**	**0**

* The Navy will request a total of 1,187 Level B harassment exposures under the MMPA.

3.9.2.2.2 Indirect Effects to Marine Mammals from Pile Driving Activities

3.9.2.2.2.1 Pile Driving Effects on Potential Prey (fish, etc.)

Impacts to Prey

Construction activities will produce both pulsed (i.e. impact pile driving) and continuous sounds (i.e. vibratory pile driving). Fish react to sounds which are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of noise energy. Additional studies have documented effects of pile driving (or other types of continuous sounds) on fish, although several are based on studies in support of large, multiyear bridge construction projects (Scholik and Yan, 2001; 2002; Govoni et al., 2003; Hawkins, 2005; Hastings, 1990; 2007; Popper et al., 2006; Popper and Hastings, 2009). Sound pulses at received levels of 160 dB re: 1 μPa may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Chapman and Hawkins, 1969; Pearson et al., 1994; Skalski et al., 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality (Caltrans, 2001; Longmuir and Lively, 2001). Fish that occur in the immediate project area would be exposed to underwater noise that could injure or disturb fish during pile driving activity. Because vibratory pile driving is the primary installation and removal methodology, the most likely impact to fish from pile driving activities at the project area would be temporary behavioral disturbance or avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior would be anticipated. See Section 3. 8 for a detailed analysis of the impacts of the Test Pile Program to fish species. In general, impacts to marine mammal prey species would be expected to be minor and temporary due to the short-time frame for the Test Pile Program. However, adverse impacts may occur to a few species of rockfish (bocaccio, yelloweye, and canary rockfish), chinook salmon, and summer run chum as a result of potential impacts to them or their larvae.

Impacts to Prey Habitat

The Test Pile Program may result in localized and temporary changes to the benthic community during pile placement. A conservative estimate of total bottom disturbance from the barge anchors, spuds, and test piles is approximately 6,970 ft^2 (647 m^2). During the pile driving period (40 days), juvenile salmonids and other fish species may experience loss of available benthic prey at the project site due to the disturbance of pile installation. However, in-water work would occur during the time frame when few salmonids would be present, therefore adverse affect to benthic prey availability are not anticipated. Additionally, the area impacted by the Test Pile Program that could be used as possible foraging habitat is relatively small compared to the available habitat in the Hood Canal. Potentially a maximum area of 1.82 m^2 (based on a 60-inch diameter pile) of foraging habitat may have decreased foraging value as each pile is driven. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the Hood Canal and nearby vicinity.

3.9.2.2.2.2 Pile Driving Effects on Water Quality

Dissolved Oxygen

During pile removal and replacement activities, suspension of anoxic sediment compounds may result in reduced dissolved oxygen in the water column. However, the high existing dissolved oxygen at the site during the proposed work windows reduces the potential for dissolved oxygen to drop to harmful levels, particularly due to the short duration of the in-water work period.

Turbidity

Some degree of localized reduction in water quality would occur as a result of in-water construction activities. Most of this effect would occur during the installation and removal piles from the substrate when bottom sediments would be disturbed. Effects to turbidity are expected to be short-term and minimal. Turbidity would return to normal levels within a short time from completion of the Test Pile Program.

No direct effects to marine mammals are expected from turbidity impacts. Short-term exposure of salmonids and marine fish (prey species for marine mammals) to suspended sediments may occur as the sediment enters the water column. Factors potentially affecting salmonids and marine fish from temporary increases in turbidity could include damage to gill tissue, physiological stress, reduced foraging efficiency, and avoidance behavior.

The minimal and temporary increases in suspended sediments that may result from this project would not likely result in gill tissue damage to fish. Studies investigating similar potential impacts to fish from larger scale sediment dredging operations have shown that increased turbidity levels from these activities were insufficient to cause gill damage in salmonids (Redding et al., 1987; Servizi and Martens, 1987). Suspended sediments in high concentrations (500 to 2,000 mg/L of suspended sediment) have been shown to cause physical stress in salmonids (Redding et al., 1987; Servizi and Martens, 1987). Behavioral responses of salmonids to elevated levels of suspended sediment include feeding disruption and changes in migratory behavior (Martin et al., 1977; Salo et al., 1980; Servizi, 1988). Salmonid foraging behavior can also be impaired by high concentrations of suspended sediment (Bisson and Bilby, 1982; Berg and Northcote, 1985; Redding et al., 1987). Behavioral changes include not rising to the surface to feed, reduction in prey location, and avoidance of areas of increased suspended sediment.

Therefore, while some degree of localized, short-term turbidity would be expected during pile driving and removal activities, unconfined salmonids and other marine fish are likely to avoid areas with elevated suspended sediment concentrations (Salo et al., 1980). As such, they would not be expected to experience physiological or behavioral stress from the proposed action.

3.9.2.2.3 Summary of Effects

Individual marine mammals would possibly be exposed to sound pressure levels during pile installation and removal operations at NBK at Bangor which could result in behavioral disturbance. Any marine mammals which are behaviorally disturbed may change their normal behavior patterns (i.e. swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any exposures would likely have only a minor effect and temporary impact on individuals and would not result in population level impacts. The sound generated from vibratory pile driving is non-pulsed (e.g., continuous), which is not known to cause injury to marine mammals. Proposed mitigation, outlined in Chapter 4, is likely to avoid most potential adverse underwater impacts to marine mammals from impact pile driving. Nevertheless, some level of impact would be unavoidable. Impacts to marine mammals from changes in water quality as a result of pile installation/removal operations would not be expected to occur.

Indirect impacts to marine mammals as a result of effects to their prey vary by prey species. The Test Pile Program has been scheduled to maximize the use of recommended work windows to avoid important salmonid spawning periods. Additionally, the Navy will survey for forage fish eggs to help determine when spawning season begins in the Hood Canal, and will not utilize the impact hammer after October 14 if forage fish eggs are present, which would indicate the presence of spawning adults. However, some fish species are still likely to be present. Fish that occur in the immediate project area would be exposed to underwater noise that could injure or disturb fish or their eggs/larvae during pile driving activity. Because vibratory pile driving is the primary installation method, the most likely impact to fish from pile driving activities at the project area would be temporary behavioral disturbance or avoidance of the area. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short-time frame for the Test Pile Program. However, moderate impacts may occur to a few species of rockfish (bocaccio, yelloweye, and canary rockfish), chinook salmon, and summer run chum as a result of their already sensitive population status. Indirect impacts to marine mammal prey as a result of changes in water quality are expected to be minor and temporary. Dissolved oxygen levels are not expected to be drop to levels that would result in harm to prey species. Some degree of localized, short-term increase in turbidity is expected to occur during installation and removal of the piles. Prey species are expected to avoid areas with elevated suspended sediments or experience minor behavioral effects due to changes in turbidity.

Endangered Species Act Conclusions

In accordance with the ESA, the U.S. Navy conducted consultation with NMFS Northwest Regional Office regarding the potential affect of the proposed action on the Steller sea lion and the Southern Resident killer whale. NBK at Bangor submitted a Biological Assessment to the NMFS Regional office on August 17, 2010 and consultation was initiated on January 26, 2011.

Acoustic exposures to the Steller sea lion are not predicted for pile driving operations associated with the Test Pile Program due to this species lack of presence during the project time frame (July 16 – Oct 31). Indirect effects to this species may be possible due to moderate effects to several of their prey species (i.e. rockfish ssp. And salmon spp.). Pile driving is known to acoustically impact fish (a prey species of the Steller sea lion) and can cause disturbance, avoidance, and in extreme cases, physical trauma. Since vibratory pile driving is the primary pile installation and removal method for this project, impacts to fish are likely only to be temporary. The Navy's determination of affect was based on NMFS guidance for ESA consultations with the Northwest region (NMFS, 2008d). The Navy concluded that despite this species' extremely unlikely presence in the project area during the time period of the proposed action, because they have been recorded in the months immediately preceding the work window, and because the proposed action has adverse effects to salmonids and generates sound pressure levels above ambient noise levels, the Test Pile Program may affect, but is not likely to adversely affect the ESA listed Steller sea lion. Acoustic exposures to Southern Resident killer whales are not predicted for pile installation and removal operations associated with the Test Pile Program due to this species lack of presence within the Hood Canal. However, due to indirect adverse effects from pile driving activities to their primary prey species (Chinook salmon and Chum salmon), the Navy concluded in its Biological Assessment (and NMFS concurred in the Biological Opinion), that the Test Pile Program may affect, but is not likely to adversely affect the ESA listed Southern Resident killer whale.

The Navy requested concurrence with these determinations and concurrence was received as part of NMFS Northwest Regional Office's Biological Opinion for the Test Pile Program on April 28, 2011.

Marine Mammal Protection Act Conclusions

Acoustic exposure estimates from pile driving operations indicate the potential for Level B harassment as defined by MMPA. No marine mammals would be exposed at levels that would result in injury or mortality. Indirect impacts to marine mammals from changes in water quality and prey availability as a result of the Test Pile program are expected to be minimal and would be temporary in nature. Although there may be impacts to individual marine mammals, the impacts at the population, stock, or species level would be negligible. In accordance with the MMPA, the Navy has submitted a request for an Incidental Harassment Authorization (IHA) to NMFS Headquarters for the incidental taking of marine mammals as a result of the proposed action. The Navy submitted the IHA application on November 2, 2010. NMFS Headquarters published a notice for the proposed incidental harassment authorization on January 25, 2011 and requested comments be submitted by February 24, 2011. The proposed action will not proceed before receipt of the approved incidental harassment authorization (IHA) which will be received in June 2011.

National Environmental Policy Act

The analysis presented above indicates that pile driving activities associated with the Navy's proposed Test Pile Program at NBK at Bangor may have impacts to individual marine mammals, but any impacts observed at the population, stock, or species level would be negligible. Therefore, in accordance with NEPA, there would be no significant impact to marine mammal populations from the proposed Test Pile Program.

3.10 BIRDS

The marbled murrelet is the only ESA-listed bird species that may occur in the vicinity of NBK at Bangor. Two other bird species, the osprey and great blue heron are currently acknowledged as species of concern under the ESA. The bald eagle, has been de-listed from federally threatened status under the ESA due to its recovery, but remains protected under the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (Eagle Act) (16 USC § 668-668a), which prohibits the taking, possession of, or commerce in bald and golden eagles. Table 3.34 provides examples of the different groupings of birds that occur or have the potential at NBK at Bangor and includes information on seasons of occurrence. Groupings include shorebirds and wading birds, waterfowl, seabirds, and raptors.

Bird densities are highest at NBK at Bangor; marine bird density is highest in winter, with large numbers of marine waterfowl occurring at this time. In surveys conducted in the 1990s by Nysewander et al. (2005), the combined density of marine birds during summer months in the vicinity of the Bangor waterfront at NBK was 10 to 29 birds per square mile, compared to 29 to 77 birds per square mile during winter. This variation in density reflects the migratory nature of most bird species found at the NBK waterfront.

3.10.1 Affected Environment

3.10.1.1 Regulatory Overview

ESA

See Section 3.8.1.1 for a description of the ESA.

Migratory Bird Treaty Act

Migratory birds are any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle. The Migratory Bird Treaty Act (MBTA) was enacted in the United Stated in 1918 in order to establish federal protection for migratory birds (16 USC 703-712). The MBTA prohibits the taking, killing or possessing of migratory birds unless permitted. The list of bird species protected by the MBTA appears in 50 CFR 10.13. NBK at Bangor is located in western Washington State which generally falls within the potential pathway of the Pacific Migratory flyway. Birds utilize this flyway primarily in fall and spring during their southward and northward migrations, respectively.

TABLE 3.34 MARINE BIRD GROUPINGS AND FAMILIES AT THE NBK AT BANGOR WATERFRONT

Marine Bird Grouping	Marine Bird Families	Season(s) of Occurrence	Preferred Habitats	Preferred Prey
Shorebirds and Wading Birds	Plovers, sanderlings, dowitchers, sandpipers, yellowlegs, and phalaropes Great blue heron	• Killdeer: year-round • Great blue heron: year-round • Spotted sandpiper: summer • Phalaropes: during migration • All other species: winter and during spring and/or fall migration	• Great blue heron: shoreline, shallow marine and freshwater • Shorebirds: Intertidal zone, mudflats, beaches	• Great blue heron: crustaceans, small fishes • Shorebirds: marine worms, insect larvae, aquatic insects
Marine Waterfowl	Diving ducks (goldeneye, scoters, bufflehead), mergansers, grebes, loons, dabbling ducks (mallard, wigeon), and geese	• Canada goose, red-necked and hooded mergansers, and some dabbling ducks: year-round • Surf and white-winged scoters: winter and in non-breeding flocks during summer • All other species: winter and/or during migration (spring and/or fall migration)	• Canada goose, mergansers, dabbling ducks: marine and freshwater shorelines, eelgrass beds, and shallow water • Scoters, goldeneyes: marine nearshore and deeper water, near pilings • Grebes, loons: marine nearshore and deeper water	• Canada goose: vegetation • Mergansers: small fishes • Dabbling ducks: marine and freshwater vegetation, freshwater and marine larvae, aquatic and terrestrial insects • Scoters, goldeneyes: molluscs, barnacles, crustaceans, other invertebrates, small fishes • Grebes, loons: small fishes
Seabirds	Pursuit divers: auklets, murres, murrelets, guillemots, and cormorants Surface feeders: gulls and terns	• *Gulls*: glaucous-winged gulls: year-round; Ring-billed gull: year-round; mew gull: winter, migrant; Bonaparte's gull: fall and spring migrant; other species: winter • *Terns*: Caspian terns: summer; common tern: fall migrant • All other species: year-round	• Pursuit divers: marine nearshore and deeper water • Surface feeders (gulls, terns): shoreline, marine nearshore, deeper water	• Pursuit divers: small fishes, invertebrates, zooplankton • Surface feeders: small fishes, molluscs, crustaceans, garbage, carrion
Raptors	Bald eagle Osprey	• Year-round • Summer resident	• Forested shoreline, shoreline, marine nearshore, freshwater	• Bald eagle: fishes, waterfowl, shorebirds, carrion • Osprey: fishes

Sources: Smith et al. 1997; Navy 2001; Opperman et al. 2003; Larsen et al. 2004; Wahl et al. 2005; WDFW 2005.

Bald and Golden Eagle Protection Act

In 1940 bald eagles gained protection under the Bald and Golden Eagle Protection Act. Bald eagles were listed as a federally endangered species under the Endangered Species Preservation Act of 1966 on March 11, 1967 and in 1972 the bald eagle became protected under the MBTA. On February 14, 1978 the bald eagle was listed as a federally endangered species in 43 of the continuous states under the ESA and listed as federally threatened in five states (Michigan, Minnesota, Wisconsin, Oregon and Washington) (43 FR 6230, February 14, 1978).

Effective August 8, 2007, the USFWS delisted the Bald Eagle under the authority of the ESA (see 72 FR 37345, July 9, 2007), removing it from the ESA's List of Endangered and Threatened Wildlife throughout most of its range. Accordingly, the prohibitions of the ESA no longer apply except to the Sonoran Desert nesting Bald Eagle population which is currently listed as federally threatened. In May 2007 the USFWS issued a set of National Bald Eagle Management Guidelines providing landowners and others with guidance on how to ensure that actions taken on private property are consistent with the Bald and Golden Eagle Protection Act and the MBTA, which both protect Bald Eagles by prohibiting killing, selling or otherwise harming eagles, their nests or eggs (USFWS, 2007). A modification to the definition of "disturb," a term specifically prohibited as a "take" by the Bald and Golden Eagle Protection Act was implemented on July 5, 2007 (72 FR 31132, June 5, 2007). The revised definition defines "disturb" as "to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, based on the best scientific information available:

1. Injury to an eagle,
2. A decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or,
3. Nest abandonment, by substantially interfering with normal breeding, feeding or sheltering behavior (USFWS, 5 June 2007, 72 FR 31132).

This definition provides clarity to the public while continuing protection for Bald Eagles (USFWS, 2007). On September 11, 2009 the USFWS published its Final Rule on Authorizations Under the Bald and Golden Eagle Protection Act for Take of Eagles (74 FR 46836). This Final Rule establishes permit provisions for Bald and Golden Eagle takes under limited circumstances.

3.10.1.2 ESA-Listed Birds

Marbled Murrelet

Status and Management

In 1992, the marbled murrelet was listed as federally threatened under the ESA in California, Oregon, and Washington (57 FR 45328). Primary causes of the species' decline include direct mortality from oil spills and by-catch in gill-net fisheries, as well as loss of nesting habitat (61 FR 26256).

Critical Habitat

Critical habitat for nesting was designated for the marbled murrelet in 1996 (61 FR 26256) and is currently proposed for revision, but the revised critical habitat will not include military lands (71 FR 53838). NBK at Bangor is not within designated marbled murrelet critical habitat (61 FR 26256; 71 FR 53838). Designated critical habitat closest to Hood Canal includes forest lands west and south from Dabob Bay, which is within flight distance of the proposed Test Pile Program project area (less than 84 kilometers [52 miles]) for breeding murrelets (61 FR 26256).

Distribution and Abundance

Marbled murrelets are seabirds that spend most of their life in the marine environment and nest in mature and old-growth forests (USFWS, 1997). Murrelets use the marine environment in Hood Canal for courtship, loafing, and foraging (USFWS, 2010). In this area, their nesting season is between April 1 and September 15. During the breeding season, murrelets tend to forage in well-defined areas along the shoreline in relatively shallow marine waters (Strachan et al., 1995). Murrelets forage at all times of the day and in some cases at night (Strachan et al., 1995).

During the pre-basic molt, flightless murrelets must select foraging sites that provide adequate prey resources within swimming distance (Carter and Stein, 1995). During the non-breeding season, murrelets typically disperse and are found farther from shore (Strachan et al., 1995).

Murrelets can occur year-round in Puget Sound and Hood Canal, although their flock size, density, and distribution vary by season (Falxa et al., 2008; Nysewander et al., 2005). Murrelet summer foraging groups occur more often in flock sizes of two, with singles and flocks of three or more birds occurring less often (Merizon et al., 1997; Ramos, 2009). Winter flock size is often times greater than four birds (USFWS, 2010).

Murrelet presence in Hood Canal has been documented through a number of survey efforts. The most accurate information comes from the consistent sampling used to estimate population size and trends under the Northwest Forest Plan Murrelet Effectiveness Monitoring Program (Raphael et al., 2007). Other survey data were generated through the Puget Sound Ambient Monitoring Program (PSAMP), conducted by WDFW. These two survey efforts (conducted since the mid-1990s) have estimated marbled murrelet densities in inland Washington marine waters. Surveys conducted for the Northwest Forest Plan Effectiveness Monitoring Program (NWFPEMP) estimated a density of 3.7 birds per square mile in Hood Canal during the 2003 breeding season (April–September) (Miller et al., 2006). The PSAMP surveys estimated marbled murrelet density in northern Hood Canal from 2.8 to 7 birds per square mile during the winter from 1993 to 2006, and 1.4 to 2.8 birds per square mile during the summer from 1992 to 1999 (WDFW, 2007b).

USFWS (2010) approximated the murrelet summer density for Floral Point (an area at the northern end of the Bangor waterfront at NBK) using the survey results for stratum 2 (conducted in July and August 2008) in Conservation Zone 1 (Falxa et al., 2009). To approximate murrelet winter density at Floral Point, USFWS (2010, in prep) developed an index using the results of winter surveys reported by Nysewander et al. (2005) for the Puget Sound Ambient Monitoring Program (1992-1999). This resulted in a multiplication of the summer density by a factor of 1.84. Table 3.35 summarizes the density which will be used for marbled murrelets in the remainder of this analysis.

TABLE 3.35 THE COMPUTED DENSITY AND NUMBER OF MURRELETS PRESENT BY FLORAL POINT DURING SUMMER AND WINTER

Area	Number and Density of Murrelets			
	Summer Season		Winter Season	
	Density† (no./km^2)	Number of Murrelets	Density‡ (no./km^2)	Number of Murrelets
Floral Point	1.61	155	2.96	284

†This was the mean density of murrelets in Conservation Zone 1 as reported by Falxa et al., 2009.
‡The estimated density of murrelets is projected to increase by a factor of 1.84 (1.61 x 1.84 = 2.96).

Additional surveys specific to marbled murrelet presence at NBK at Bangor have been conducted. Marbled murrelets were observed in shoreline and at-sea surveys conducted over several months from 2007 to 2010 (Agness and Tannenbaum, 2009b; Tannenbaum et al., 2009b), and the Kitsap Audubon Society reported marbled murrelets in three annual Christmas Bird Count surveys between 2001 and 2007 (Kitsap Audubon Society, 2008). Murrelets were observed in nearshore and deeper waters, including one individual near EHW-1 in September 2008.

Marbled murrelets nest solitarily in trees with features typical of coniferous old-growth (stand age from 200 to 250 years old, trees with multi-layered canopy). Although old-growth forest is the preferred habitat for nesting, marbled murrelets are known to nest in mature second growth forest with trees as young as 180 years old (Hamer and Nelson, 1995). WDFW Priority Habitat Species maps do not indicate the presence of marbled murrelet nests in the upland areas, including and adjacent to, NBK at Bangor (WDFW, 2007c). Although forest stand inventories at NBK at Bangor indicate that stands are typically less than 110 years old, some relict old-growth trees can be found near Devil's Hole and a small "old-growth" stand has been recently located at the northern portion of the base (International Forestry, 2000; Jones, 2010). This stand is scheduled for delineation to determine suitability as "potential habitat" for marbled murrelets."

3.10.1.3 Species with Special Protection Status

Bald Eagle

Bald eagles in the Pacific Northwest include resident birds and winter migrants that breed farther north. Migration patterns in general are timed to track the availability of spawning salmonids (Buehler, 2000). Many resident eagles in the Pacific Northwest migrate in late summer, when juveniles and adults move north up the coast to meet salmon runs in Alaska. At the end of these salmon runs in late fall, Alaskan and Pacific Northwest eagles move south along the coast following salmon runs. Adults reach wintering grounds in Pacific Northwest states in November or December, followed by juveniles in January (Buehler, 2000). Eagles that breed in more northern latitudes return to their breeding grounds during spring migration from January to March, depending on food resources and weather conditions.

WDFW identified 1,125 bald eagle territories in Washington in 2005, of which 75 percent were occupied (WDFW, 2007d). Near Hood Canal and the Bangor waterfront at NBK, bald eagles nest along the shoreline of Dabob Bay on the Bolton Peninsula and along the shoreline of Quilcene Bay, west of Dabob Bay, in Hood Canal. Bald eagles have been observed feeding, perching or roosting, and bathing at NBK at Bangor year round (Don, 2001a; Agness and Tannenbaum, 2009b; Tannenbaum et al., 2009b). An active bald eagle nest is located south of Devil's Hole near the waterfront (Leicht, 2008, personal communication) and bald eagle nesting territories occur within 1 mile (1.7 km) of the base (WDFW, 2007c). The closest known nesting territory outside the base contains two nests, which were approximately 850 feet (260 m) north of the NBK at Bangor property line. A third nest in this territory, which was about 550 feet (167 m) from the property line, no longer exists (Slater, 2009). Five known bald eagle territories are located on the Toandos Peninsula of Hood Canal (WDFW, 2007c). The closest point of Toandos Peninsula is ~1.5 miles away from NBK at Bangor.

Osprey

Ospreys are listed as a species of concern under the ESA and are a species to monitor for the state of Washington. Ospreys are summer-resident raptors that occur and nest near water, including marine shorelines, rivers, lakes, and streams where fish are available for foraging (Poole et al., 2002). Their nests are usually located in tall trees near large bodies of water. They have been observed flying, perching, and foraging at NBK at Bangor (Agness and Tannenbaum, 2009b; Tannenbaum et al., 2009b). Four active osprey nests at NBK at Bangor with fledged young were cited in the NBK at Bangor Integrated Natural Resources Management Plan (INRMP) (DoN, 2001a), including a nest south of Cattail Lake (> 1 mile from the study area). These nest sites are protected with 100-foot (30-meter) no-harvest buffer zones.

<u>Great Blue Heron</u>

Great blue heron are listed as a species of concern under the ESA and are a species to monitor for the state of Washington. Great blue herons forage on fish, amphibians, and aquatic invertebrates in wetlands, streams, and marine shorelines and, although distributed throughout the state of Washington, are most common in lowlands (Quinn and Milner, 2004). They are year-round residents in low elevation areas of western Washington. Great blue herons breed in colonies (rookeries) that are typically located near a body of water. The INRMP cited up to six great blue heron rookeries (Don, 2001a) located at Hunter’s Marsh and other wetlands at NBK at Bangor. However, no evidence of breeding was observed during May 2008 field visits to Hunter’s Marsh, the only rookery cited in the INRMP in the vicinity of the proposed project area. The Navy manages impacts to heron rookeries by establishing a 100 foot (~30 m) no-harvest buffer zone for timber around nesting locations (DoN, 2001a). In 2008, three new nests were constructed on a tower at EHW-1, at least two of which had chicks during summer 2008 marine wildlife surveys (Tannenbaum et al., 2009b). Subsequent surveys in the winter of 2009/2010 (non-nesting season) did not show the presence of any nesting materials at the tower, though these surveys occurred outside of the nesting season (Tannenbaum, 2010, pers. 3-134arbo.). It is expected, however, that future nesting at this location is unlikely since EHW-1 is a poor quality nesting location.

3.10.1.4 Non-Listed ESA Birds

<u>Shorebirds</u>

Shorebirds occurring at or near the project area are mainly present during winter and/or migration, depending on species life history (Table 3.34). Exceptions include the killdeer, which is present year round, and the spotted-sandpiper, a summer resident and potential breeder at NBK at Bangor. Shorebirds primarily rely on resources at NBK at Bangor for foraging during the non-breeding season when over-wintering or as a stopover during spring and fall migrations (for species such as phalaropes) (Buchanan, 2004). Both the killdeer and spotted sandpiper nest close to water (Opperman, 2003) and may nest on the shoreline in the vicinity of the Test Pile Program project area. Shorebirds focus on intertidal habitat for all foraging activities (Johnson and O’Neil, 2001). Many shorebird species (e.g., plovers, sanderlings, sandpipers, and dowitchers) forage on larvae, and aquatic insects (Buchanan, 2004). Other food sources of shorebirds include amphipods, copepods, crustaceans, and molluscs. Shorebirds rest or sleep (roost) in a variety of location-dependent habitats. Some roosting habitats used by shorebirds include salt flats adjacent to intertidal foraging areas, higher elevation sand beaches, fields, or grassy areas near intertidal foraging areas; roost sites occasionally include piles, log rafts, floating docks, or other floating structures when natural roost sites are limited (Buchanan, 2004).

Marine Waterfowl

Most marine waterfowl species only occur at the Bangor waterfront at NBK during the winter and migrate north during their breeding season. However, common and hooded mergansers, Canada geese, and some dabbling duck species (mallard, gadwall, and northern shoveler) can be found near the project area year round. Of these species, only the Canada goose and merganser have been regularly sighted during summer months (Agness and Tannenbaum, 2009b; Tannenbaum et al., 2009b). Surf and white-winged scoters primarily occur in winter but can occur in summer (Opperman, 2003), although sightings of scoters are less common during summer months (Agness and Tannenbaum, 2009b). Marine waterfowl primarily forage in the nearshore environment, including near manmade structures (such as EHW-1), but are also found in inland deeper marine waters (Agness and Tannenbaum, 2009b). The primary forage resources of marine waterfowl include molluscs, crustaceans, and plant material. Other secondary food sources of marine waterfowl in the nearshore vicinity of the Test Pile Program project area are aquatic larvae and invertebrates. In the Puget Sound region, eelgrass beds are important foraging zones for dabbling ducks (American wigeon and mallard) (Lovvorn and Baldwin, 1996). Mergansers, such as the common merganser, nest close to water in rock crevices, tree cavities, or under tree roots (Opperman, 2003) and may nest along the shoreline habitat near the project area during summer. Marine waterfowl also rest on shore and the intertidal zone (Agness and Tannenbaum, 2009b).

Seabirds

There are two primary guilds of seabirds that occur near the project area: surface feeding and pursuit-diving. In addition, the parasitic jaeger is a predatory seabird that may occur in the vicinity of NBK at Bangor during fall migration (late September to early October) in pursuit of small birds (such as common terns, which are also in migration during this time) (Opperman, 2003). Depending on individual species life history, surface-feeding seabirds occur during different seasons. Whereas glaucous-winged gulls occur year round (Hayward and Verbeek, 2008), other gull species only occur during a portion of the year (see Table 3.35). Glaucous-winged gulls breed at established colonies, and the closest colony to the Test Pile Program project area is located approximately 30 miles (48 km) to the northwest (Protection Island) (Hayward and Verbeek, 2008). Non-breeding Caspian terns and breeders disperse from colonies after the breeding season ends in June or July and are common in the vicinity of the Test Pile Program site from April to August. Gulls and terns in the vicinity forage on small schooling fish, visible from the water surface in the nearshore marine and inland marine deeper water habitats (e.g., Pacific herring, Pacific sand lance, and juvenile salmonids). Additional forage resources taken opportunistically by gulls include objects gleaned on the water surface, garbage on shore or inland, scavenged carrion, and small birds and eggs. Gulls can also forage in the intertidal zone; for example, gulls can feed on molluscs by dropping a mollusc from the air to break the shell on the beach or other hard surface, such as EHW-1.

Pursuit-diving seabirds can occur year round in the vicinity of the project area; however, numbers of some species are greater during winter months (e.g., pelagic cormorant, common murre, and pigeon guillemot). Cormorants, such as the double-crested cormorant, nest in colonies along the outer coast of Washington, while non-breeding cormorants are found year round at NBK at Bangor. Cormorants roost on buoys and other structures at the waterfront in groups of 10 individuals, the majority of which are juveniles (Agness and Tannenbaum, 2009b). Gulls roost in similar sized groups (Agness and Tannenbaum, 2009b).

With the exception of the pigeon guillemot, seabirds such as the common murre and rhinoceros auklet do not nest near the project area (Wilson and Manuwal, 1986; Ainley et al., 2002; Agness and Tannenbaum, 2009b). Non-breeding common murres can occur year round. In general, however, common murres are most abundant in inland waters of Washington during the winter (Johnson and O'Neil, 2001), whereas rhinoceros auklets are more common in inland waters during the summer (Johnson and O'Neil, 2001; Opperman, 2003).

Pursuit-diving seabirds are found in nearshore and inland marine deeper waters near the Test Pile Program area, where they dive to capture prey underwater. These seabirds are also found near manmade structures, such as the EHW-1, where algal and invertebrate communities (which provide additional forage resources) have become established on underwater piles. Primary forage resources of these seabirds include small schooling fish and other nearshore fish, such as Pacific sand lance and Pacific herring (Vermeer et al., 1987). The pigeon guillemot forages opportunistically on a more general diet of epibenthic fish and invertebrates than some other pursuit-divers, such as the common murre (Vermeer et al., 1987). Additional forage resources of pursuit-diving marine birds in the marine water habitats include zooplankton and aquatic invertebrates.

3.10.2 Environmental Consequences

3.10.2.1 No Action Alternative

Under the No Action Alternative the Test Pile Program would not be conducted. Baseline conditions, as described above, for birds would remain unchanged. Therefore, there would be no significant impacts to birds from implementation of the No Action Alternative.

3.10.2.2 Proposed Action

The evaluation of impacts to marine birds considers the importance of the resource, the proportion of the resource affected relative to its occurrence in the region, the particular sensitivity of the resource to project activities; and the duration of environmental impacts or disruption. In general, impacts from pile installation and removal at the proposed Test Pile Program site would be similar to those described for marine mammals (see Section 3.9), including elevated underwater noise levels, increased human activity and noise, and changes in prey availability within the project area. In particular, underwater and airborne pile driving noise during the test pile period has the potential to disrupt marine bird nesting, foraging, and resting in the vicinity of the project area. Impacts to marine birds are anticipated to be highly localized because marine birds are wide-ranging and have a large foraging habitat available in Hood Canal, relative to the foraging area that might be impacted by pile driving within the project area.

3.10.2.2.1 Direct Effects of Pile Driving Activities

3.10.2.2.1.1 Potential Acoustic Effects of Pile Driving on Birds

The primary impacts to marine birds from the Test Pile Program would be associated with noise resulting from pile installation and removal activities. Impacts to marine birds associated with water quality changes (turbidity) in nearshore habitats and changes in prey availability (benthic community and forage fish) would be localized and temporary during the 40 day pile driving period and are not discussed further in this section. The most important impact to marine birds associated with pile driving would occur when birds are foraging underwater at the same time underwater noise is being generated by impact pile driving, and to a lesser extent, vibratory pile driving. These potential impacts are discussed below.

Potential Effects of Underwater and Airborne Noise

There are no empirical data specific to impact pile driving and its effects on any seabird, but studies that have evaluated other types of underwater sounds (underwater blasting and seismic testing) on vertebrates provided some basis for evaluating the effects of pile driving on seabirds (Entranco and Hamer Environmental, 2005). Exposure to high sound pressure levels (SPLs) can result in barotrauma, or physical injury caused by a change in pressure usually occurring in the ear (Hastings and Popper, 2005; USFWS, 2006), i.e., internal injuries, including hemorrhage and rupture of internal organs caused by a difference in pressure between an air space inside the body and the surrounding gas or liquid. As a result, marbled murrelets (and other diving birds) exposed to underwater sound pressure levels from impact pile driving within close proximity to the source could potentially be injured. Recent construction-period monitoring at Hood Canal Bridge, approximately 22 miles (35 km) from NBK at Bangor, described a pigeon guillemot that appeared to be distressed and initially unable to fly following underwater exposure to impact pile driving at a distance of approximately 225 feet (68 m) (Entranco and Hamer Environmental, 2005).

Although some birds may exhibit an annoyance reaction and flee from the project area upon commencement of pile driving, others may continue to forage close to the construction area and be exposed to associated noise. Prey species, such as fish, could potentially be killed or injured as a result of pile driving, which could serve as an attractant and compound the issue of underwater noise exposure to birds that forage underwater. Monitoring at Hood Canal Bridge demonstrated that marbled murrelets continued to dive and forage within 984 feet (300 m) of active pile driving operations, within the projects predicted impact area (Entranco and Hamer Environmental, 2005). This observation indicates that some foraging marine birds may habituate to pile driving.

Behavioral responses of birds to pile driving are not well known and were extrapolated from the literature on fishes by USFWS, recognizing that there is considerable uncertainty on the subject (USFWS, 2006). In the analysis of pile driving impacts to marbled murrelets at the Anacortes, Washington, ferry terminal, USFWS stated that they would anticipate that SPLs in excess of 150 dBRMS could cause significant disruption of normal behaviors (USFWS, 2006). Behaviors that would indicate disturbance of marbled murrelets and other marine birds include flushing (startle reaction), aborted feeding attempts, delayed feeding, or avoidance of the area. TTS can also result from exposure to elevated underwater noise, potentially affecting communication and/or ability to detect predators or prey. Responses of marine bird species in general are expected to be similar to those predicted for marbled murrelets. Birds would likely avoid the immediate pile driving site but could potentially habituate to pile driving noise well within the disturbance impact area due to sound attenuation with increasing distance from the source.

3.10.2.2.1.2 Thresholds and Criteria for Pile Driving for Birds

Little is known of the physiology of avian hearing underwater, and there are no empirical data specific to the effects of pile driving on any marine bird species. USFWS established a 180 dB re: 1µPa peak threshold to conservatively address underwater noise impacts that may cause injury and a 150 dB re: 1 µPa rms guidance criterion for behavioral disturbance (USFWS, 2006). USFWS (2004) identified a sound-only injury threshold for marbled murrelets at nest sites of 92 dB (A) re: 20 µPa, where injury is defined as a bird flushing from the nest or the young missing a feeding. This threshold was generated by work done in the Olympic National Forest for marbled murrelets and spotted owls (USFWS, 2004). Noise-related thresholds have not been established for marine bird species other than marbled murrelets that occur on the waterfront, such as scoter species, pigeon guillemots, goldeneye species, cormorants, and grebes, but they are likely to respond similarly to pile strikes.

In the letter of concurrence the U.S. Navy received from the USFWS Washington Office for the Test Pile Program, the Service instituted a newly developed set of criteria to assess injurious effect from underwater noise to the marbled murrelet. Their analysis was based on dual criteria of 206 dBpeak re: 1µPa and 183 dB SEL re: 1µPa. During consultation, the Navy disagreed with the decision by the USFWS Washington Office to change the criteria for assessing injurious effects based on both the timing of the change within the context of the consultation process and with the criterion value and metric that was developed; however, USFWS proceeded over the Navy's objections. The Navy is continuing discussions with the USFWS Washington Office regarding the appropriateness of the criteria for assessing injurious impacts to marbled murrelets and has indicated to the Service that the Navy does not consider the Test Pile Program's letter of concurrence as setting precedence for other future Navy consultations.

All analysis contained in this EA was conducted under the established criteria at the time that consultation was initiated.

3.10.2.2.1.3 Determining Expected Sound Pressure Levels

<u>*Underwater Noise from Pile Driving*</u>

Underwater noise associated with pile driving activities would likely be one of the most important impacts to marine birds present during pile driving within the project area. As described in Section 3.9.2.2.1.4, (Underwater Noise) pile driving within the project area would result in increased underwater noise levels. Impact pile driving using a single-acting diesel impact hammer and 153-cm (60-inch) steel piles would produce peak underwater noise levels of 210 dB re: 1 µPa peak; 185 dB re: 1µPa^2-sec SEL; and average RMS levels of 195 dB re: 1 µPa at a distance of 33 feet (10 m) from the pile in the absence of any noise mitigation devices. Existing underwater ambient noise levels measured along the Bangor waterfront at NBK were measured at 114 dB re: 1 µPa (Slater, 2009). Any location in Hood Canal with a direct line-of-sight to the source of impact pile driving would experience noise levels above the average background noise. However, locations with an intervening land mass would experience lower noise levels from pile driving.

Airborne Noise from Pile Driving

Marine birds can also be disturbed by airborne noise associate with pile driving. As described in Section 3.9.2.2.1.4 (Airborne Noise), pile driving and removal activities within the project area would result in increased airborne noise levels. Based on in-situ recordings from similar monitored projects the sound pressure levels which would be expected during the Test Pile Program would be 105 dB re: 20 μPa at a distance of 50 feet (15 m) from the source for impact pile driving and 95 dB re: 20 μPa at 50 feet (15 m) from the source for vibratory pile driving.

3.10.2.2.1.4 Distance(s) to Sound Thresholds

Underwater Noise from Pile Driving

Pile driving would generate underwater noise that potentially could result in disturbance to birds swimming by the project area. Transmission loss (TL) underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, transmission loss is:

$$TL = B * \log_{10}© + C * R,$$

Where:

B = logarithmic (predominantly spreading) loss
C = linear (scattering and absorption) loss
R = range from source in meters

For all underwater calculations in this assessment, linear loss © was not used (i.e. C=0) and transmission loss was calculated using only logarithmic spreading. Therefore, using practical spreading (B=15), the revised formula for transmission loss is TL = 15 log10 ©.

The distances to the underwater marbled murrelet thresholds were calculated using the received levels reported previously from in-situ recordings from other similar construction activities, and the formula above for practical spreading. For the proposed action, the Navy intends to employ noise reduction techniques during impact pile driving, including the use of a sound attenuation device (i.e. Gunderboom SAS™, TNAP, confined and/or unconfined bubble curtain). Additionally, vibratory pile driving will be the primary installation method. The calculations of the distances to the marbled murrelet noise thresholds were calculated for impact installation with and without consideration for mitigation measures. Distances calculated with consideration for mitigation assumed a 10 dB reduction in source levels from the utilization of sound attenuation devices (e.g. Gunderboom SAS™, TNAP, confined and/or unconfined bubble curtain). The Navy will be using the mitigated distances for impact pile driving for all further analysis in this EA, except during temporary periods of unattenuated impact pile driving to test the effectiveness of sound attenuation devices used during the Test pile Program. Assuming the use of a sound attenuation device, the modeling indicates the distance to the 180 dB peak injury threshold during steel pile installation would be 705 feet (215 m). The distance to the 150 dB rms disturbance threshold for impact and vibratory pile driving during steel pile installation would be 7,067 feet (2,154 m) and 3,280 feet (1,000 m), respectively. As discussed in Section 3.9.2.2.1.5, some of the distances produced by the calculations are unrealistic, because they assumed a field free of obstruction. For instance, the actual distance to the behavioral disturbance zone for impact pile driving may be shorter than that calculated due to the irregular contours of the waterfront, the narrowness of the canal, and the maximum fetch at the project area. Table 3.36 summarizes the distances to an area encompassed by sound pressure levels generated during the different phases of construction relative to USFWS guideline thresholds. Figure 3-17 provides a visual depiction of these zones relative to the study area.

TABLE 3.36 CALCULATED DISTANCES(S) TO AND AREA ENCOMPASSED BY THE USFWS GUIDELINE THRESHOLD FOR UNDERWATER IMPACTS FROM PILE DRIVING ON THE MARBLED MURRELET

Species	Threshold	Distance Without Mitigation (m)	Distance With Mitigation (m)	Distance in (km)	Predicted Area in (km^2)	Actual Area in (km^2)
Marbled Murrelet	Impact Driving – Injury (180 dB peak)	1,000*	215*	0.215	0.145	0.136
	Impact Driving – Behavioral (150 dB rms)	10,000*	2,154*	2.154	14.576	7.670
	Vibratory Driving – Behavioral (150 dB rms)	NA	1,000*	1.000	3.142	1.700

dB = decibel; rms = root-mean-square; µPa = microPascal
Practical spreading loss (15 log, or 4.5 dB per doubling of distanced) and -10 dB for sound attenuation were used for calculations.
Sound pressure levels used for calculations were: 195 dB re: 1 µPa @ 10m for impact and 180 dB re: 1 µPa @ 10m for vibratory
*Range calculated is greater than what would be realistic. Hood Canal average width at site is 2.4 km, and is fetch limited from N to S at 20.3 km.

USFWS Washington Office use of different criteria for assessing underwater injurious impact to marbled murrelets in their letter of concurrence for the Test Pile Program, resulting in different zones of influence for injurious effects compared to the Navy analysis. USFWS determined that the distance to the 206 dBpeak re: 1µPa criterion would occur at 7 meters and 34 meters, with and without attenuation, respectively. USFWS determined that the distance to the 183 dBSEL re: 1µPa^2-sec criterion would occur at 63 meters and 198 meters, with and without attenuation, respectively. The calculation for the SEL criterion is dependent upon the number of impact strikes. For the Test Pile Program, 100 strikes is the maximum number of strikes that could occur per day, and was assumed for the calculation with a sound attenuation device. For the calculation without a sound attenuation device, USFWS assumed that during each test of the bubble curtain during which a maximum of 1 minute of unattenuated impact pile driving will occur, only 50 strikes would occur without attenuation. These distances to the injurious impact criteria estimated by USFWS were smaller than those assumed by the Navy in the analysis contained in the EA. Therefore, the Navy's analysis can be assumed to be more conservative.

Airborne Noise from Pile Driving

Pile driving would generate airborne noise that potentially could result in disturbance to birds foraging, resting, or transiting in the vicinity of the project area. Transmission loss (TL) in air is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. A spherical spreading loss model, assuming average atmospheric conditions, was used to estimate the distance to the 92 dB(A) re: 20 µPa rms airborne thresholds for marbled murrelets. The formula for calculating spherical spreading loss is:

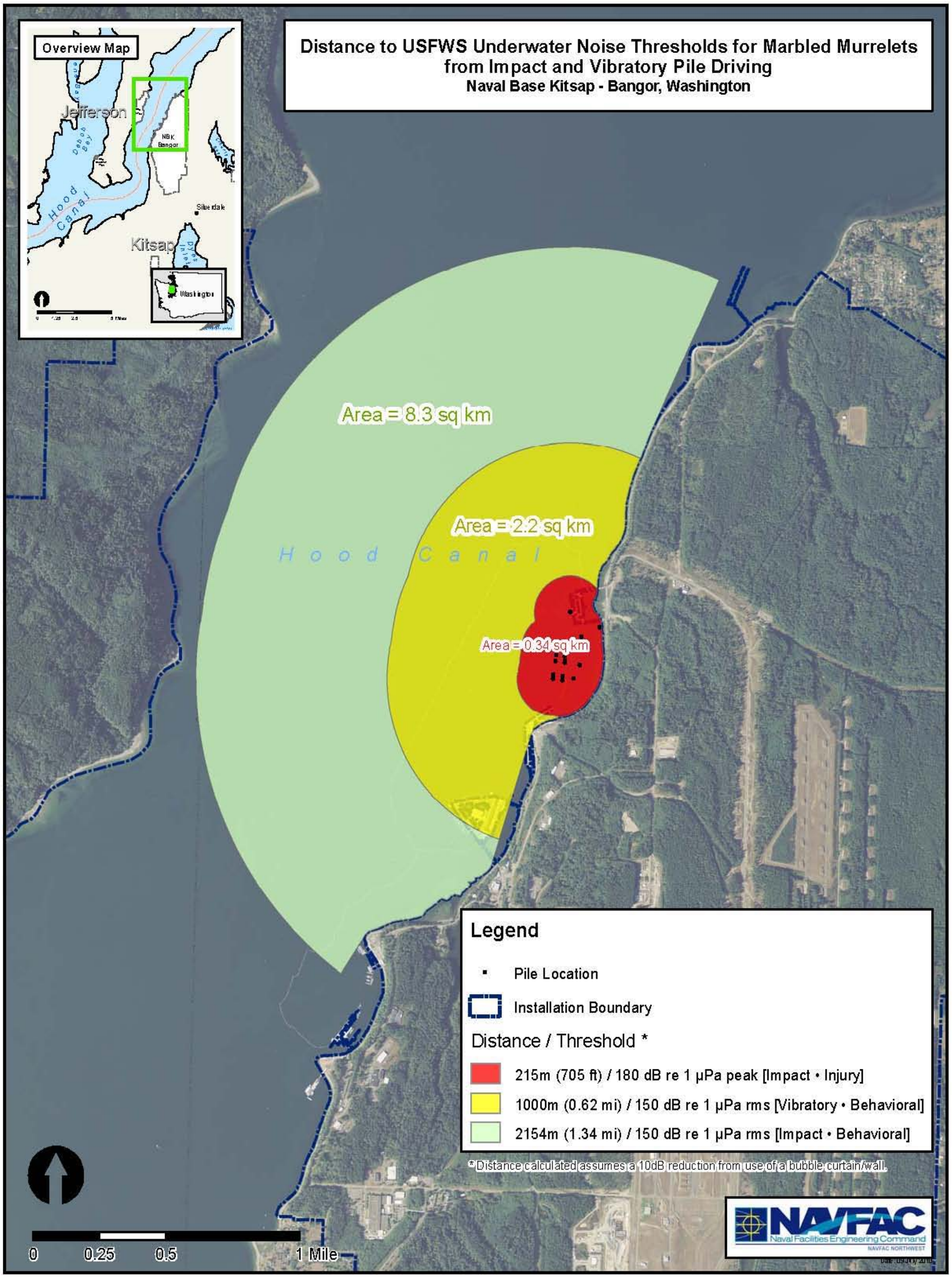


Figure 3-17 Distances to USFWS Underwater Noise Thresholds for Marbled Murrelets from Impact and Vibratory Pile Driving

$$TL = 20\log r$$

Where:

TL = Transmission loss

r = Distance from source to receiver

*Spherical spreading results in a 6 dB decrease in sound pressure level per doubling of distance.

The distances to the airborne marbled murrelet threshold was calculated using received levels reported previously from in-situ recordings from other similar construction activities, and the formula above for spherical spreading. The modeling indicates that the distance to the 92 dB(A) re: 20 µPa airborne injury during steel pile installation would be at a distance of approximately 223 feet (68 m) over water, and vibratory would exceed the airborne threshold for approximately 72 feet (22 m) over the water. Table 3.37 summarizes the distances to an area encompassed by sound pressure levels generated during the different phases of construction relative to USFWS guideline thresholds. Figure 3-18 provides a visual depiction of these zones relative to the study area. Since protective measures are in place out to the distances calculated for the underwater thresholds, the distances for the airborne thresholds will be covered fully by monitoring.

TABLE 3.37 CALCULATED DISTANCES(S) TO AND THE AREA ENCOMPASSED BY THE USFWS GUIDELINE THRESHOLD FOR AIRBORNE IMPACTS FROM PILE DRIVING ON THE MARBLED MURRELET

Species	Threshold	Distance (m)	Distance in (km)	Actual Area in (km^2)
Marbled Murrelet	Impact Driving – Injury (92 dB(A) re 20µPa)	68	0.068	0.0145
	Vibratory Driving – Injury (92 dB(A) re 20µPa)	22	0.022	0.0015

dB = decibel; rms = root-mean-square; µPa = microPascal

Spherical spreading loss (20 log, or 6 dB loss per doubling of distanced) was used for calculations

Sound pressure levels used for calculations were: 105 dB re: 20 µPa at a distance of 15 meters (50 feet) for impact pile driving and 95 dB re: 20 µPa at 15 meters (50 feet) for vibratory pile driving

USFWS (2004) has also identified noise-only alert and disturbance thresholds for marbled murrelets where alter behavior refers to the bird showing apparent interest in the noise source and disturbance is indicated by avoidance of the noise. These threshold levels change depending on the baseline noise level and do not widely apply (USFWS, 2004; WSDOT, 2008; Teachout 2009, personal communication). The airborne threshold was derived from studies of nesting murrelets, and responses of foraging and resting birds in the marine environment are less well known. However, murrelets on the water may be impact by pile driving through behavioral disturbance in the aforementioned distances.

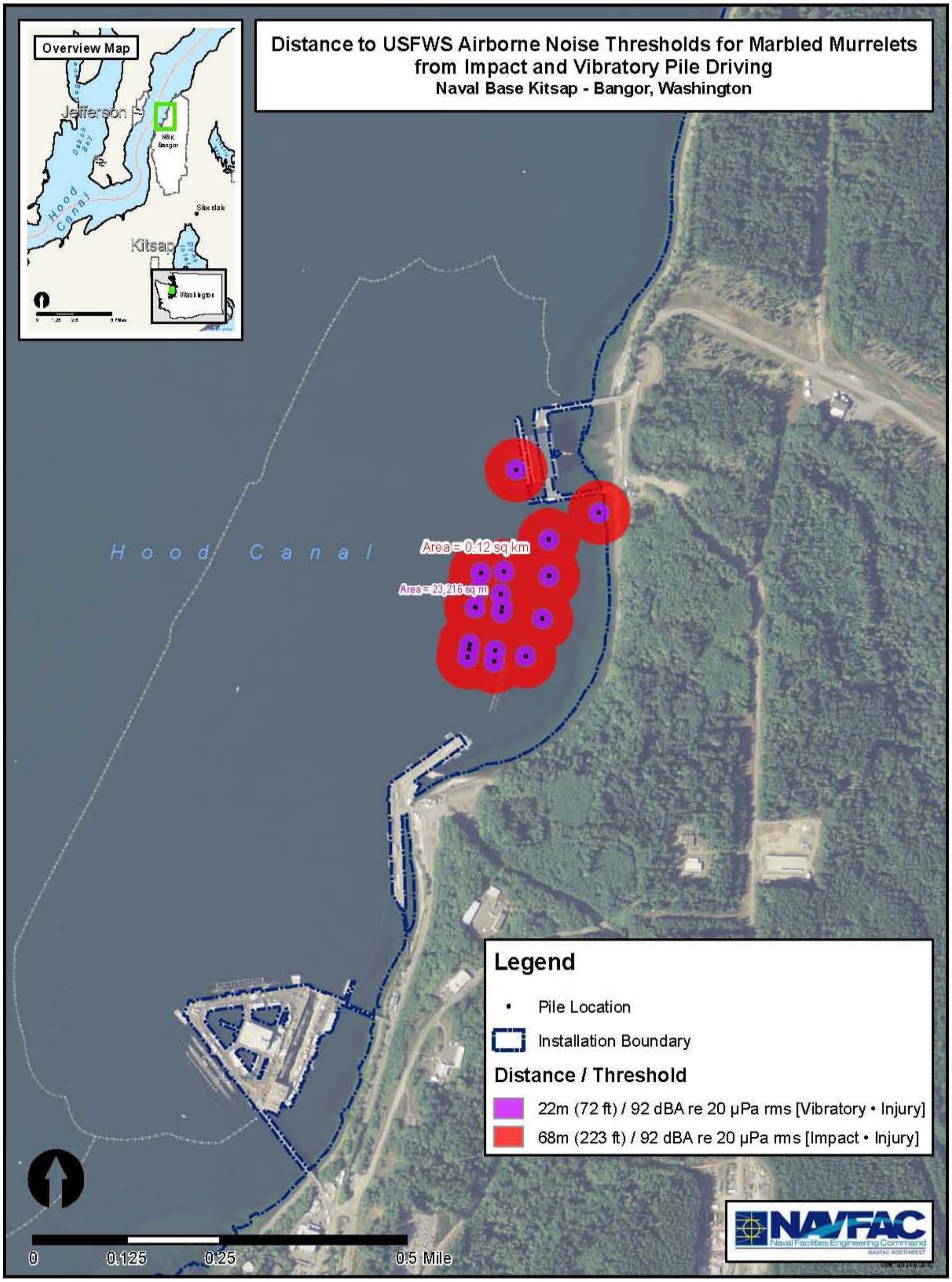


Figure 3-18 Distances to USFWS Airborne Noise Thresholds for Marbled Murrelets from Impact and Vibratory Pile Driving

Noise-related thresholds have not been established for marine bird species other than marbled murrelets that occur on the waterfront, such as scoter species, pigeon guillemots, goldeneye species, cormorants, and grebes, but they are likely to respond similarly to pile strikes. Behavioral responses of seabirds, including marbled murrelets, were monitored during construction of Hood Canal Floating Bridge in Washington (Entranco and Hamer Environmental, 2005). At the beginning of pile driving work, the majority of seabirds in the vicinity responded by flushing, but over time some habituation occurred. Most of these species use the Bangor waterfront at NBK for foraging and resting (Agness and Tannenbaum, 2009b; Tannenbaum et al., 2009b).

3.10.2.2.1.5 Sound Exposure Modeling

For details of the sound exposure modeling see Section 3.9.2.2.1.6. The exposure assessment methodology is an estimate of the numbers of individuals exposed to the effects of pile driving activities exceeding USFWS guideline thresholds. Of significant note in these exposure estimates, additional mitigation methods (i.e. visual monitoring and the use of shutdown zones) were not quantified within the assessment and successful implementation of this mitigation is not reflected in exposure estimates. Results from the acoustic impact exposure assessment should be regarded as conservative estimates that are strongly influenced by limited biological data. For instance, the Navy assumed that one hundred percent of the in-air density of marbled murrelets was available to be exposed to underwater sounds at any time which is a highly conservative modeling parameter. While the numbers generated from the pile driving exposure calculations provide conservative overestimates of marbled murrelet exposures for consultation with USFWS, the duration and limited geographic extent of Test Pile Program would likely further limit actual exposures.

ESA-Listed Birds

Marbled Murrelet

Marbled murrelets are present in the Hood Canal almost year-round but have peak densities in the winter. The Test Pile Program work period (40 days) overlaps the end of the marbled murrelet nesting season (April 1 to September 15), however, murrelet densities are lowest during the summer period in which this project would take place (Nysewander et al., 2005), and suitable nesting habitat does not occur within 0.25 miles (1320 feet/403 meters) of the project area. Noise from pile installation and removal has the potential to cause injury and behavioral disturbance for marbled murrelets. Although murrelets would likely avoid the immediate pile driving site and would habituate to pile driving noise well within the disturbance impact area, potential impacts may occur, especially considering the observations at Hood Canal Bridge (Entranco and Hamer Environmental, 2005), described in Section 3.10.2.2.1.

Table 3.38 depicts the number of acoustic harassments that are estimated from vibratory and impact pile driving during installation/removal operations both underwater and in-air for marbled murrelets. Based on the modeling analysis no injurious exposures are expected to occur to marbled murrelets are a result of both attenuated and unattenuated impact pile driving associated with the Test Pile Program. Based on the modeling analysis there is the potential for 187 marbled murrelets to be exposed to underwater sound pressure levels that would cause disturbance as a result of impact pile driving during pile installation. There is the potential for an additional 45 marbled murrelets to be exposed to underwater sound pressure levels that would cause disturbances as a result of vibratory pile installation and removal. No exposures to injurious airborne sound pressure levels from impact or vibratory pile driving are predicted by the modeling analysis. Disturbance from underwater noise impacts is not expected to be significant because it is estimated that only a small number of marbled murrelets may be affected by acoustic harassment. Additionally, marbled murrelet observers will be monitoring the shutdown and buffer zones (see Chapter 4 for a detailed discussion of mitigation measures) for the presence of marbled murrelets, and will alert work crews when to begin or stop work due to presence of these birds in or near the shutdown and buffer zones, reducing the potential for acoustic harassment. Based on the exposure analysis, marbled murrelets are not expected to be exposed to underwater or airborne sound pressure levels that would cause injury.

TABLE 3.38 POTENTIAL EXPOSURES OF MARBLED MURRELETS WITHIN VARIOUS NMFS ACOUSTIC THRESHOLD ZONES

Season	Density of Marbled Murrelets	Underwater Exposure Estimate			Airborne Exposure Estimate
		Impact Injury Threshold (180dB peak)[1]	Impact Disturbance Threshold (150 dB rms)[1]	Vibratory Disturbance Threshold (150 dB rms)[1]	Impact & Vibratory Injury Threshold (92dB (A) rms)[2]
July – Oct	1.61	0*	187**	45	0

[1] All underwater sound pressure levels are re: 1μ Pa.
[2] All airborne sound pressure levels are re: 20 μ Pa.
* The modeling for underwater exposures indicated that zero injurious exposures of marbled murrelets were likely to result from attenuated or unattenuated impact pile driving.
**The modeling from underwater exposures indicated that 180 behavioral exposures of marbled murrelets were likely to result from attenuated impact pile driving and an additional 7 behavioral exposures were likely to result from unattenuated impact pile driving.

Species with Special Protection Status

Other protected marine bird species that forage along the waterfront and nest in the vicinity of the project area include the bald eagle, osprey, and great blue heron. Because these species capture prey in the nearshore and intertidal habitats, they are susceptible to the same potential airborne noise impacts from pile driving and removal described above for marbled murrelets.

Bald Eagle

USFWS (2003) determined that elevated noise levels from impact pile driving at a dock in Port Angeles could disrupt the normal feeding behavior of adult bald eagles within approximately 0.5 mile of the dock site. One bald eagle has been observed foraging on the shoreline approximately 975 meters (3,200 feet, 0.6 mile) north of the project area (Tannenbaum et al., 2009b). This falls outside of the potential impact zones estimated in the Port Angeles dock project. In addition, the largest airborne injury zone estimates using the marbled murrelet criteria was 68 meters (233 feet) during impact pile installation. This zone is significantly shorter than the distance to any observed bald eagle nests in the area. Therefore, injurious effects as a result of pile installation and removal are unlikely from the proposed action.

Watson and Pierce (1998) found that vegetative screening and distance were the two most important factors determining the impact of visual disturbances for bald eagles. There is no effective vegetative screening within 0.5 mile of the project area along the shoreline; therefore, bald eagles would most likely avoid foraging within this area during the Test Pile Program. Further, the area does not currently appear to receive much use by bald eagles; therefore, impacts to foraging bald eagles are not expected.

The bald eagles observed during spring and summer marine bird surveys at NBK at Bangor are probably the resident pair at the nests located in the Vinland neighborhood, and a resident pair nesting near Devil's Hole, since this species is highly territorial during the breeding season. The closest nest is over one mile from the project area, with vegetative screening present; therefore, no impacts to nesting bald eagles are expected. Pile installation and removal activities as part of the proposed action would have no significant impacts on the bald eagle.

Osprey

Ospreys have been observed foraging along the shoreline south of EHW-1 (Tannenbaum et al., 2009b), adjacent to the project area. Test Pile Program pile driving and removal would overlap the ospreys' period of residence in the area (July through October). Ospreys present during the test period, would probably avoid foraging within this area due to the noise. However, any potential disturbance would be short-term (40-day project schedule) and the reduction in the availability of optimal foraging areas due to the Test Pile Program would be minimal relative to the potential foraging habitat available to ospreys in the Hood Canal. Lastly, the closest nest recently identified for ospreys on NBK property was north of the Test Pile Program action area at Cattail Lake, more than one mile away. This location is well outside the potential acoustic impact zones for airborne noise from the Test Pile Program. As a result, the proposed action would have no significant impacts on the osprey.

Great Blue Heron

Great blue herons are intolerant of disturbance while foraging and nesting (Eissinger, 2007) and conduct both activities in the area around EHW-1 (Tannenbaum et al., 2009b). As a result, Great blue herons would likely avoid foraging within this area during pile driving.

The INRMP (DoN, 2001a) designated a 100-foot protection zone around great blue heron rookeries from timber harvesting. Three pairs of great blue herons nested on a tower at EHW-1 in summer 2008 (Tannenbaum et al., 2009b). However, subsequent surveys have not revealed active nests in this area. The closest rookery located at NBK at Bangor to the Test Pile Program is at Hunter's marsh. It is located in the upland area behind the existing EHW-1 facility, however, despite its close proximity, this rookery falls outside the largest injury zone associated with airborne sound pressure levels predicted for marbled murrelets (assumed to be the most sensitive bird species) , which only extends 68 meters (233 feet) from the pile. Since there are no established criteria from which to assess behavioral impacts for airborne noises on birds, its unknown if great blue herons utilizing Hunter's Marsh could be behaviorally disturbed from pile operations. Pile driving within the project area would be greater than 100 feet (30 m) from the great blue heron nests at Hunter's March, so there would likely be no physical disturbance to the rookery from construction activities. Pile driving and removal would only overlap with the last two weeks of the great blue heron nesting season, which extends in the area from mid-February to the end of July. Additionally, great blue herons would be unlikely to nest at the site during pile driving due to the noise associated with the construction activities. Moreover, there would be no visual screening between the nests and pile driving activities, and this species is intolerant of noise and human disturbance (Eissinger, 2007). Great blue heron colonies may move from year to year in response to disturbance (Eissinger, 2007), and other suitable nesting sites are available (and have been used) in forest stands at NBK at Bangor (DoN, 2001a). Thus, avoidance of the EHW-1 tower nesting location during the pile driving period would not impeded nesting or impact the great blue heron population in the area. Impacts associated with pile driving and removal would be limited to behavioral disturbance or short-term avoidance of the area. Therefore, the proposed action would have no significant impacts on the great blue heron.

Migratory Birds

Most migratory and winter-resident seabirds, shorebirds, and waterfowl do not breed in the vicinity of the Bangor waterfront at NBK. Six species recognized by the USFWS as species of concern could occur in the project area, and include the Caspian tern, yellow-billed loon, pelagic cormorant, western grebe, lesser yellowlegs, and short-billed dowitcher (USFWS, 2008a). Of these species, pelagic cormorants have been observed in Christmas bird counts (Kitsap Audubon Society, 2008) and summer surveys (Agness and Tannenbaum, 2009b; Tannenbaum et al., 2009b). Pelagic cormorants do not breed in the vicinity, however. Western grebes have been observed during the spring migration (Agness and Tannenbaum, 2009b) and Christmas bird counts (Kitsap Audubon Society, 2008). Migratory marine bird species would be subject to underwater and airborne noise. While it is likely that most marine birds would avoid the immediate vicinity of the project area during pile driving, it is possible that some individuals may habituate. Diving species such as loons, grebes, and cormorants could be exposed to underwater noise. Mitigation measures employed for the marbled murrelet may also minimize noise-related impacts to other diving migratory birds (see Section 4.4, Mitigation Measures and Regulatory Compliance). Migratory marine birds are widespread throughout Puget Sound in winter months, and the project area is very small compared to their habitat overall. Furthermore, exposure to sounds would be temporary due to the transitory nature of birds migrating through the project area. The proposed action would have no significant impacts on migratory birds.

3.10.2.2.2 Potential Indirect Effects of the Proposed Action

3.10.2.2.2.1 Effects on Potential Prey (fish, etc.)

Impacts to Prey

Construction activities will produce both pulsed (i.e. impact pile driving) and continuous sounds (i.e. vibratory pile driving). Fish react to sounds which are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of noise energy. Additional studies have documented effects of pile driving (and other types of continuous sounds) on fish, although several are based on studies in support of large, multiyear bridge construction projects (Scholik and Yan, 2001, 2002; Govoni et al., 2003; Hawkins, 2005; Hastings, 1990, 2007; Popper et al., 2006, 2007; Popper and Hastings, 2009). Sound pulses at received levels of 160 dB re: 1 μPa may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Chapman and Hawkins, 1969; Pearson et al., 1992; Skalski et al., 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality (Caltrans, 2001; Longmuir and Lively, 2001). Fish that occur in the immediate project area would be exposed to underwater noise that could injure or disturb fish during pile driving activity. Because vibratory pile driving is the primary installation and removal methodology, the most likely impact to fish from pile driving activities at the project area would be temporary behavioral disturbance or avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. See Section 3.8 for a detailed analysis of the impacts of the proposed action to fish species. In general, impacts to bird prey species are expected to be minor and temporary due to the short-time frame for the proposed action. However, moderate impacts may occur to a few species of rockfish (bocaccio, yelloweye, and canary rockfish), chinook salmon, and summer run chum as a result of potential impacts to them or their larvae.

Impacts to Prey Habitat

The proposed action may result in localized and temporary changes to the benthic community during pile placement. A conservative estimate of total bottom disturbance from the installation and removal of the piles, which includes the potential to disturb the bottom habitat one meter surrounding each pile is 6,970 ft^2 (647 m^2). During the pile driving period, juvenile salmonids and other fish species may experience loss of available benthic prey at the project area due to the disturbance of their habitat during pile installation and removal. Additionally, plankton and zooplankton which occupy the water column and are the primary prey of forage fish may be negatively affected by increased sound pressure levels and turbidity from construction activities. However, in-water work would be scheduled to occur during the time frame when few salmonids would be present and impact pile driving will cease after October 14, if forage fish eggs are present at the project site, to limit exposure to spawning forage fish; therefore, adverse affects to benthic prey availability are anticipated to be minimal. Additionally, the area impacted by the proposed action that could be used as possible foraging habitat is relatively small compared to the available habitat in the Hood Canal. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and avian foraging habitat in the Hood Canal and nearby vicinity.

3.10.2.2.2.2 Effects on Water Quality

Dissolved Oxygen

During pile removal and replacement activities, suspension of anoxic sediment compounds could result in reduced dissolved oxygen in the water column. However, the high existing dissolved oxygen at the site during the proposed work windows reduces the potential for dissolved oxygen to drop to harmful levels, particularly due to the short duration of the in-water work period.

Turbidity

Some degree of localized reduction in water quality would occur as a result of in-water construction activities. Most of this effect would occur during the installation and removal of piles from the substrate when bottom sediments would be disturbed. Effects to turbidity would be expected to be short-term and minimal. Turbidity would return to normal levels within a short time from completion of the proposed action.

No direct effects to birds are expected from turbidity impacts. Short-term exposure of salmonids and marine fish (prey species for birds) to suspended sediments may occur as the sediment enters the water column. Factors potentially affecting salmonids and marine fish from temporary increases in turbidity could include damage to gill tissue, physiological stress, reduced foraging efficiency, and avoidance behavior.

The minimal and temporary increases in suspended sediments that may result from the proposed project would not likely result in gill tissue damage to fish. Studies investigating similar potential impacts to fish from larger scale sediment dredging operations have shown that increased turbidity levels from these activities were insufficient to cause gill damage in salmonids (Redding et al., 1987; Servizi and Martens, 1987). Suspended sediments in high concentrations (500 to 2,000 mg/L of suspended sediment) have been shown to cause physical stress in salmonids (Redding et al., 1987; Servizi and Martens, 1987). Behavioral responses of salmonids to elevated levels of suspended sediment include feeding disruption and changes in migratory behavior (Martin et al., 1977; Salo et al., 1980; Servizi, 1988). Salmonid foraging behavior can also be impaired by high concentrations of suspended sediment (Bisson and Bilby, 1982; Berg and Northcote, 1985; Redding et al., 1987). Behavioral changes include not rising to the surface to feed, reduction in prey location, and avoidance of areas of increased suspended sediment.

Therefore, while some degree of localized, short-term turbidity would be expected during pile installation and removal activities, unconfined salmonids and other marine fish are likely to avoid areas with elevated suspended sediment concentrations (Salo et al., 1980). As such, they would not be expected to experience physiological or behavioral stress from the proposed action.

3.10.2.3 Summary of Effects

Endangered Species Act Conclusions

Underwater and airborne sound levels from impact and vibratory pile driving have the potential to harass marbled murrelets foraging and resting in the vicinity of the proposed Test Pile Program. Nearshore waters in the vicinity provide foraging habitat and prey species, and marbled murrelets have been observed in the area during the proposed construction window for pile driving. Some construction activities may temporarily affect the presence of this species, such as water quality changes (turbidity) in nearshore habitat and dislocation of prey populations (benthic community and forage fish). The presence of construction workers, barges, cranes, vessels (i.e. tugs, small monitoring boats, etc.), pile equipment, and associated activities would create visual disturbances for marbled murrelets attempting to forage or rest in surrounding waters. Exposure to underwater sounds from pile installation and removal underwater could cause behavioral disturbance, but would not be anticipated to result in injury or mortality.

Several mitigation measures would be employed to minimize noise-related impacts to marbled murrelets. Sound attenuation devices (e.g. Gunderboom SAS™, temporary noise attenuation pile [TNAP], confined and/or unconfined bubble curtain) would be used to reduce initial sound pressure levels from pile driving noise, and slowly ramping up sound levels at the beginning of each pile removal and driving session would discourage marbled murrelets from remaining in the vicinity. Additionally, marbled murrelet monitors would be utilized during all pile installation and removal operations and pile operations would be shutdown if marbled murrelets approach or enter potential injury zones. Based on the above analysis, because pile installation and removal could still result in the exposure of marbled murrelets to sound pressure levels above the behavioral guidance criterion which the Navy felt constituted behavioral harassment the Navy determined that the proposed action may affect, is likely to adversely affect the marbled murrelet.

In accordance with the ESA, the U.S. Navy conducted extensive consultations with the USFWS Washington Office regarding the potential effect of the proposed action on marbled murrelets. The Navy submitted a Biological Assessment to the United States Fish and Wildlife Service (USFWS) Washington Office on August 17, 2010, and formal consultation was initiated on October 14, 2010. The analysis in the BA, and incorporated into this EA, concluded that the proposed action "may affect, likely to adversely affect" the marbled murrelet. The Navy determined the behavioral exposures predicted by the modeling analysis presented above in Table 3.38 would cause behavioral harassment which may affect the marbled murrelet if it is present in the study area during pile driving. Critical habitat for the marbled murrelet has not been designated along the Bangor waterfront at NBK; therefore there would be no impact to critical habitat. A letter of concurrence was received from the USFWS Washington Office on April 19, 2011 and a subsequent letter clarifying the initial letter on May 11, 2011 in which the Service determined that the proposed action "may affect, not likely to adversely affect" the marbled murrelet. The Service concurred that there would be no effect to critical habitat for the marbled murrelet since none occurs in the vicinity of the proposed action.

Of particular note in the USFWS Washington Office's letter of concurrence is that the Service used a newly developed set of criteria to assess injurious effects from underwater noise to the marbled murrelet. Their analysis differed from the analysis conducted by the Navy in several respects, including that their analysis was based on dual criteria of 206 dBpeak re: 1µPa and 183 dB SEL re: 1µPa. Based on the new criteria, the zone of influence for injurious effects was reduced compared to the Navy's analysis, due to the low number of strikes (100 maximum) per day for the Test Pile Program. Overall, however, neither the Navy's nor USFWS's analyses concluded that injurious effects would occur to the marbled murrelet from the proposed action. The criterion and zone of influence for behavioral disturbance was the same in the analysis conducted by the Navy and USFWS. The Navy determined that the instances of exposure to underwater sound predicted in the modeling at the behavioral criterion level constituted harassment. The USFWS Washington Office concluded in their letter of concurrence that "exposure to underwater sound pressure levels that reach or exceed 150 dBrms re: 1µPa may cause behavioral response such as avoidance, interrupted resting or feeding. However, due to the inclusion of the in-water timing restriction during the breeding season to reduce the likelihood of delayed feeding attempts of young, the fact that pile driving is not continuous throughout the day, and that monitoring results show that marbled murrelets continue to forage in situations where they are exposed to sound levels at or above 150 dBrms re: 1µPa, we do not expect any measurable alterations in the normal behavior of marbled murrelet. Thus, effects to marbled murrelets from potential noise-related disturbances are considered insignificant." Therefore, the USFWS Washington Office determined that these exposures did not constitute harassment under the ESA, and that the proposed action would not likely adversely affect the marbled murrelet.

During consultation, the Navy disagreed with the decision by the USFWS Washington Office to change the criteria for assessing injurious effects based on both the timing of the change within the context of the consultation process and with the criterion value and metric that was developed. The Navy formally submitted a White Paper to the USFWS Washington Office on April 11, 2011 indicating the Navy's opposition to the proposed criteria change on the basis that the criteria did not represent the best available science; however, USFWS proceeded over the Navy's objections. The Navy is continuing discussions with the USFWS Washington Office regarding the appropriateness of the criteria for assessing injurious impacts to marbled murrelets and has indicated to the Service that the Navy does not consider the Test Pile Program's letter of concurrence as setting precedence for other future Navy consultations.

National Environmental Policy Act

The analysis presented above indicates that pile driving activities associated with the Navy's proposed Test Pile Program at NBK at Bangor may have impacts to individual birds. However, because few individual of the entire population may be affected, and impacts would be limited to behavioral disturbance, any impacts observed at the population, stock, or species level would be negligible. Therefore, in accordance with NEPA, there would be no significant impact to bird populations (including marbled murrelets) from the Test Pile Program.

Migratory Bird Treaty Act

The proposed action would not diminish the capacity of a population of migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem, and therefore would not have a significant adverse effect on migratory bird populations. The proposed action would have no significant impacts on migratory birds.

3.11 CULTURAL AND TRIBAL RESOURCES

Cultural resources are historic districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. They include archaeological resources, historic architectural/engineering resources, and traditional resources. Cultural resources that are eligible for listing in the National Register of Historic Places (NRHP) are called historic properties and are evaluated for potential adverse impacts from an action. In addition, some cultural resources, such as Native American sacred sites or traditional resources may not be historic properties, but they are also evaluated under NEPA for potential adverse effects from a major federal action. These resources are identified through consultation with appropriate Native American or other interested groups.

3.11.1 Affected Environment

3.11.1.1 Regulatory Overview

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470) requires federal agencies to identify historic properties within the proposed project's area of potential effect, determine potential effects the proposed project may have on identified historic properties, and consult with the State Historic Preservation Officer (SHPO) on determinations of eligibility and findings of effects. If the proposed project adversely affects an identified historic property, further consultation with the SHPO is required to avoid or minimize the adverse effect. To be considered eligible for inclusion in the NRHP, cultural resources must be determined to be significant by meeting one or more of the criteria outlined in 36 CFR 60.4 (NRHP, Criteria for Evaluation). A historic property must also possess integrity of location, design, setting, materials, workmanship, feeling, or association. A property must be 50 years old or older to be considered for eligibility to the NRHP or must have achieved exceptional importance within the last 50 years. For example, more recent historic resources on a military installation may be considered significant if they are of exceptional importance in understanding the Cold War.

Tribal Treaty Rights and Trust Responsibilities

Treaties with American Indian tribes are considered government to government agreements, similar to international treaties, and preempt state laws. Treaty language securing fishing and hunting rights is not a "grant of rights (from the federal government to the Indians), but a grant of rights from them – a reservation of those not granted" (United States v. Winans 1905). This means that the tribes retain rights not specifically surrendered to the United States. Furthermore, the United States has a trust or special relationship with American Indian tribes. Secretarial Order 3206, American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, states the following:

"The unique and distinctive political relationship between the United States and the Indian Tribes is defined by statutes, Eos, judicial decisions, and agreements, and differentiates tribes from other entities that deal with, or are affected by, the federal government."

This unique relationship provides the basis for legislation, treaties, and Eos that grant unique rights or privileges to American Indians (Morton v. Mancari, 1974). The trust responsibility has been interpreted to require federal agencies to carry out their activities in a manner that is protective of American Indian treaty rights. EO 13175 (Consultation and Coordination with Indian Tribal Governments) affirms the trust responsibility of the United States and directs agencies to consult with American Indian tribes and respect tribal sovereignty when taking actions affecting such rights. This policy is also reflected in the March 30, 1995 document, Department of Commerce – American Indian and Alaska Native Policy (United States Department of Commerce, 1995). Also, on 21 November 1999, the DoD promulgated its Native American and Alaska Native Policy emphasizing the importance of respecting and consulting with tribal governments on a government-to-government basis. The Policy requires an assessment, through consultation, of the effects of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Native American lands before decisions are made by the services.

In 1855, Territorial Governor Isaac Stevens negotiated treaties with 24 of the 29 modern-day federally-recognized tribes located in Washington State. The treaties known as the "Stevens Treaties" included language pronouncing that "[T}he right of taking fish at U&A grounds and stations is further secured to said Indians in common with all citizens of the Territory. . .together with the privilege of hunting and gathering roots and berries on open and unclaimed lands." Subsequent legal decisions (the Boldt decisions) have identified U&A areas and afforded tribes the right to fifty percent of all fish and shellfish present or passing through the tribe's historical U&A areas, including off-reservation areas. The Skokomish, Lower Elwha Klallam, Port Gamble S'Klallam, Jamestown S'Klallam and Suquamish have adjudicated U&A in the Hood Canal which includes the project area.

COMNAVREG NW Instruction 11010.14 sets forth policy, procedures and responsibilities for the Commander, Navy Region Northwest consultations with federally recognized American Indian and Alaska Native tribes. The goal of the policy is to establish permanent working relationships built upon respect, trust and openness with tribal governments.

U.S. NAVY INSTRUCTIONS

Secretary of the Navy Instruction (SECNAVINST) 5090.8a, Policy for Environmental Protection, Natural Resources and Cultural Resources Programs, requires the Navy to incorporate the impacts from its undertakings to cultural resources into its planning and program efforts. SECNAVINST 4000.35a, Department of the Navy Cultural Resources Program, establishes policy and assigns responsibilities within the Department of the Navy for fulfilling the requirements of cultural resources laws such as the NHPA.

3.11.1.2 NRHP Properties

Although NBK at Bangor has no properties listed in the NRHP, there are NRHP-eligible properties within the installation boundaries. The Navy has conducted archaeological and architectural surveys and inventories at NBK at Bangor in 1992, 2009, and 2010 (Lewarch et al., 1993; Grant et al., 2010; Hardlines, 2010). The Navy has determined NRHP eligibility of the recorded sites. The SHPO has concurred with some of the recorded sites and the Navy will seek SHPO concurrence with the remaining determinations. A 2010 survey of the area directly south of the project area located a historic berm that is not NRHP eligible (Sackett, 2010). The 2010 survey also documented Delta Pier, Marginal Wharf, and the existing EHW along the Bangor waterfront at NBK. Delta Pier (approximately one mile south of the project area) and EHW-1 are considered eligible based on their Cold War context and Marginal Wharf (approximately 0.3 miles south of the project area) is not (Sackett, 2010). In addition, any resource that might be encountered during future investigations would be treated as eligible for the NRHP until such time as it could be evaluated for NRHP eligibility. Consultation with the Washington SHPO has occurred and the SHPO concurred with the Navy's finding of 'no historic properties affected" (Appendix D).

3.11.1.3 Archaeological Resources

Three archaeological sites associated with the activities of indigenous populations are located in the vicinity of the Bangor waterfront at NBK. American Indian site 45KP108 is a shell midden (locations where shells and other food debris have accumulated over time, often representing locations of past aboriginal use); this shell midden is located south of Delta Pier and is considered to be eligible for the NRHP (Lewarch et al., 1997). Sites 45KP106 and 45KP107 are also shell middens and are located just to the north of Floral Point; neither is eligible for listing on the NRHP (Lewarch et al., 1997).

A number of archaeological sites primarily associated with logging and subsistence farming activities occur in the area of NBK at Bangor. These sites include collapsed historic structures, historic land use complexes, orchard complexes, scattered fruit trees and ornamental plants, debris scatters, a marked historic grave listing (Lewarch et al., 1993) and a small collapsing cabin with wire fence and low density historic debris scatter (45KP211) (Grant et al., 2010). Historic Navy activity is also represented by two sites: Site 45KP209 is a section of World War II-era railroad and emergency derail run-out totaling 1,230 feet; and Site 45KP212 is a multi-component site consisting of two cobble tools, a damaged residential concrete foundation remaining from when the house was barged away after the Navy condemned the property, debris and ornamental plants associated with the former residence, concrete foundation fragment and associated piers of unknown origin, a pedestrian footbridge, and a bulkhead/pier associated with a former picnic area (Grant et al., 2010).

A survey performed in 2010 of the proposed Test Pile Program location and the proposed EHW-2 location identified no prehistoric or ethno historic cultural materials or sites. This survey covered all of the areas above the water line, including the beach (Sackett, 2010). An in-water survey did not occur as part of this study; however, the National Oceanic and Atmospheric Administration (NOAA) charts were examined. A historic berm was recorded south of EHW-1; it is not considered to be eligible for the NRHP (Sackett, 2010).

3.11.1.4 Architectural Resources

Three eras of architectural resources are located at NBK at Bangor. The first set of resources includes the period of logging and subsistence farming that preceded Navy ownership of the study area in 1942. These resources include cabins, concrete structures, and a well house that were recorded during the 1992 archaeological survey (Lewarch et al., 1993). Those resources that are not intact buildings or structures and are treated as historic archaeological sites rather than as architecture; none are considered eligible for listing in the NRHP.

The second and third sets of architectural resources relate to the Navy's use of the installation during World War II and the Cold War eras. They include: Administration Area Buildings 1, 3, and 4; the Industrial Area District; and the original Marginal Wharf. Of these, the original Commanding Officer's and Senior Assistants' Quarters are NRHP eligible (Kalina, 2007, personal communication). Marginal Wharf, Delta Pier, and EHW-1 are within the vicinity of the Bangor waterfront at NBK. Marginal Wharf was built in 1944 and later was used to load munitions bound for the Vietnam conflict. It is not considered eligible for the NRHP (Sackett, 2010). Delta Pier and EHW-1 had prominent roles during the Cold War, providing support for the Trident Nuclear Submarine fleet; both are considered eligible for the NRHP based on their Cold War association (Sackett, 2010).

3.11.1.5 Traditional Resources

In the cooperative agreement of 1997, signed between the Navy and the Point No Point Treaty Council (Skokomish, Port Gamble S'Klallam, Lower Elwha Klallam, and the Jamestown S'Klallam Tribes), the Navy permitted tribal access to the intertidal beach south of Delta Pier (approximately 1.1 miles south of the project area) for the "enhancement, perpetuation, and harvest of shellfish" (DoN, 1997). Prior to increased waterfront security measures at NBK at Bangor, five beaches were designated for shellfish harvesting. Four of these beaches were used for recreational shellfish harvesting by NBK at Bangor residents, and the fifth was used for tribal shellfish harvesting. Currently, all beaches are closed to residents. Due to national security needs, tribal access is restricted to the beach south of Delta Pier. The tribes manage the shellfish harvest location and access this location when they desire, however the tribes typically use this area three to four times a year. Additionally, the tribes collect cedar bark on the base some years during the spring when the dogwood trees are in bloom. These areas are located throughout the base where cedar trees are located. The Navy has actively continued its consultation with the Point No Point Treaty tribes and other groups (the Lower Elwha Klallam, Jamestown S'Klallam, Port Gamble S'Klallam, Skokomish, and Suquamish Tribes) regarding current and anticipated Navy activities at NBK at Bangor.

3.11.1.6 Submerged Cultural Resources

The NHPA also applies to submerged or marine resources, and the Navy is responsible for identifying cultural resources and impacts on those resources within its jurisdiction. Consultation procedures parallel the NHPA Section 106 procedures with added emphasis on the protection of submerged resources through avoidance.

NOAA nautical charts show no submerged ships or shipwrecks in the vicinity of NBK at Bangor (NOAA, 2007). Because of the extent of modern marine activity and its nature, it is unlikely that unrecorded submerged historic resources exist along the shoreline of NBK at Bangor. No historic properties or anomalies have been encountered by diver, remotely operated vehicle, or remote sensing surveys in the vicinity of EHW-1.

3.11.2 Environmental Consequences

3.11.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not be conducted. Baseline conditions, as described above, for cultural resources and tribal fisheries/access would remain unchanged. Therefore, there would be no significant impacts to cultural resources and tribal fisheries/access from implementation of the No Action Alternative.

3.11.2.2 Proposed Action

In accordance with Department of the Navy policy and policy issued by Commander, Navy Region Northwest invited the tribes with U&A to enter into government-to-government consultation in regard to the proposed action. In the spring of 2009, Naval Base Kitsap invited five tribes to initiate government-to-government for the proposed construction of EHW-2. The tribes also receive invitations to comment on the scope of the Environmental Impact Statement being developed for the construction and operation of the proposed wharf. The Suquamish was the only tribe to provide comments.

On June 18, 2010, the Commanding Officer of Naval Base Kitsap held a government-to-government meeting with the Chairman of the Suquamish Tribe and presented the known details of the alternatives being outlined in the EIS. The details of the proposed Test Pile Program were also presented. The Suquamish indicated they had no objection to the proposed Test Pile Program. On July 29, 2010 the Commanding Officer of Naval Base Kitsap participated in a similar government-to-government meeting with the Chairman of the Skokomish Tribe. The Skokomish Tribe did not express any concern over the proposed Test Pile Program. A government-to-government meeting occurred on August 31, 2010 with the Jamestown S'Klallam and Port Gamble S'Klallam Tribes, Lower Elwha Klallam Tribe and the Point-No-Point Treaty Council. No adverse comments on the Test Pile Program were presented as a result of this meeting (Appendix C).

The EHW-1 and Delta Pier are considered to be eligible for the NRHP due to their cold war era significance; Marginal Wharf is considered to be not eligible. These structures are eligible within the Cold War context. Delta Pier and Marginal Wharf would not be impacted by this alternative. The Test Pile Program would have no adverse effect as a result of the proposed action. No submerged archaeological sites are expected, since most historical activity was associated with resource harvesting, such as logging that occurred primarily along the shoreline and upland areas.

On June 28, 2010 the Washington SHPO concurred with the Navy's finding of no historic properties affected, see Appendix D.

3.12 ENVIRONMENTAL HEALTH AND SAFETY

3.12.1 Affected Environment

The NBK at Bangor waterfront is restricted from public access. Figure 1-3 indicates the restricted areas associated with the base. As a result, recreation and commercial fishing and other public activities, with the exception of tribal access, are restricted from the NBK at Bangor waterfront. Navy property allowing tribal shellfish harvesting are approximately one mile south of the site and only used intermittently. In addition to shellfish harvesting, the tribes collect cedar bark throughout the base some years during the spring when the dogwood trees are in bloom. Tribal consultations are discussed in section 3.11 and Appendix C. The nearest off-base residence consists of a small rural population approximately 1.5 north of the proposed project location, the closest on-base residence is 3.75 miles from the proposed project area, and the closest community west of the base across Hood Canal is over 4 miles away. The portion of Hood Canal adjacent to the proposed project site averages 1.5 miles in width and is bordered on the west by a 768-acre Navy-owned buffer strip on the Toandos Peninsula. This military buffer zone is restricted to the public and there is no recreational access. Areas surrounding the buffer area have rural and commercial forest land use designations by Jefferson County. As a result, the proposed Test Pile Program would not occur in the direct vicinity of a populous area.

3.12.2 Environmental Consequences

3.12.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not be conducted. Baseline conditions would remain unchanged. Therefore, there would be no significant impacts to environmental health and safety from implementation of the No Action Alternative.

3.12.2.2 Proposed Action

The proposed action would result in the operation of two barges (one medium sized and one large), one tug boat and pile driving and removal equipment along the Bangor waterfront at NBK between July 16 and October 31, 2011. Work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September 16 through October 31, 2011. The proposed action would not be expected to result in any impacts related to public environmental health and safety. Activities would not be likely to release hazardous materials to the environment. Noise associated with the impact hammer is expected to attenuate to less than 60 dBA at 1.5 miles (2,414 m). Noise associated with the vibratory hammer is expected to attenuate to 60 dBA at 0.53 miles (860 m). However, these noise levels do not account for sound attenuation by trees and other environmental factors. Residences on the west side of Hood Canal are approximately 4 miles from the project area, resulting in lower levels of sound from the proposed action. As a result, the nearest residence would be within the permissible noise levels per the Washington noise regulations (WAC 173-60-040). The base is a Class C noise receiving zone, so noise reaching offices and commands on base will not violate WAC 173-60-040. Equipment operators, data collectors, and other workers would follow all OSHA regulations in regards to personal protection equipment (ear plugs, life vests, steel-toe boots, etc.). Recreational activities such as boating, scuba diving, kayaking, and fishing on Hood Canal can occur adjacent to the base. As a result, recreational users could be exposed to noise levels exceeding permissible residential exposure levels as they could be closer to the construction than land based receptors. The adverse noise impact would be experienced by greater numbers of recreational users during the summer months when recreational uses are likely to increase. However, the floating security barrier would prevent recreational users from getting close enough to the pile driver to receive injurious noise levels.

A floating security barrier prevents recreational and commercial boater access to the waterfront area of the base. Boaters are allowed to pass by the security fencing but must be outside the restricted area. Since no public recreational uses occur within the project area, the proposed action would have no direct impact to recreational uses or access in the surrounding community. In order to maintain adequate levels of safety for vessel navigation during in-water construction activities, a Notice to Mariners would be issued to minimize navigational hazards outside the existing floating security fence. Therefore, there would be no significant impacts to environmental health and safety from implementation of the proposed action.

3.13 SOCIOECONOMICS

Socioeconomics is defined as the basic attributes and resources associated with the human environment, generally including factors associated with regional demographics and economic activity. This section also describes issues of environmental justice (minority and low income populations) and the protection of children. The area described includes Kitsap County with emphasis on NBK at Bangor and the cities of Bremerton and Poulsbo as well as the unincorporated community of Silverdale, as appropriate.

3.13.1 Affected Environment

3.13.1.1 Regulatory Overview

Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was signed into law on February 11, 1994. This EO requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental impacts of its programs, policies, and activities on minority and low-income populations including Native American populations. USEPA and CEQ emphasize the importance of incorporating environmental justice review in the analyses conducted by federal agencies under NEPA and of developing protective measures that avoid disproportionate environmental impacts on minority and low-income populations.

Protection of Children

The President issued EO 13045, *Environmental Health Risks and Safety Risk to Children,* on April 21, 1997. This order requires each federal agency to "…make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and shall...ensure that its policies, programs, activities, and standards address disproportionate risks to children…." This order was issued because a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks.

Navy Supplemental Environmental Planning Policy

EO 12898 and EO 13045 require each federal agency to identify and address impacts of their programs, policies, and activities. The Navy implemented E.O. 12898 and E.O. 13045 through the Chief of Naval Operations Supplemental Environmental Planning Policy signed on September 23, 2004 which is incorporated in to the OPNAVINST 5090.1C, the current policy. This policy provides instructions for naval personnel to identify and assess stressors to, and disproportionately high and adverse impacts upon, minorities, low-income populations, and children. A component of this policy institutes processes that result in consistent and efficient consideration of environmental impacts on Navy decision-making.

3.13.1 Demographics and Employment

NBK at Bangor is located near Silverdale, Washington, on the Kitsap Peninsula. The base is located 13 miles (21 km) northwest of Bremerton, also in Kitsap County. At the 2000 census, Kitsap County had a total population of 231,969 and the estimated 2009 population totaled 240,862. The demographic characteristics of the area are provided in Table 3.39.

Kitsap County is approximately 84 percent Caucasian with the remainder of the population (minority populations) consisting of 3 percent African American; 4 percent Hispanic origin; 6 percent Asian and Pacific Islander; 2 percent American Indian (the Skokomish, Lower Elwha

Klallam, Port Gamble S'Klallam, Jamestown S'Klallam and Suquamish) or Alaskan Native; and 1 percent other. The median family income in Kitsap County is $53,878 and approximately 15 percent of the families are low income (USCB, 2000a). The incidence of poverty in the affected region is below state levels with the exception of Bremerton, which has a poverty rate of 17.9 percent 7 percent higher than the state and 9 percent higher than the county. Individuals living below the poverty level account for 4.7 percent of the population in Silverdale, 8.9 percent in Poulsbo, and 8.4 percent in Kitsap County.

TABLE 3.39 DEMOGRAPHIC CHARACTERISTICS

Location	2000 Population	Estimated 2009 Population	Percent Minority (2009)	Percent Low Income (2009)	Percent Youth (2009)
City of Bremerton	37,259	34,974	29.4	19.4	22.7
City of Poulsbo	6,813	7,955	20.7	6.2	23.1
Silverdale CDP[1]	15,816	15,192	30.6	5.5	22.8
Kitsap County	231,969	240,862	20.5	8.9	23.6
State of Washington	5,894,121	6,465,755	29.1	11.8	23.9

Sources: U.S. Census Bureau, 2000 a-e; 2010 b-f.

[1] The unincorporated community of Silverdale is a Census Designated Place (CDP). A CDP is defined as a statistical entity comprising a dense concentration of population that is not within an incorporated place but is locally identified by a name.

The federal government is the largest employer in Kitsap County. The base employs 11,500 military personnel and 14,900 DoD civilians. The number of military personnel and DoD civilians associated with NBK at Bangor comprises approximately 10.9 percent of Kitsap County's population. Up to 15,000 retired military personnel and DoD civilians from the U.S. Navy, Coast Guard, and Marine Corps in Kitsap County are supported by NBK at Bangor and the surrounding military installations. Approximately 9,900 of the total number of retirees are military retirees once assigned to NBK at Bangor or Bremerton.

Approximately 25 percent of the active duty military population resides on the base. Housing for NBK at Bangor is privatized with the exception of the Jackson Park community on NBK at Bangor, which remains as government-owned military family housing. The current military family housing inventory at NBK at Bangor includes 1,279 units. Unaccompanied bachelor housing at NBK at Bangor includes 952 permanent rooms and 113 transient rooms. In addition to military housing, NBK at Bangor also provides recreational facilities, retail, and service enterprises for base personnel and their dependents. The surrounding communities (Silverdale, Bremerton and Poulsbo) provide additional services for the base population, including off-base housing, schools, and other public services.

There are no residences in the immediate vicinity of the project area. The nearest off-base residence is approximately 1.5 miles north of the proposed project location, the closest community west of the base across Hood Canal is approximately 4 miles away in the vicinity of Thorndyke Bay, and the closest on-base residence is 3.75 miles from EHW-1. For the most part, shoreline areas south of the base are developed with single-family homes while upland areas are a mix of single-family homes, hobby farms, and occasional commercial areas along major arterials.

NBK at Bangor does not have any primary or secondary schools. The educational needs of the military dependents associated with NBK at Bangor and the region's youth are serviced by Central Kitsap School District (CKSD) #401 in Silverdale. Approximately 12,642 students are enrolled in the Silverdale district from elementary through high school (CKSD, 2010). Military family dependents comprise 26 percent of the district's students, and a total of 50 percent of the student body are in families economically tied to the military sector in Kitsap County.

Employment characteristics for the region are presented in Table 3.40. The civilian labor force in Kitsap County included 114,233 persons in 2009, of which an estimated 103,123 were employed. The unemployment rate was 9.7 percent. Median household income was $60,882, and persons below the poverty level represented 7.4 percent of the population (USCB, 2010a). The military accounted for 9.4 percent of total employment in Kitsap County overall, as compared to military employment in the state of Washington accounting for 2.0 percent of total employment (U.S. Bureau of Economic Analysis, 2010).

TABLE 3.40 ESTIMATED 2009 EMPLOYMENT CHARACTERISTICS

Location	Civilian Labor Force	Employment	Unemployment Rate
City of Bremerton	16,439	14,417	12.3
City of Poulsbo	3,633	3,339	8.1
Silverdale CDP[1]	7,388	6,890	6.7
Kitsap County	114233	103,123	9.7
State of Washington	3,438,309	3,110,355	9.5

Sources: U.S. Census Bureau, 2010 g-l.

Government and government enterprises comprise the largest employment sector in the region, accounting for one-third of all jobs in Kitsap County, as depicted in Table 3.41. In terms of private employment, primary industries in Kitsap County are business services, retail trade, and health care. The military, specifically the Navy, has the largest economic impact on Kitsap County. It is estimated that the direct impact of military bases in Kitsap County includes 27,375 jobs (uniformed and civilian) and $1.1 billion in annual payroll. Furthermore, much of the private industry in the county is related to military activities, including defense-related suppliers and contractors. The military presence in Kitsap County is estimated to support 46,935 total jobs, representing 48 percent of all jobs in the county, and providing $1.8 billion in annual wages (Washington Office of Financial Management, 2004).

3.13.2 Environmental Consequences

3.13.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not be conducted. Baseline conditions, as described above, for demographics, the local community, environmental justice and the protection of children would remain unchanged. Therefore, there would be no significant impacts to socioeconomics from implementation of the No Action Alternative. The

No Action Alternative would not result in a finding of any disproportional impacts to minorities, low income populations, or children.

TABLE 3.41 2008 EMPLOYMENT BY INDUSTRY IN KITSAP COUNTY AND WASHINGTON STATE

Industry	Kitsap County		Washington State	
	Number	Percent of Total	Number	Percent of Total
Total	130,123	100.0	4,012,270	100.0
Private				
Farm Employment	677	0.5	82,497	2.1
Forestry, Fishing, and related activities	476	0.4	37,620	0.9
Mining	189	0.1	7,268	0.2
Utilities	201	0.2	5,522	0.1
Construction	8,270	6.4	273,800	6.8
Manufacturing	2,024	1.6	310,930	7.7
Wholesale Trade	1,958	1.5	142,203	3.5
Retail Trade	15,561	12.0	411,559	10.3
Transportation and Warehousing	1,518	1.2	118,716	3.0
Information	1,869	4.1	117,365	2.9
Finance and Insurance	3,838	2.9	160,894	4.0
Real Estate and Rental and Leasing	6,598	5.1	200,240	5.0
Professional and Technical Services	8,415	6.5	283,704	7.1
Management of Companies and Enterprises	205	0.2	36,063	0.9
Administrative and Waste Services	5,447	4.2201,742	5.0	
Educational Services	1,860	1.4	37,343	1.7
Health Care and Social Assistance	13,110	10.1	378,094	9.4
Arts, Entertainment and Recreation	3,198	2.5	93,353	2.3
Accommodation and Food Services	7,467	5.7	254,791	6.4
Government				
Government and Government Enterprises	40,577	31.2	626,015	15.6
Federal, Civilian	14,960	11.5	70,078	1.7
Military	12,198	9.4	81,107	2.0
State and Local	13,419	10.3	474,830	11.8

Source: U.S. Bureau of Economic Analysis, 2010.

3.13.2.1 Proposed Action

The socioeconomic impacts related to construction employment would occur only for the duration of the Test Pile Program. The proposed action would generate very few temporary jobs (approximately 30) and would contribute minimally to local earnings spending. This is because construction employment associated with this project would likely be accommodated by labor resources already in the region (Table 3.41). The additional population would not create undue demand on housing, schools, or other social services. As such, no permanent or long lasting socioeconomic impacts are anticipated as a result of the construction associated with the proposed Test Pile Program. Therefore, the proposed action would not result in a significant impact to socioeconomics.

As discussed in Section 3.11, tribal access is restricted to the beaches south of Delta Pier (approximately 1.1 miles south of the project area), due to national security, and would not be altered due to the proposed action. Cedar bark collection would not be impacted from the proposed action as it occurs in terrestrial areas (located on base where cedar trees are found) and the proposed action will only affect in-water activities associated with the Test Pile Program, there is no terrestrial component to the proposed action. Shellfish in the designated beaches would not be adversely impacted by the proposed action. The shellfish beds are managed by the tribes and there is no restriction on use of these beds, however the tribe's usually only harvest shellfish three to four times a year. As a result, the proposed action would not have an impact on tribal resources or the ability of tribes to collect and potentially sell those resources.

Environmental justice concerns related to construction activity typically include: exposure to noise, safety hazards, pollutants, and other hazardous materials. Although low and minority populations are present in the surrounding areas (see Table 3.39), none reside near the project area and, thus, would not be subject to any disproportionate impacts. There would be no disproportionately high and adverse environmental, human health, and socioeconomic affects upon Minority and Low-Income populations, Indian Tribes or children.

3.14 COASTAL ZONE MANAGEMENT ACT

3.14.1 Affected Environment

3.14.1.1 Regulatory Overview

Coastal Zone Management Act

Congress passed the federal Coastal Zone Management Act (CZMA) in 1972 to encourage the appropriate development and protection of the nation's coastal and shoreline resources (16 USC 33:1451-1465). The CZMA gives states the primary role in managing these areas. To assume this role, each state develops a Coastal Zone Management Plan (CZMP) that describes the state's coastal resources and how these resources are to be managed. Washington was the first state to receive federal approval of its CZMP in 1976, which was most recently revised in 2001 (WDOE, 2001). WDOE's Shorelands and Environmental Assistance Program is the entity responsible for implementing Washington's program.

The CZMA applies to land within the coastal zone, which includes Hood Canal (WDOE, 2001). However, the CZMA excludes "…lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government, its officers or agents" (16 USC 1453 definition of coastal zone). The consistency determination for these federal properties is then conducted to determine if project-related impacts on the neighboring properties would be consistent under CZMA regulations.

Washington Coastal Zone Management Program

Washington's CZMP defines Washington State's coastal zone to include the following 15 counties with marine shorelines: Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, Wahkiakum and Whatcom. The CZMP applies to activities that may impact Washington's coastal resources within the 15 counties, as well as activities outside these counties. Most, but not all, activities and development outside the coastal zone are presumed to not impact coastal resources

Washington's CZMP is described in WDOE (2001) and is titled Managing Washington's Coast — Washington State's Coastal Zone Management Program. Within this program, Hood Canal is identified as a Specially Designated Area and an Area of Concern (these are areas of unique, scarce, fragile, or vulnerable natural habitat; have historic, cultural, or scenic value; are areas of high productivity; or are areas needed to protect and maintain coastal resources).

Shoreline Management Act

Washington's Shoreline Management Act (SMA) (RCW 90.58) was adopted in 1972 and was established to provide broad policy giving preferences to uses that protect the quality of water and the natural environment, depend on proximity to the shoreline, and preserve and enhance public access or increase recreational opportunities for the public along shorelines. The SMA applies to marine waters; streams with a mean annual flow greater than 20 cubic feet per second; water areas of the state larger than 20 acres; upland areas called shorelines 200 feet landward from the edge of these waters; and the following areas when they are associated with one of the above: biological wetlands and river deltas, and some or all of the 100-year floodplain including wetlands within the floodplain.

Under the SMA, each city and county adopts a shoreline master program based on state guidelines but tailored to the specific needs of the city or county. Kitsap County has developed a Shoreline Management Master Program under Title 22 of the Kitsap County Code. To obtain federal consistency with the CZMA, activities at NBK at Bangor that impact neighboring properties within Washington's CZMP would need to be consistent with the SMA and Kitsap County Shoreline Management Master Program. The SMA also identifies shorelines of statewide significance, which include Hood Canal.

Kitsap County Shoreline Management Master Program

The Kitsap County Code under the Shoreline Management Master Program considers Hood Canal a Shoreline of Statewide Significance and has established three policies with respect to preservation of natural resources in Hood Canal. These policies include: (1) assessing the potential for adverse impacts on water quality, sediment quality, shellfish, finfish, wildlife, boating, recreational and commercial fishing, public access, scenic vistas, and wetlands; (2) prohibiting development within the shorelines of Hood Canal that would degrade these resources; and (3) encouraging development that would improve these resources.

The project area is located within Kitsap County; however, the local government does not have any jurisdictional authority in the project area because it is a federal military facility. The Kitsap County Shoreline Management Master Program applies to lands outside of federal or state ownership. For these lands, the program has five designations: urban, semi-rural, rural, conservancy, and natural.

Energy Facility Site Evaluation Council and Ocean Resources Management Act

These laws are not applicable to the proposed action. The Energy Facility Site Evaluation Council applies to permitting of new power generation facilities. The Ocean Resources Management Act (43.143 RCW) applies to management of oil and gas development off the coast of Washington.

3.14.1.2 Existing Environment

Waters in Washington are considered a natural resource owned and managed by Washington State. Bedlands (tidelands, shorelands, and/or submerged lands) may also be owned by the state, a federal entity, or private individuals. The Navy has agreements for rights to bedlands along the Bangor waterfront at NBK, extending to the extreme low tide line. The bedlands beyond the extreme low tide line are state lands under the jurisdiction of the Washington Department of Natural Resources.

3.14.2 Environmental Consequences

3.14.2.1 No Action Alternative

Under the No Action Alternative, the Test Pile Program would not be conducted. Baseline conditions, as described above, for coastal zone management would remain unchanged. Therefore, there would be no significant impacts to coastal zone management from implementation of the No Action Alternative.

3.14.2.2 Proposed Action

On December 16, 2010 Washington Department of Ecology concurred with the Navy's assessment that the proposed Test Pile Program is consistent Washington's CZMP (see Appendix A). Access to NBK at Bangor, including the project site, is controlled by the Navy and is restricted to authorized military personnel, civilians, contractors, and local tribes. Tribal access is restricted to the beach south of Delta Pier for shellfish harvesting. Since no public recreational uses occur at the proposed Test Pile Program project site, the proposed action would have no direct impact to recreational uses or access in the surrounding community. If implemented, the Test Pile Program would occur along the waterfront and would occur within public views from individuals traveling on vessels in waters adjacent to the restricted areas; however, these activities would be visually compatible with existing military waterfront activities. The Navy would implement mitigation measures to ensure impacts to fish, mammals and birds were reduced to the maximum extent feasible (Chapter 4). The discussion on water quality impacts (see Section 3.3) provides details regarding the proposed action's federal consistency with the CWA.

3.15 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Table 3.42 summarizes the conclusions for each resource area analyzed in this EA. The table includes summaries for both the proposed action and the No Action Alternative.

TABLE 3.42 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE

Resource	Proposed Action	No-Action Alternative
Bathymetry	The Test Pile Program is short-term in duration and any impacts to bathymetry would be inconsequential. The proposed action would not result in significant impacts to bathymetry.	There would be no change in existing conditions and no impacts to bathymetry.
Geology and Sediments	No impact on subsurface slope stability is expected nor is the proposed action likely to cause chemical constituents to violate Sediment Quality Standards. No significant impacts to geology and sediments.	There would be no change in existing conditions and no impacts to geology and sediments.
Water Resources	No impact to temperature or salinity in the project area. Dissolved oxygen (DO) concentrations would not decrease as a result of pile installation and removal. Pile driving would not result in long term impacts to turbidity. The proposed action would not violate Water Quality Standards. The proposed action would not result in significant impacts to water resources.	There would be no change in existing conditions and no impacts to water resources.
Air Quality	Washington state is in attainment for all criteria pollutants (CO, NO_x, SO_x, O_3 and particulate matter [PM_{10} and $PM_{2.5}$]). The proposed action would not exceed Puget Sound Clean Air Agency thresholds or greenhouse gas reporting thresholds. The Test Pile Program would not result in significant impacts to air quality and would not require a permit.	There would be no change in existing conditions and no impacts to air quality.
Airborne Noise	The proposed action would occur over 40 work days between July 16 and October 14, 2011 for impact pile driving and until October 31, 2011 for vibratory pile driving and other in-water work. Work would occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 and during all daylight hours from September 16 through October 31, 2011. The closest off-base residences are approximately 1.5 miles north of the study area, the closest community west of the base across Hood Canal is approximately 4 miles away, and the closest on-base residence is 3.75 miles from EHW-1. The portion of Hood Canal adjacent to EHW-1 averages 1.5 in. width and is bordered on the west by a 768-acre Navy-owned buffer strip on the Toandos Peninsula. This military buffer zone is restricted to the public and there is no recreational access.	There would be no change in existing conditions and no impacts to airborne noise.

TABLE 3.42 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Airborne Noise (Continued)	Areas surrounding the buffer area have rural and commercial forest land use designations by Jefferson County. The noise associated with the proposed action would reduce to 60 dB during construction which is consistent with the Washington Noise Regulations under the Washington Administrative Code. Recreation and tribal access would not be adversely impacted as a result of construction. No adverse impacts to sensitive receptors would occur. No significant impacts to airborne noise.	
Marine Vegetation	No long term impacts to marine vegetations (green algae, red algae, kelp and eelgrass). Indirect impacts to marine vegetation could occur but these impacts would be temporary (only during pile installation and removal) and marine vegetation would be expected to recover. The Test Pile Program would not result in long term or significant impacts to marine vegetation including brown algae, red algae, green algae, eelgrass, and non-floating kelp..	There would be no change in existing conditions and no impacts to marine vegetation.
Benthic Invertebrates	A temporary loss of benthic habitat and direct mortality of less motile species could occur; however, benthic invertebrates would likely recover from the impacts of pile driving. The Test Pile Program would not result in significant impacts to benthic invertebrates.	There would be no change in existing conditions and no impacts to benthic invertebrates.
Fish	No affect to the North American Green Sturgeon and the Pacific eulachon would occur. Forage fish species occurring along Hood Canal in the vicinity of the proposed action may be affected but are not likely to be adversely affected by the proposed action when the mitigation measures described in Chapter 4 of this EA are utilized. The proposed action is determined to have a may affect, not likely to adversely affect for the federally threatened bull trout. The proposed action is determined to have a may affect, likely to adversely affect for the federally threatened Pacific Sound Chinook salmon, the federally threatened Hood Canal Summer-run chum, the federally threatened Puget Sound Steelhead, the federally threatened yellow eye rockfish, the federally threatened canary rockfish, and the federally endangered bocaccio rockfish.	There would be no change in existing conditions and no impacts to fish.

TABLE 3.42 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Fish (continued)	The proposed action would adversely affect essential fish habitat. Under NEPA, the proposed action will not result in significant impacts to fish. A Biological Assessment was submitted to the NMFS Northwest Regional Office on August 17, 2010. A Biological Opinion was received on April 28, 2011.	
Marine Mammals	The EA analyzes the effects of the proposed action to the threatened Steller sea lions, the endangered SRKW, and several non-ESA listed species of marine mammals. No marine mammals would be exposed to sound levels resulting in injury or mortality during pile driving activities. The proposed action would result in behavioral disturbance to several species of marine mammals due to underwater noise from pile operations. However, due to the lack of presence of the Steller sea lion and the SRKW within the action area during the months of the proposed Test Pile Program, no behavioral harassment is expected to either species. The proposed action would result in negligible impacts to the population, stock or species level. The proposed action would not result in significant impacts to marine mammals. Chapter 4 details the mitigation measures set in place to lessen the impacts to mammals. A Biological Assessment was submitted to the NMFS Northwest Regional Office on August 17, 2010. The Navy concluded that the proposed action may affect, but would not likely adversely affect the Steller sea lion and SRKW. Consultations with the NMFS Northwest Regional Office was initiated on January 26, 2011 for the Steller sea lion and the SRKW and a Biological Opinion was received on April 28, 2011 which concurred with these determinations. An IHA application was submitted on November 2, 2010 to the NMFS Headquarters to comply with the MMPA as a result of the anticipated behavioral harassment of marine mammals associated with the proposed action. The IHA will be received in June 2011. Construction will not proceed until receipt of this permit.	There would be no change in existing conditions and no impacts to marine mammals.

TABLE 3.42 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Birds	The EA analyzes the effects of the proposed action on the threatened marbled murrelet and several non-ESA listed bird species including migratory birds and birds of special status. The proposed action is not anticipated to have an adverse impact on migratory birds or special status birds. The Navy determined the proposed action is determined to have a may affect, likely to adversely affect finding for the marbled murrelet. Critical habitat for the marbled murrelet has not been designated along the Bangor waterfront at NBK; therefore, there would be no impact to critical habitat. Chapter 4 details the mitigation measures set in place to lessen the impacts to the marbled murrelet and other birds, generally. The Navy submitted a Biological Assessment to the USFWS Washington Office on August 17, 2010. Formal consultation was initiated on October 14, 2010 and extensive consultations were conducted between the U.S. Navy and the USFWS Washington Office regarding the potential effect of the proposed action on marbled murrelets. A letter of concurrence was received from the USFWS Washington Office on April 19, 2011 and a subsequent letter clarifying the initial letter on May 11, 2011 in which the Service determined that the proposed action may affect, not likely to adversely affect the marbled murrelet. The Service concurred that there would be no effect to critical habitat for the marbled murrelet since none occurs in the vicinity of the proposed action.	There would be no change in existing conditions and no impacts to birds.
Cultural and Tribal Resources	On June 28, 2010 the Washington SHPO concurred with the Navy's finding of "no historic properties affected," see Appendix D. EHW-1 and Delta Pier are potentially eligible for the National Register of Historic Places due to their Cold War context. Delta Pier would not be impacted by the proposed action. No submerged archaeological sites are expected to occur in the vicinity of the proposed action. Traditional resources would not be impacted. The proposed action would not alter or impact the current access granted to the tribes.	No change in existing conditions and no impacts to tribal resources.

TABLE 3.42 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Cultural and Tribal Resources (continued)	On June 18, 2010, a government-to-government meeting with the Chairman of the Suquamish Tribe was held. The Suquamish indicated they had no objection to the Test Pile Program. On July 29, 2010 government-to-government meeting with the Chairman of the Skokomish Tribe occurred. The Skokomish Tribe did not express any concern over the proposed Test Pile Program. A government-to-government meeting occurred on August 31, 2010 with the Jamestown S'Klallam and Port Gamble S'Klallam Tribes, Lower Elwha Klallam Tribe and the Point-No-Point Treaty Council. No adverse comments on the Test Pile Program were presented (Appendix D).	
Environmental Health and Safety	The proposed action is not expected to result in any impacts related to public environmental health and safety. Construction activities are not likely to release hazardous materials to the environment. Construction crews would follow applicable state and federal laws to ensure a safe working environment. The noise associated with the proposed action would reduce to 60 dB during construction which is consistent with the Washington noise regulations. Recreational boaters, scuba divers, kayakers, etc. could be exposed to noise levels exceeding permissible residential exposure levels although no injury would be anticipated. In order to maintain adequate levels of safety for vessel navigation during in-water construction activities, a Notice to Mariners would be issued to minimize navigational hazards outside the existing floating security fence. Regulations under the Washington Administrative Code. The proposed action would not result in significant impacts to environmental health and safety.	No change in existing conditions and no impacts to environmental health and safety.

TABLE 3.42 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES BY RESOURCE (continued)

Resource	Proposed Action	No-Action Alternative
Socioeconomics	The proposed action is not expected to result in any impacts related to socioeconomics. There would be no disproportionately high and adverse environmental, human health and socioeconomic affects upon minority and low-income populations, Indian Tribes or children. Tribal access and fishing rights would not be altered or impacted as a result of the proposed action because these areas are 1.1 miles south of the study area.	No change in existing conditions and no impacts to socioeconomics.
Coastal Zone Management Act	A CCD was submitted to the Washington Department of Ecology on August 17, 2010 to comply with the CZMA. On December 16, 2010 Washington Department of Ecology concurred with the Navy's assessment that the Test Pile Program is consistent Washington's CZMP (see Appendix A). Access to NBK at Bangor, including the project site, is controlled by the Navy and is restricted to authorized military personnel, civilians, contractors, and local tribes. Tribal access is restricted to the beach south of Delta Pier. Since no public recreational uses occur at the Test Pile Program project site, the proposed action would have no direct impact to recreational uses or access in the surrounding community. The Navy would implement mitigation measures to ensure impacts to fish, mammals and birds were reduced to the maximum extent feasible (Chapter 4). The discussion on water quality impacts (see Section 3.3) provides details regarding the proposed action's federal consistency with the CWA.	No change in existing conditions and no impacts to coastal zone management.

4 MITIGATION AND MONITORING

4.1 MARINE MAMMAL MITIGATION MEASURES

The exposures outlined in Section 3.9 represent the maximum expected number of marine mammals that could be exposed to acoustic sources reaching Level B harassment levels. The Navy proposes to employ a number of mitigation measures, discussed below, in an effort to minimize the number of marine mammals potentially affected.

4.1.1 Mitigation for Pile Driving Activities

The modeling results for zones of influences (ZOIs) discussed in Section 3.9 were used to develop proposed mitigation measures for pile installation and removal activities at NBK at Bangor. The ZOIs effectively represent the mitigation zone that would be established around each pile to prevent Level A harassment to marine mammals. While the ZOIs vary between the different diameter piles and types of installation methods, the Navy is proposing to establish mitigation zones for the maximum zone of influence for all pile installation and removal activities conducted to support the Test Pile Program. Proposed mitigation measures presented below assume the proposed project is implemented.

1. Shutdown and Buffer Zone –

    - The shutdown zone shall include all areas where the underwater or airborne sound pressure levels (SPLs) are anticipated to equal or exceed the Level A (injury) Harassment criteria for marine mammals (180 dB isopleth for cetaceans; 190 dB isopleth for pinnipeds).
    - The buffer zone shall include all areas where the underwater sound pressure levels are anticipated to equal or exceed the Level B (disturbance) Harassment criteria for marine mammals (160 dB re: 1µPa for impact, 120 dB re: 1 µPa for vibratory, or 90 dB re: 20µPa for airborne). The distance encompassing these zones will be adjusted to accommodate any difference between predicted and measured sound levels.
    - The shutdown and buffer zones will be monitored throughout the time required to install or remove a pile. If a marine mammal is observed entering the buffer zone, a “take” would be recorded and behaviors documented. However, that pile segment would be completed without cessation, unless the animal approaches/enters the shutdown zone, at which point all pile driving activities will be halted.
    - All buffer and shutdown zones will initially be based on the distances from the source which were predicted for each threshold level. However, in-situ acoustic monitoring will be utilized to determine the actual distances to these threshold zones , and the size of the shutdown and buffer zones will be adjusted accordingly (increased or decrease) based on received sound pressure levels.

2. Visual Monitoring –

- Impact Installation: Monitoring will be conducted for a 50 m* shutdown zone and a 464 m buffer zone (Level B harassment) surrounding each pile for the presence of marine mammals before, during, and after pile driving activities. Monitoring will take place from 30 minutes prior to initiation through 30 minutes post-completion of pile driving activities.
- Vibratory Installation: Monitoring will be conducted for a 50 m* shutdown zone. The 120 dB disturbance criterion predicts an affected area of 41.5 sq. km. Due to the difficulty of effectively monitoring such a large area, the Navy intends to monitor a buffer zone equivalent to the width of the Hood Canal for the presence of marine mammals before, during, and after pile driving activities. However, if the in-situ acoustic monitoring indicates that the 120 dB rms isopleths is smaller than the width of the Hood Canal, the monitoring zone would be reduced accordingly. Sightings occurring outside this area will still be recorded and noted as a take, but detailed observations outside this zone will not be possible. Monitoring will take place from 30 minutes prior to initiation through 30 minutes post-completion of pile driving activities.
- Monitoring will be conducted by qualified observers. A trained observer will be placed from the best vantage point(s) practicable (*e.g.* from a small boat, the pile driving barge, on shore, or any other suitable location) to monitor for marine mammals and implement shut-down/delay procedures when applicable by calling for the shut-down to the hammer operator.
- Prior to the start of pile driving activity, the shutdown and safety zones will be monitored for 30 minutes to ensure that it is clear of marine mammals. Pile driving will only commence once observers have declared the shutdown zone clear of marine mammals. Animals will be allowed to remain in the buffer zone and their behavior will be monitored and documented.
- If a marine mammals approaches/enters the shutdown zone during the course of pile driving operations, pile driving will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 30 minutes have passed without re-detection of the animal.

3. Sound Attenuation Devices – Sound attenuation devices (e.g. Gunderboom SAS™, TNAP, confined bubble curtain, and/or unconfined bubble curtain) will be utilized during all impact pile driving operations. Impact pile driving is only expected to be required to "proof" or drive the last 10-15 feet of each pile. The Navy plans to use a Gunderboom Sound Attenuation System™ (SAS) as mitigation for in-water sound during construction activities. A traditional sound attenuation device such as a bubble curtain/wall will be used as a backup

* Based on coordination with NMFS HQ, a minimum shutdown zone of 50 meters was recommended to standardize monitoring for future activities, even though this zone is slightly larger than the modeled Level A harassment zone. This mitigation applies only to marine mammals. This measure will be carried out for impact and vibratory pile driving/removal activities.

mitigation if the Navy cannot obtain the Gunderboom SAS™ or if it does not achieve the proposed noise attenuation. The Navy will also test the feasibility and effectiveness of using sound attenuation devices with vibratory hammers. The Navy will employ a sound attenuation device on a minimum of one vibratory driven pile of each pile size to test the practicability of this concept and see if the air interface reduces the source energy level.

4. Acoustic Measurements – Acoustic measurements will be used to empirically verify the proposed shutdown and buffer zones. For further detail regarding the acoustic monitoring plan see Section 4.2.

5. Timing Restrictions – The Navy, in consultation with NMFS Northwest Regional Office and USFWS Washington Office under ESA, has set timing restrictions for pile installation and removal activities to avoid in-water work when ESA-listed fish populations are most likely to be present. Therefore, all pile driving would occur only between July 16 –October 31, 2011 of the approved in-water work window from July 16 through February 15 to minimize the number of fish exposed to underwater sound and other disturbance. To minimize impacts to forage fish, impact pile driving activities will only occur from July 16 to October 14, 2011. Impact pile driving after October 14, 2011 will be contingent on the results of forage fish spawning surveys. If forage fish eggs are not found prior to October 14, forage fish surveys will continue on a weekly basis and impact pile driving will be allowed to proceed. If any forage fish eggs are found, impact pile driving will cease within a week of the survey. Vibratory pile driving and other in-water work will be allowed to proceed through October 31, 2011. The month for the Test Pile Program (July – Oct.) were also selected because they overlap with times when Steller sea lions and the majority of California sea lions are not expected to be present within the project area.

6. Soft Start – The use of a soft-start procedure is believed to provide additional protection to marine mammals by providing a warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. The Test Pile Program will utilize soft-start (ramp-up/dry-fire) techniques recommended by NMFS for impact and vibratory pile driving. These measures are as follows:

   > "*The soft-start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 1-minute waiting period. This procedure should be repeated two additional times. If an impact hammer is used, contractors are required to provide an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 1-minute waiting period, then two subsequent 3-strike sets.*"

7. Daylight Construction – Pile driving/removal will occur between two hours post-sunrise and two hours prior to sunset from July 16 through September 15, 2011 to protect breeding murrelets. From September 16 through October 31, 2011 pile driving/removal activities will only occur during all daylight hours.

4.1.2 Mitigation Effectiveness

It should be recognized that although marine mammals would be protected from Level A harassment by the utilization of sound attenuation devices and marine mammal observers (MMOs) monitoring the near-field injury zones, mitigation may not be one hundred percent effective at all times in locating marine mammals in the buffer zone. The efficacy of visual detection depends on several factors including the observer's ability to detect the animal, the environmental conditions (visibility and sea state), and monitoring platforms.

All observers utilized for mitigation activities will be experienced biologists with training in marine mammal detection and behavior. Due to their specialized training, the Navy expects that visual mitigation will be highly effective. Trained observers have specific knowledge of marine mammal physiology, behavior, and life-history which may improve their ability to detect individuals or help determine if observed animals are exhibiting behavioral reactions to construction activities.

The Puget Sound region, including Hood Canal, only infrequently experiences winds with velocities in excess of 25 knots (Morris et al., 2008). The typically light winds afforded by the surrounding highlands, coupled with the fetch limited environment of Hood Canal, result in relatively calm wind and sea conditions throughout most of the year. The proposed Test Pile Program project area has a maximum fetch of 8.4 miles to the north, and 4.2 miles to the south, resulting in maximum wave heights of from 2.85-5.1 feet (Beaufort Sea State between 2-4), even in extreme conditions (30 knot winds) (CERC, 1984). Visual detection conditions are considered optimal in Beaufort Sea State conditions of three or less, which align with the conditions that should be expected for the Test Pile Program at NBK at Bangor.

Observers would be positioned in locations which provide the best vantage point(s) for monitoring, which would probably be an elevated position as they provide a better range of viewing angles. Also, the shutdown and buffer zone has a relatively small radius to monitor which should improve detectability.

4.2 MARINE MAMMAL MONITORING AND REPORTING MEASURES

4.2.1 Monitoring Plan

The following monitoring measures would be implemented along with the mitigation measures (Section 4.1) in order to reduce impacts to marine mammals to the lowest extent practicable. The monitoring measures include both acoustic measurements and visual observations and address both underwater and airborne sounds from the Test Pile Program.

4.2.2 Acoustic Measurements

The Navy would conduct acoustic monitoring for impact driving of steel piles in order to determine the actual distances to the 190 dB re: 1µPa rms/180 dB re 1µPa rms and the 160 dB re: 1µPa rms isopleths and to determine the relative effectiveness of the Gunderboom SAS™/bubble curtain system at attenuating sound underwater. The Navy would also conduct acoustic monitoring for vibratory pile driving in order to determine the actual distance to the 120 dB re: 1µPa rms isopleth for behavioral harassment relative to background levels. Airborne acoustic monitoring would be conducted to determine the actual distances to the 100 and 90 dB re: 20µPa isopleths during impact and vibratory pile driving. Acoustic monitoring would occur for each type of pile installation and removal methodology.

At a minimum, the methodology includes:

- For underwater recordings, a stationary hydrophone system with the ability to measure sound pressure levels at mid-water depth and ~1 meter from the bottom will be placed at a distance of 10 meters from the source pile to measure the effectiveness of the bubble curtain system. A weighted tape measure will be used to determine the depth of the water. The hydrophone will be attached to a nylon cord or steel chain if current is swift enough, to maintain a constant distance from the pile. The nylon cord or chain will be attached to a float or tied to a static line at the surface 10 meters from the piles.

- For underwater measurements, in addition to determining the area encompassed by the 190, 180, 160, and 120 dB RMS isopleths for marine mammals, hydrophones would also be placed at other distances as appropriate to accurately capture the spreading loss which occurs at the Test Pile project area or to determine the distance to the thresholds for fish, and birds (these include peak, rms, and sound exposure levels [SEL]).
- For each additional monitored location, the preference is for hydrophones with multi-channel recording capabilities; however, at minimum, a hydrophone recording at mid-water depth will be used at all additional locations in order to evaluate site specific attenuation and propagation characteristics that are present within the action area.
- For airborne recordings, a stationary hydrophone will be placed at 50 feet (15.24 m) from the source for initial reference recordings.
- For airborne measurements, in addition to determining the area encompassed by the 100 and 90 db RMS isopleths for pinnipeds and harbor seals, hydrophones will be placed at other distances as appropriate to accurately capture spreading loss which occurs at the Test Pile project area, or to determine the distance to thresholds for birds.
- All hydrophones will be calibrated at the start of the action and will be checked at the beginning of each day of monitoring activity.
- Ambient conditions, both airborne and underwater, would be measured at the project site in the absence of construction activities to determine background sound levels. Ambient levels are intended to be recorded over the frequency range from 10 Hz to 20 kHz.
- Sound pressure levels associated with soft-start techniques will be measured.
- Underwater sound pressure levels would be continuously monitored during the entire duration of each pile being driven. Sound pressure levels will be monitored at select locations in real time. Sound levels will be measured in Pascals which are easily converted to decibel (dB) units.
- Airborne levels would be recorded as unweighted, as well as in dBA and the distance to marine mammal and/or avian thresholds (respectively) would be measured.
- The effectiveness of using a sound attenuation device (i.e. bubble curtain) with a vibratory hammer will be tested during the vibratory driving of a minimum of one pile of each size.
- The relative effectiveness of sound attenuation devices at reducing the sound pressure levels produced during impact pile driving will be tested during the Test Pile Program. The Navy proposes to conduct tests on up to seven piles by temporarily turning off the sound attenuation device for up to one minute. Sound pressure levels will be recorded during this period to compare to sound pressure levels recorded during periods in which the sound attenuation devices are in operation. Each test will be conducted for a

maximum of one minute per pile with only one test occurring per day, for a maximum of seven piles, or seven minutes of unattenuated impact pile driving over the duration of the Test Pile Program. The following on/off regime will be utilized during sound attenuation testing:

Pile Driving Timeframe	Sound Attenuation Device Condition
Initial driving of the pile	On
One minute off towards the end of driving for the pile (maximum)	Off
Final portion of pile driving	On

- Environmental data would be collected including but not limited to: wind speed and direction, air temperature, humidity, surface water temperature, water depth, wave height, weather conditions and other factors that could contribute to influencing the airborne and underwater sound levels (e.g. aircraft, boats, etc.).
- The chief inspector would supply the acoustics specialist with the substrate composition, hammer model and size, hammer energy settings and any changes to those settings during the piles being monitored, depth of the pile being driven, and blows per foot for the piles monitored.
- Post-analysis of the sound level signals will include determination of absolute peak overpressure and under pressure levels recorded for each pile, RMS value for each absolute peak pile strike, rise time, average duration of each pile strike, number of strikes per pile, SEL of the absolute peak pile strike, mean SEL, and cumulative SEL (Accumulated SEL = single strike SEL + 10*log (# hammer strikes) and a frequency spectrum both with and without mitigation, between 10 and 20,000 Hz for up to eight successive strikes with similar sound levels.

4.2.3 Visual Marine Mammal Monitoring

The Navy would collect sighting data and behavioral responses to construction for marine mammal species observed in the region of activity during the period of construction.

4.2.3.1 Qualifications

All observers will be trained in marine mammal identification and behaviors. The observers will have no other construction related tasks while conducting monitoring.

4.2.4 Methods of Monitoring

The Navy will monitor the shut down zone and safety zone before, during, and after pile driving. Based on NMFS requirements, the Marine Mammal Monitoring Plan would include the following procedures for impact pile driving:

- Marine mammal observers (MMOs) would be located at the best vantage point(s) in order to properly see the entire shut down zone and safety zone. This may require the use of a small boat to monitor certain areas while also monitoring from one or more land based vantage points.

- During all observation periods, observers would use binoculars and the naked eye to search continuously for marine mammals.
- To verify the required monitoring distances, the zones would be clearly marked with buoys or other suitable aquatic markers.
- If the shut down or safety zones are obscured by fog or poor lighting conditions, pile driving would not be initiated until all zones are visible.
- The shut down and safety zones around the pile will be monitored for the presence of marine mammals before, during, and after any pile driving activity.
- Pre-Activity Monitoring:
    - The shut down and buffer zones will be monitored for 30 minutes prior to initiating the soft start for pile driving. If marine mammal(s) are present within the shut down prior to pile driving or during the soft start, the start of pile driving would be delayed until the animal(s) leave the shut down zone. Pile driving would resume only after the MMO has determined, through sighting or by waiting approximately 30 minutes that the animal(s) has moved outside the shut down zone.
- During Activity Monitoring:
    - The shutdown and buffer zones will also be monitored throughout the time required to drive a pile. If a marine mammal is observed entering the buffer zone, a "take" would be recorded and behaviors documented. However, that pile segment would be completed without cessation, unless the animal enters or approaches the shutdown zone, at which point all pile driving activities will be halted. Pile driving can only resume once the animal has left the shutdown zone of its own volition or has not been re-sighted for a period of 30 minutes.
- Post-Activity Monitoring: Monitoring of the shutdown and buffer zones would continue for 30 minutes following the completion of pile driving.

4.2.5 Data Collection

MMOs will use NMFS-approved sighting forms. NMFS requires that at a minimum, the following information be collected on the sighting forms:

- Date and time that pile driving begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters identified in the acoustic monitoring (e.g. wind, humidity, temperature);
- Tide state and water currents;
- Visibility;
- Species, numbers, and if possible sex and age class of marine mammals;
- Marine mammal behavior patterns observed, including bearing and direction of travel, and if possible, the correlation to sound pressure levels;

- Distance from pile driving activities to marine mammals and distance from the marine mammal to the observation point;
- Locations of all marine mammal observations;
- Other human activity in the area.

Additionally, based on recent discussions with NMFS Headquarters, the Navy would record behavioral observations such that, if possible, the Navy can attempt to determine whether animals can be (or are) "taken" by more than one sound source in a day's operation. For instance, the Navy has agreed to: "Note in behavioral observations, to the extent practicable, if an animal has remained in the area during construction activities. Therefore, it may be possible to identify if the same animal or different individuals are being taken."

4.2.6 Reporting

A draft report would be submitted to NMFS Headquarters within 45 days of the completion of acoustic measurements and marine mammal monitoring. The results would be summarized in graphical form and include summary statistics and time histories of sound values for each pile. Acoustic measurements will be reported for each type of installation and removal methodology. A final report would be prepared and submitted to the NMFS Headquarters within 30 days following receipt of comments on the draft report from the NMFS Headquarters. At a minimum, the report shall include:

- Size and type of piles;
- A detailed description of the sound attenuation devices including their design specifications;
- The impact or vibratory hammer force used to drive/extract the piles;
- A description of the monitoring equipment;
- The distance between hydrophone(s) and pile;
- The depth of the hydrophone(s);
- The depth of water in which the pile was driven;
- The depth into the substrate that the pile was driven;
- The physical characteristics of the bottom substrate into which the piles were driven;
- The ranges and means for peak, RMS, and SEL's for each pile;
- The results of the acoustic measurements, including the frequency spectrum, peak and RMS SPLs, and single-strike and cumulative SEL with and without the attenuation system;
- The results of the airborne noise measurements including dBA and unweighted levels;
- A description of any observable marine mammal behavior in the immediate area and, if possible, the correlation to underwater sound levels occurring at that time;

- Results: Including the detectability of marine mammals, species and numbers observed, sighting rates and distances, behavioral reactions within and outside of safety zones;
- A refined take estimate based on the number of marine mammals observed in the safety and buffer zones; This may be reported as one or both of the following: a rate of take (number of marine mammals per day), or take based on density (number of individuals within the area);

4.3 FISH MITIGATION AND MONITORING

The following mitigation measures would apply to marine fish:

- In-water construction would observe the Puget Sound Marine Area 13 (northern Hood Canal) in-water work window (July 16 to February 15) as outlined in WAC 220-110-271 and USACE (2008) to minimize in-water project impacts on potentially occurring juvenile salmonids that would otherwise be exposed to underwater noise produced during pile driving.
- The pile driving contractor would use a mechanical soft-start approach during impact pile driving by using low hammer energy values to provide time for swimmers, divers, fish, and wildlife to hear the noise and react to it by moving away from the sound. During the test pile installation, a vibratory driver would be used whenever possible to drive piles. An impact hammer would be used to proof load the piles to verify bearing load capacity, and would not be used as the primary means to drive piles. Impact pile driving would be limited to no more than 100 pile strikes per day and no more than 1500 pile strikes for the entire project.
- Due to the size of the piles (estimated to be 60 inches [152 cm]), i.e. Gunderboom SAS™, TNAPs, confined and/or unconfined bubble curtain) would be employed to decrease the amount of underwater pile driving noise.
- Sound attenuation devices will be used during all impact hammer operations, except when conducting tests on the effectiveness of the sound attenuation measures. Testing of sound attenuation measures for impact pile driving will be conducted on up to seven piles. Each test will be conducted for a maximum of one minute per pile with only one test occurring per day, for a maximum of seven piles, or seven minutes of unattenuated impact pile driving over the duration of the Test Pile Program. During each test, unattenuated strikes will be limited to no more than 50 pile strikes per pile or per day.
- The pile driving barge will remain in waters that have a minimum depth of 6 feet to avoid grounding or potentially impacting the nearshore. No spudding/anchoring will be allowed in any existing eelgrass habitat.
- Barges will not shade existing eelgrass for extended periods of time (more than one day). Previously shaded eelgrass will remain unshaded for at least one day before a barge can be re-positioned above the habitat.
- Forage Fish Surveys – The proposed action overlaps in time with when forage fish may be spawning along the Bangor shoreline at NBK. The exact beginning of the spawning season within Hood Canal is unknown, but is estimated to occur in mid-October. The Navy proposes to do weekly forage fish egg surveys (on the beach) in the immediate

vicinity of the Test Pile location beginning September 30, 2011 to determine the presence of forage fish eggs, which would serve as an indicator of the presence of spawning adult forage fish in the nearby waters. Impact pile driving after October 14 will be contingent on the results of forage fish spawning surveys. If forage fish eggs are not found prior to October 14, forage fish surveys will continue on a weekly basis and if any forage fish eggs are found, impact pile driving will cease within a week of the survey.

4.4 MARBLED MURRELET MITIGATION

4.4.1 Methodology

General Project Mitigation

Several mitigation measures developed for the proposed action generally apply to the marbled murrelet. For instance, the proposed action would be limited to the time period between July 16 and October 31, 2011. Impact pile driving would primarily occur between July 16 and October 14, 2011, with impact pile driving occurring after October 14, contingent upon the results of spawning forage fish surveys. Impact pile driving would be limited to no more than 100 pile strikes per day and no more than 1500 pile strikes for the entire project. Additionally, pile driving/removal would occur between two hours after sunrise and two hours prior to sunset from July 16 through September 15, 2011 to protect breeding murrelets. From September 16 through October 31, 2011 pile driving/removal will only occurring during all daylight hours. Lastly, all piles driven by an impact hammer would be surrounded by a sound attenuation device over the full water column to minimize in-water noise, except when conducting tests on the effectiveness of the sound attenuation measures.

Marbled Murrelet Specific Mitigation

The following mitigation measures were developed during consultations with the USFWS Washington Office to provide additional protection for marbled murrelets:

- No impact pile driving will occur for piles larger than 36 inches in diameter after October 14th.
- After September 30th, unattenuated impact pile driving will be restricted to the installation of the smallest pile (24-inch diameter).

In an effort to further reduce potential impacts to marbled murrelets the Navy would conduct marbled murrelet surveys based on the protocol and methodology modified from the field methods established by U.S. Forest Service, Pacific Northwest Research Station (Raphael, et al., 2007) and the marbled murrelet survey report for the Carderock Division Research Facility Wave Screen project at Naval Base Kitsap, Bangor, WA. This protocol applies to monitoring associated with in-water impact pile driving. It does not apply to monitoring for vibratory pile driving, pile removal, or out-of water pile driving.

If any alcid species (e.g., marbled murrelets, pigeon guillemots, common murres, auklets, puffins) are detected within the area to be surveyed during any monitoring period, the surveyor(s) shall observe and monitor these species and record their behavior, particularly if they are behaving abnormally. The Bird Observation Record form will be completed by each observer for each transect. The Beaufort Wind Scale will be used to determine sea-state.

4.4.2 Observer Qualifications

All observers will be experienced biologists proficient in the identification of marbled murrelets and will have completed the USFWS-sponsored marbled murrelet training. Trained observers must have specific knowledge of marbled murrelet physiology, behavior, and life-history, which may improve their ability to detect individuals or help determine if observed animals are exhibiting behavioral reactions to construction activities.

USFWS requires that the observers have no other construction related tasks while conducting monitoring. The Navy will monitor the shut down injury zone before, during and after pile driving.

4.4.3 Data Collection

The marbled murrelet observers will use the USFWS-approved Bird Observation Record Form which will be completed by each observer for each survey day. The following information will be collected on the sighting form.

- Date and time that pile driving begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters identified in the acoustic monitoring (e.g. wind, humidity, temperature);
- Tide state and water currents: The Beaufort Wind Scale (Appendix B), specific descriptions of sea state, and notes will be used to determine sea-state.
- Visibility;
- Species, numbers, and if possible, sex and age class of marbled murrelets;
- Marbled murrelet behavior patterns observed, including bearing and direction of travel. If possible, include the correlation to sound pressure levels;
- Distance from pile driving activities to marbled murrelets and distance from the marbled murrelet to the observation point;
- Locations of all alcid observations;
- Other human activity in the area.

4.4.4 Injury Zones

Monitoring within the injury zone and implementing other minimization measures, such as the use of the sound attenuation devices, will reduce the impacts of underwater and airborne sound from pile driving on these species.

To verify the required monitoring distances, the survey boats will be equipped with Global Positioning System (GPS) units in order to mark the impact injury zone (up to 200 meter radius from pile driving activity). Figure 4-1 schematically indicated the arrangement of marbled murrelet transects. The zone will be monitored for presence of marbled murrelets before, during, and after any pile driving activity. During all observation periods, observers would use binoculars and the naked eye to search continuously for marbled murrelets. Each observer monitors out to 50 meters.

If the monitoring zones are obscured by fog, Beaufort Wind Scale greater than two, or poor lighting conditions, pile driving would not be initiated until all zones are visible. Monitoring will commence approximately one-half hour before the initiation of impact pile driving and will continue until pile driving is completed each day.

4.4.5 Monitoring Techniques

It should be recognized that although marbled murrelets will be protected from injury by the utilization of sound attenuation devices, observers monitoring the near-field injury and behavioral modification zone may not be one hundred percent effective at all times in locating marbled murrelets. However, the efficacy of visual detection depends on several factors including the observer's ability to detect the animal, the environmental conditions (visibility and sea state), and monitoring platforms.

4.4.6 Visual Survey Protocol Prior to Pile Driving

The following survey methodology will be implemented prior to commencing pile driving activity:

- Transect lines will be established using GPS;
- Transect lines will be no more than 100 meters apart. If the sea-state is greater than Beaufort 2, the pile driving and associated monitoring will cease; The two survey boats will monitor for marbled murrelets flying over the airborne vibratory injury zone (22 meter radius from pile driving activity), airborne impact injury zone (68 meters from pile driving activity), and the underwater impact injury zone (up to 200 meter radius from the pile driving activity) during impact pile driving.
- The above described monitoring efforts will be run concurrently;
- Impact pile driving will not commence until the entire survey area has been completely surveyed and it is determined that no marbled murrelets are in the water within these zones (airborne and underwater injury);
- If marbled murrelets are not within these surveyed zones, the observers are to raise a green flag and radio the Pile Driving Engineer Lead that impact pile driving can commence;
- If marbled murrelets are within these surveyed zones, the survey will continue and impact pile driving will NOT commence;
- Survey boats will maintain speed equal to or less than 10 knots per hour;

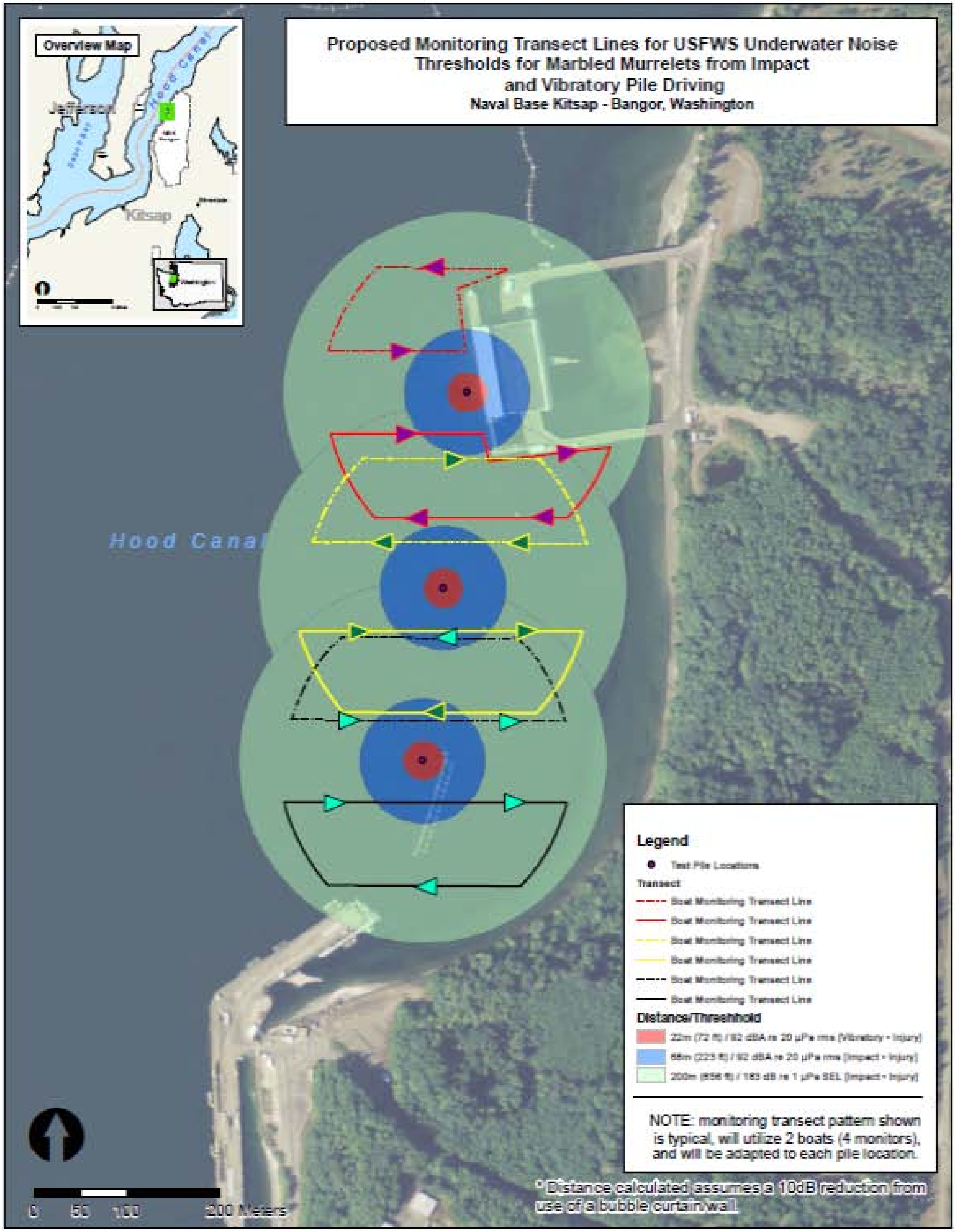


Figure 4-1 Marbled Murrelet Survey Protocol

- The boats will have a minimum of two observers using aid of binoculars (not including the boat operator);
- In case of fog or reduced visibility, the observers must be able to see a minimum of 50 meters or pile driving cannot commence;
- If any alcid species (e.g., marbled murrelets, pigeon guillemots, common murres, auklets, puffins) are detected outside the specified survey zones during the pre-pile driving monitoring and after pile driving is initiated, the observers shall observe and monitor these birds and record their behavior.
- All bird observations will be recorded on the Bird Observation Record forms. The biologists will document the number and general location of all murrelets.

4.4.7 Visual Survey Protocol During Pile Driving

The injury zone will be monitored throughout the time required to drive the pile. The following monitoring protocol will be implemented:

- The survey protocol identified above in Section 4.4.5 will continue and repeat during pile driving with the following additional conditions.
- If a marbled murrelet is seen approaching injury zones (200 meter radius during impact pile driving and it appears likely that the bird will dive into the water or land in the water within that zone, the observers will immediately raise a red flag and radio to alert the Pile Driving Engineer Lead. This action will require an immediate “all-stop” on pile driving.
- Once it is determined that the marbled murrelet has indeed landed in the water within the behavior modification and injury zones (as defined above), the boat will stop and the observers will monitor the marbled murrelet until it leaves the zone of injury. Once it has left the area, pile driving will not begin again until the “pre-pile driving survey” (See Section 4.4.5) has been completed and the zone has been cleared of all marbled murrelets. If a marbled murrelet is seen entering the zone of injury but is not seen leaving, the general area that the marbled murrelet was last located will continue to be scanned for up to 5 minutes. If no marbled murrelet is seen, then the “pre-pile survey” will be completed (as described above) before impact pile driving may occur.
- Seabird behavior (including marbled murrelets) during pile driving will be noted, especially apparent responses to pile driving and other construction-related activities. Bird Observation Record forms will be used to document observations.

4.4.8 Visual Post Pile Driving Observational Survey

These surveys will observe and record unusual or abnormal behavior of marbled murrelets for 30 minutes after cessation of pile driving Survey results will be noted in the Bird Observation Record form. During these surveys, dead, injured or sick seabirds may be discovered.

Searches for diving seabird carcasses along nearby beaches will be conducted following impact pile driving activities. Biologists will walk accessible beaches within 0.5 miles of the pile driving location. Beach surveys will be conducted during low or receding tides, if possible, to maximize the chances of finding beached carcasses. Beach surveys will be conducted each day following in-water impact pile driving, as is practical based on the timing of tide events, pile driving activities and Navy security and safety requirements. Beach surveys are of secondary priority and will not be conducted if such activities would interfere with the implementation of murrelet monitoring or if the timing of low/receding tides imposes unreasonable schedule demands on the biologists.

Any dead bird found within the survey area will be collected and submitted to USFWS Washington Office for necropsy using Chain of Custody Record Form. If transfer to USFWS Washington Office cannot be performed within the same day, salvaged birds will be kept cool (but not frozen) until delivery.

4.4.9 Interagency Notification

Observers will immediately notify the USFWS Washington Office upon locating a dead, injured, or sick marbled murrelet specimen. Notification must be made to the USFWS Law Enforcement Office at (425) 883-8122 or the Services’ Western Washington Fish and Wildlife Office at (360) 753-9440, and include the date, time, precise location of the injured bird or carcass, and any other pertinent information.

Care should be taken in handling dead birds to preserve biological materials in the best possible state for later analysis of cause of death, if that occurs. In conjunction with the preservation of biological materials from a dead animal, the finder (i.e. marbled murrelet survey monitors) has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed.

4.4.10 Survey Report

A draft report will be submitted to the USFWS Washington Office within 30 days of the completion of the in-water work window for which there has been impact pile driving and marbled murrelet monitoring. The results will be summarized in graphical form and include summary statistics and time histories of impact sound values for each pile, and associated marbled murrelet observations. A final report will be prepared and submitted to the USFWS Washington Office within 30 days following receipt of comments on the draft report from the USFWS Washington Office. The report shall include:

- General data:
  - Observation dates, times, and conditions;
  - Copies of the field data sheets or logs;
  - Date and times of monitoring activities;
  - Water conditions (e.g., sea-state, surface water temperature);
  - Weather conditions (e.g., wind speed and direction, air temperature, humidity);
  - Physical characteristics of the bottom substrate into which the piles are driven.
- Specific pile driving data:
  - Description of the pile driving activity being conducted (size of pile and type of pile driving);

  - Detailed description of the sound attenuation device, including design specifications;
  - Impact hammer force used to drive/extract the piles;
  - Description of the monitoring equipment;
  - Distance between hydrophone(s) and pile;
  - Depth of the hydrophone(s);
  - Depth of water in which the pile was driven;
  - Depth into the substrate that the pile was driven;
  - Ranges and means for peak, RMS, and SEL's for each pile;
  - Results of the acoustic measurements, including the frequency spectrum, peak and RMS SPL's, and single-strike and cumulative SEL with and without the attenuation system;
  - Results of the airborne noise measurements including dBA and unweighted levels.
- Pre-activity observational survey-specific data:
  - Dates and time survey is initiated and terminated;
  - Description of any observable bird, marine mammals, fish behavior in the immediate area during monitoring;
  - If possible, the correlation to underwater sound levels occurring at the time of this observable behavior;
  - Describe actions performed to minimize impacts to marbled murrelets, such as monitoring, use of sound attenuation devices, hydroacoustic recordings, etc.
- Post-activity observational survey-specific data:
  - Results of the post-activity survey will include the numbers and condition of marbled murrelets and other species, and behavioral reactions within the observations zones;
  - Birds salvaged for necropsy (if applicable);
  - Use Chain of Custody Record Form for dead birds/threatened and endangered species (as required);
  - Necropsy results, based on information provided by the Agencies (as required).

5 CUMULATIVE IMPACTS

5.1 Principles of Cumulative Impacts Analysis

The approach taken herein to analyze cumulative effects[13] meets the objectives of the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) regulations, and CEQ guidance. CEQ regulations (40 CFR 1500-1508) provide the implementing procedures for NEPA. The regulations define "cumulative effects" as:

> . . . the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

CEQ provides guidance on cumulative impacts analysis in *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ, 1997). This guidance further identifies cumulative effects as those environmental effects resulting "from spatial and temporal crowding of environmental perturbations. The effects of human activities will accumulate when a second perturbation occurs at a site before the ecosystem can fully rebound from the effects of the first perturbation." Noting that environmental impacts result from a diversity of sources and processes, this CEQ guidance observes that "no universally accepted framework for cumulative effects analysis exists," while also noting that certain general principles have gained acceptance. One such principle provides that "cumulative effects analysis should be conducted within the context of resource, ecosystem, and community thresholds—levels of stress beyond which the desired condition degrades." Thus, "each resource, ecosystem, and human community must be analyzed in terms of its ability to accommodate additional effects, based on its own time and space parameters." Therefore, cumulative effects analysis normally will encompass a Region of Influence (ROI) or geographic boundaries beyond the immediate area of the proposed action, and a time frame including past actions and foreseeable future actions, to capture these additional effects. Bounding the cumulative effects analysis is a complex undertaking, appropriately limited by practical considerations. Thus, CEQ guidelines observe that it "is not practical to analyze cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful."

For the proposed action to have a cumulatively significant impact to an environmental resource, two conditions must be met. First, the combined effects of all identified past, present, and reasonably foreseeable projects, activities, and processes on a resource, including the effects of the proposed action, must be significant. Second, the proposed action must make a substantial contribution to that significant cumulative impact. Finally, if the effects of the proposed action alone would have a significant impact to an environmental resource within its ROI, then the impacts of the proposed action in combination with all other past, present, and reasonably foreseeable actions would normally be cumulatively significant.

[13] CEQ Regulations provide that the terms "cumulative impacts" and "cumulative effects" are synonymous (40 CFR § 1508.8[b]).

Cumulative impacts are those changes to the physical, biological, and socioeconomic environments that would result from a proposed action when added to other past, ongoing, and reasonably foreseeable actions, regardless of what agency of government or person undertakes such other actions (40 CFR 1508.7).

5.1.1 Identifying Region of Influence or Geographical Boundaries for Cumulative Impacts Analysis

The ROI or geographic boundaries for analyses of cumulative impacts can vary for different resources and environmental media. For air quality, the potentially affected air quality regions are the appropriate boundaries for assessment of cumulative impacts from releases of pollutants into the atmosphere. For wide-ranging or migratory wildlife, specifically marine mammals, fish, and sea birds, any impacts of the proposed action might combine with the impacts of other activities or processes within the range of the population. The ROI or geographic boundary for the majority of resources analyzed for cumulative impacts in this EA is Hood Canal and the Hood Canal watershed.

The cumulative impacts analysis for the Test Pile Program considers known past, present, and reasonably foreseeable future actions throughout Hood Canal, including NBK at Bangor and its 4.5-mile shoreline on the canal. Although some marine organisms occurring at NBK at Bangor move beyond Hood Canal, these organisms are likely to spend the majority of their time in Hood Canal, and thus cumulative impacts to such organisms are most likely to result from actions within Hood Canal. Hood Canal (and its watershed) is the most relevant region for defining populations or communities of marine and coastal resources occurring at NBK at Bangor. Surrounding communities in which actions at NBK at Bangor are most likely to contribute to cumulative social impacts include Silverdale, Poulsbo, and Bremerton, all of which are on the Kitsap Peninsula and within Kitsap County. A ROI for evaluating the cumulative impacts of the proposed action is defined for each resource in Section 5.3.

5.2 Projects and Other Activities Analyzed for Cumulative Impacts

5.2.1 Past, Present, and Reasonably Foreseeable Future Actions

Identifiable present effects of past actions are analyzed to the extent they may be additive to impacts of the proposed action. In general, the Navy lists and analyzes the effects of individual past actions only where appropriate; cumulative impacts analysis typically focuses on aggregate effects of past actions. This analysis depends on the availability of data and the relevance of future effects of past, present, and future actions. Although certain data (e.g., extent of forest cover) may be available for extensive periods in the past (i.e., decades), other data (e.g., water quality) may be available only for much shorter periods. Because specific information and data on past projects and actions are usually scarce, the analysis of past effects is often qualitative (CEQ, 1997). Analysis will primarily include present and reasonably foreseeable future actions that may have effects additive to the effects of the proposed action. These actions include all likely future development of the region even when foreseeable future action is not planned in sufficient detail to permit complete analysis (CEQ, 1997).

Table 5.1 lists the past, present, and reasonably foreseeable future actions at NBK at Bangor and within the ROI that have had, continue to have, or would be expected to have some impact to the natural and human environment. The projects in this table are limited to those implemented in the last 5 years or those with ongoing contributions to environmental effects. Navy projects were selected based on a review of NEPA and permitting documentation for past actions. Projects with measurable contributions to impacts within the ROI for a resource area were selected for inclusion in the cumulative analysis.

The cumulative analysis considers reasonably foreseeable proposed plans and actions that are focused on shoreline developments in the Hood Canal watershed (Figure 5-1) and that have a potential to result in cumulative impacts to the marine environment. Although no official boundaries exist along the waterway, the northeastern section of the canal, extending from the mouth of the canal at Admiralty Inlet to the southern tip of Toandos Peninsula, is referred to as northern Hood Canal, the reach from Toandos Peninsula south to Great Bend is referred to as mid-Hood Canal, and the reach from Great Bend to Lynch Cove is referred to as southern Hood Canal. The Test Pile Program project site is within northern Hood Canal. The projects considered in this analysis were identified through contacts with the Kitsap County, Mason County, and Jefferson County Departments of Community Development, WSDOT, natural resource agencies, and American Indian tribes.

Overlap in the construction periods for multiple, closely located projects can result in short-term, cumulative impacts that are additional to standard, longer-term cumulative impacts. Based on current projected schedules, the Explosives Handling Wharf 1 (EHW-1) may overlap with the Test Pile Program. The EHW-1 project would entail pile driving that would be cumulatively considerable with the proposed action. The EHW- 1 project would complete necessary repairs and maintenance at the EHW-1 facility at NBK at Bangor. This action includes the removal of 138 steel and concrete piles and the installation of 28 steel piles during 2011 and 2012. Cumulative impacts arising from these potential construction overlaps are addressed in this chapter where appropriate.

5.2.2 Other Regional Activities, Processes, and Trends

In addition to those past, present, and planned future projects listed in Table 5.1, other activities were considered in the cumulative impact analysis. A description of those activities is provided in the following sections.

5.2.2.1 Shoreline Development

Development along the shoreline of Hood Canal has been relatively intense. Residential uses predominate, with lot sizes smaller than those in the upland area. Some of these residences have docks. Commercial facilities are scattered along the shoreline; the community of Seabeck, to the south, has a store, a few businesses, a marina, and a retreat center. The Hood Canal Bridge is north of NBK at Bangor and the project area. Farther south is Scenic Beach State Park. Future general development in the Hood Canal watershed would increase impervious surface and thereby affect vegetation and soils, with potential impacts to water quality in streams and Hood Canal.

TABLE 5.1. PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE PROJECTS IN HOOD CANAL

PROJECT	PROJECT DESCRIPTION	PROJECT TIMEFRAME		
		Past	Present	Future
NBK at Bangor Waterfront Operations	Waterfront operations include the overall integration of all port operations at the Bangor waterfront. Activities include vessel traffic movement and management, personnel clearance and tracking, and ingress/egress within the restricted areas.	X	X	X
NBK at Bangor Waterfront Facilities Maintenance	Common maintenance activities include pressure washing of waterfront piers to remove bird fecal material, marine debris (i.e., clam and mussel shells) and foreign materials (i.e., dirt and algae). Maintenance area includes walkways and approaches to the piers. Other maintenance activities may involve repair and replacement of structures or facilities as needed. Upcoming maintenance actions would include pile driving for KB Dock repair.	X	X	X
EHW-1 Maintenance	This multiyear project involves replacing deteriorated piles, the most recent phase, and installation of twenty nine 30-inch steel piles. Phased repair of this structure is expected to continue until 2024.	X	X	X
Force Protection and Weapons Security Measures	The project involves installation and operation of facilities, including 14-foot-high above-water fencing on pontoons along the Waterfront Restricted Area; construction of an Auxiliary Reaction Force Facility (14,000 sq ft) and an Armored Fighting Vehicle Operational Storage Facility (16,146 sq ft); alteration of two buildings for a new armory (2,500 sq ft); and replacement of an Alert Force Garage (2,530 sq ft) including a new paved access road.	X	X	X
Road Improvements	Road clearing and grading are continuous. Loss of vegetation and habitat can be expected from road improvements, including those for the D5 Road and Transfer Facilities and Missile Haul Road.	X	X	X
CSDS-5 Support Facilities	The Navy implemented upgrades to waterfront and shore-based support facilities for its Submarine Development Squadron FIVE Detachment at NBK at Bangor. These upgrades were completed in July 2005. Anticipated levels of mission support and the operational tempo of assigned submarines require additional shore-side buildings for administration, operations, industrial, and support functions. Security requirements and operational efficiency dictate consolidation of off-base contractor space onto a contiguous site adjacent to the shore-based support facilities. The Navy is proposing facility upgrades to the existing Service Pier, a size increase of 18,000 sq ft, construction of a new waterfront support facility (12,560 sq ft), expansion of existing shore-based support facilities.	X	X	X

TABLE 5.1. PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE PROJECTS IN HOOD CANAL (continued)

PROJECT	PROJECT DESCRIPTION	PROJECT TIMEFRAME		
		Past	Present	Future
Mission Support Facilities	Mission support facilities may include activities or projects such as the addition of power booms, captivated camels, and piles for support or attachment; installation of emergency power generation capability; and other activities to support facilities or operations.	X	X	X
Navy Surface Warfare Center Carderock Division (NSWCCD) Detachment Bremerton Command Consolidation	Construction of in-water facilities includes a new access pier (8,800 sq ft), pontoon (21,600 sq ft), vessel overwater footprint (13,623 sq ft) and associated mooring components, and 102 new steel piles. Project tasks also include road improvements to Carlson Spit Access Road, a 23,000 sq ft building, and the addition of 100 workers.	X	X	
Waterfront Security Enclave and Security Barriers	In process is creation of enclave fencing for the entire NBK at Bangor Waterfront Restricted Area and construction of an associated parking area. Mitigation action will restore tidal influence to Cattail Lake, thereby increasing intertidal habitat.			X
Waterfront Restricted Area Land-Water Interface	This project is being addressed in an EIS for NBK at Bangor waterfront projects. Its object is to provide security upgrades to the existing Bangor Waterfront Restricted Area at NBK by constructing two Waterfront Restricted Area Land-Water Interface barriers, which will connect both ends of the Waterfront Restricted Area enclave to the existing floating barriers. The Land-Water Interface barriers will extend from the high water mark to the terminations of the Port Security Barriers and will be capable of moving in the full tide range and providing an anchorage for the floating barriers. The project consists of two separate construction features. The first is the delay system, which connects the high tide termination with the existing Port Security Barrier to prevent entry of unauthorized persons, vehicles, and/or vessels. The second is construction of the sensor equipment that will provide detection. This project is scheduled for FY 2013.			X
Swimmer Interdiction Security System In-water Structure and Support Facilities	The Navy implemented a Swimmer Interdiction Security System to meet special U.S. Government security requirements for military installations in response to the terrorist attacks of September 11, 2001. The system would protect waterside Navy assets and sailors, and would remain in operation as long as valuable naval assets were located at NBK at Bangor. The Navy examined various alternatives for implementing the system: marine mammals (preferred alternative), combat swimmers, and remotely operated vehicles. Under the preferred alternative, specially trained marine mammals and their human teammates would respond rapidly to security alerts by detecting, classifying, and marking the location of underwater objects or intruders. Humans would work aboard small power boats, and marine mammals would be in enclosures. A Draft EIS was made available to the public for comment in December 2008, with a Record of Decision signed in 2009.		X	X

TABLE 5.1. PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE PROJECTS IN HOOD CANAL (continued)

PROJECT	PROJECT DESCRIPTION	PROJECT TIMEFRAME		
		Past	Present	Future
Service Pier Extension	The potential Service Pier Extension project entails construction of a finger pier on the south side of the Service Pier south of the EHW-2 project site, and will involve a modest amount of pile driving.			**X**
Electromagnetic Measurement Range	The proposed Electromagnetic Measurement Range Sensor System equipment project includes installation of sensor equipment, including an underwater instrument array, data/power cables, a pile-supported platform, an in-water navigation aid, and an upland monitoring system at NBK at Bangor.	**X**	**X**	**X**
Reuse or Replacement of Magnetic Silencing Facility Pier	Reuse or replacement of the Magnetic Silencing Facility Pier and upland monitoring building locations to support Maritime Force Protection Unit (Coast Guard) personnel and vessels would be limited to the MSF area, shifting current operations from the existing KB Dock location.			**X**
Northwest Training Range Complex EIS	A wide variety of military training activities are conducted in the W-237 operating areas west of Washington, including training exercises in anti-air, anti-surface, and anti-submarine warfare; electronic combat exercises; mine countermeasures training; naval special warfare training; and various support operations. The Navy has developed policies and procedures to preclude harm and to minimize the effects of Navy training on terrestrial and marine species and habitats. This action involves activities at Floral Point, which is within the Region of Influence for this cumulative analysis. The Navy prepared an EIS/OEIS to assess effects of ongoing and potential future training activities in the Northwest Training Range Complex. The Draft EIS/OEIS was made available to the public in December 2008. A No-Action Alternative and two action alternatives were assessed in the Draft EIS/OEIS. A Biological Opinion from NMFS was signed in June 2010. A second Biological Opinion from USFWS was signed in August 2010. The ROD was signed October 2010.	**X**	**X**	**X**
NAVSEA NUWC Keyport Range Complex Extension	This project involves an increase in the underwater Hood Canal Military Operating Area, including areas in and outside Hood Canal. The EIS included the Dabob Bay Range Complex and a proposed expansion of the MOAs both to the north and south of their existing limits.	**X**	**X**	**X**

TABLE 5.1. PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE PROJECTS IN HOOD CANAL (continued)

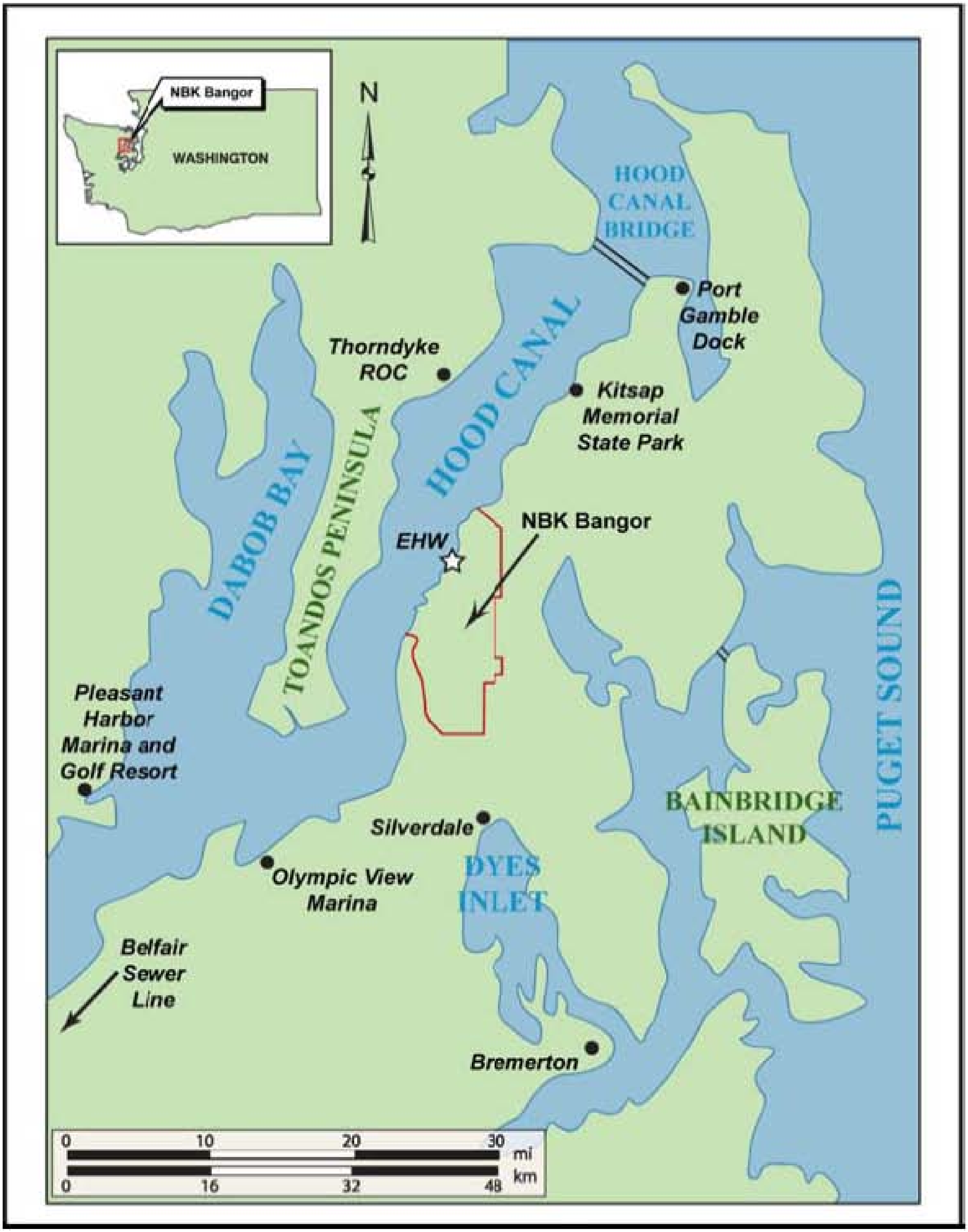
PROJECT	PROJECT DESCRIPTION	PROJECT TIMEFRAME		
		Past	**Present**	**Future**
EHW-2	The Navy would construct and operate a second Explosives Handling Wharf adjacent to, but separate from, the existing Explosives Handling Wharf. The in-water facility would consist of a covered operations building, six lightning towers, a warping wharf, and access trestles from shore. Upland components would include construction of an upland road, a pile-supported abutment where trestles connect to shore, a five-acre upland construction staging area, and new utility facilities and modifications. Approximately 20 existing facilities and/or structures would be modified or demolished to comply with safety requirements. The Navy examined five action alternatives. Depending on alternative, total overwater coverage would range from 6.3 acres to 8.5 acres, the number of piles would range from 440 to 1,500. All alternatives would include loss of 0.18 acres of wetlands and impacts to forest and shrublands (5.8 acres temporary disturbance and 0.8 acres permanent loss). A Draft EIS was made available to the public in March 2011.			**X**
Port Gamble Dock	The Olympic Property Group has applied for a permit for a dock at a former mill site in Port Gamble. A preliminary design for a 165-foot dock was initially submitted for review.			**X**
Kitsap Memorial State Park	Washington State Parks is conducting a slope stabilization project for an approximately 1,000-foot-long creosote-treated bulkhead at Kitsap Memorial State Park in Poulsbo on Hood Canal. The treated wood bulkhead is being removed and the shoreline "naturalized" as part of the project. The project, currently under way, has been permitted by both an approved shoreline exemption under normal maintenance repair and replacement and an approved Site Development Activity Permit. Naturalization of the shoreline will improve nearshore habitat in this stretch of Hood Canal.		**X**	**X**

TABLE 5.1. PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE PROJECTS IN HOOD CANAL (continued)

PROJECT	PROJECT DESCRIPTION	PROJECT TIMEFRAME		
		Past	Present	Future
Olympic View Marina	Olympic View Marina, LLC, is proposing to replace the abandoned Seabeck Marina on Seabeck Bay approximately 7 miles south of NBK at Bangor on the east side of Hood Canal. Ongoing construction of a new marina involves the installation of 72,510 sq ft of piers, floats, and gangways (approximately 1.66 acres of overwater structures) for the moorage of approximately 200 boats. The design calls for 250 steel piles (14- to 20-inch-diameter). This project would result in short-term water quality and noise impacts during construction, as well as long-term shading under the new overwater structures and loss of marine habitats from installation of the breakwater and pier pilings. Upland vegetation would be cleared for the on-land structures. In order to permit rebuilding of the marina, the shoreline designation of the old Seabeck Marina in the Kitsap County Shoreline Management Master Program was amended from “conservancy” to “rural” in April 2009. In January 2010, workers began installing pilings for the docks. Construction was put on hold from mid-February until July in compliance with the fish window. Removal of concrete debris from the beach was completed in October 2010. The completion date for this project is uncertain.			X
Thorndyke Resources Operation Complex (T-ROC) Conveyor and Pier	As proposed, the project proponent, Fred Hill Materials, would move gravel from the Shine gravel pit, owned by Miles Sand & Gravel, on a 4-mile-long conveyor belt to Thorndyke Bay on Hood Canal. The gravel would then be loaded onto barges and ships at a 1,000-foot-long pier. Assuming an average width of 13 feet, the overwater coverage of the pier plus that of two proposed buildings would be approximately 0.32 acre. The pier would be supported on piles spaced approximately 100 feet apart. Approximately 45 piles (18- and 30-inch-diameter) would be required for the pier and support structures. The new pier would be located approximately 3 miles north of the NBK at Bangor waterfront on the west side of Hood Canal. There would be aesthetic impacts and potential interference with marine vessel traffic due to the high volume of barge and tug traffic proposed for this project. Upland vegetation would be cleared for construction of the conveyor belt, with potential erosion and water quality impacts. This is the same project also referred to as the Pit-to-Pier. The T-ROC conveyor and pier proposal is undergoing the environmental review process for permitting, and Jefferson County is waiting for Fred Hill Materials to submit updated studies to complete a gap analysis. The application is still open, but there is considerable uncertainty as to whether this project will be implemented.			X

TABLE 5.1. PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE PROJECTS IN HOOD CANAL (continued)

PROJECT	PROJECT DESCRIPTION	PROJECT TIMEFRAME		
		Past	Present	Future
Pleasant Harbor Marina and Golf Resort	The Statesman Group of Companies is proposing a new master-planned development at Pleasant Harbor south of Brinnon. The project locale is on the west side of Hood Canal approximately 9 miles southwest of NBK at Bangor. The 256-acre development includes resort housing, a hotel, a restaurant, a spa, a clubhouse, an 18-hole golf course, and other resort-type facilities. It would involve refurbishment of an existing 285-boat marina and development of resort facilities along the shoreline. Planning is ongoing for this project, and a supplemental EIS is being prepared (the original EIS was published on November 27, 2007). Both the draft and final EIS documents addressed nine issues and impacts: (1) shellfish, (2) water quality, (3) transportation, (4) public services, (5) shorelines, (6) fish and wildlife, (7) rural character, (8) archaeology and cultural resources, and (9) critical areas. Project construction would likely result in short-term water quality and noise impacts. Refurbishing the marina would result in some loss of nearshore marine benthic habitat in the immediate project vicinity. The golf course and upland facilities would likely require considerable clearing of upland vegetation (estimated at 50 percent or 128 acres), with a potential for erosion and water quality impacts. Impervious surfaces are predicted to be approximately 15 percent of the total area, or approximately 38 acres.			**X**
Belfair Sewer Line	Mason County is constructing a sewer line in the Belfair area (extreme south end of Hood Canal, approximately 25 miles south of NBK at Bangor, and not shown in Figure 4–1) to replace aging and failing septic systems with a sanitary sewer system. The sewer line would run on both the north and south shores of southern Hood Canal. The project was developed as part of the Mason County Facilities Plan approved in 2002, which received state funding from the 2005 Legislature. The sewer line would not be located directly adjacent to Hood Canal, so construction would have little potential for marine impacts. Construction has begun, and to date almost 4,000 feet of pipe have been laid for the project along State Road 3, Old Belfair Highway, and Clifton Road. Deadlines for hookup to the sewer have not yet been established; however, the system is slated to come online in spring 2011. There would be at least temporary disturbance of upland habitat along the sewer line route. One purpose of the project is to reduce the impact of failing septic systems to water quality in Hood Canal. The Belfair Sewer Line would help to decrease water quality impacts to Hood Canal by eliminating inadequate septic systems.			**X**
Hood Canal Bridge improvements	The Washington State Department of Transportation recently completed upgrades to the Hood Canal Bridge. This project involved reconstruction of the east half of the Hood Canal Bridge to current design standards and improvements to the remainder of the structure. The bridge was redesigned to current wind, wave, and seismic standards. To improve safety and mobility, it now features two 12-foot traffic lanes and 8-foot shoulders. The resulting dependability of the drawspan has reestablished the 600-foot opening for large vessels that pass through the bridge.	**X**		



5.1 Location of Future Navy and Non-Navy Action

The shoreline of Hood Canal has been, and continues to be, subject to development by property owners. Over the past 5 years, an average of 15 shoreline development permit applications (i.e., Joint Aquatic Resource Permit Applications) per year has been submitted by property owners within the ROI. The actions permitted (e.g., pier/dock construction, shoreline stabilization, stairways/beach access, shoreline construction, submarine cable installation, septic system failures) are likely to continue within this region at the same pace (i.e., approximately 15 per year) over the next several years.

5.2.2.2 Agency Plans for Improving Environmental Conditions in Hood Canal

As described in previous chapters, there are several water quality parameters of concern in Hood Canal, including low DO levels and high nutrients, particularly in the southern part of the canal. The area of concern for low DO levels is south of the Bangor waterfront at NBK. Because of these water quality problems, and concern for salmon and the overall environmental health of Hood Canal, several government entities and community groups have joined together to plan and develop programs to improve environmental conditions in Hood Canal. The primary action plan was developed by the Hood Canal Coordinating Council (HCCC), a consortium of county governments, tribes, and other groups that was formed to help recover summer-run chum salmon populations in Hood Canal and the eastern Strait of Juan de Fuca and to restore native plant communities along adjacent shorelines. These governments and groups work together to educate and help landowners restore nearshore areas, remove invasive plants and weeds, control septic runoff into Hood Canal, and identify properties for conservation acquisition. The purpose of these actions is to counteract the adverse effects of past actions and thus improve environmental conditions in Hood Canal.

Recommended key actions in the HCCC's plan include updating Kitsap County's Shoreline Master Plan and critical areas ordinances, conducting a nearshore assessment, adopting the Kitsap County draft shoreline environmental designations, and continuing to monitor the Big Beef Creek summer-run chum salmon reintroduction project (HCCC, 2005). Under its Marine Riparian Initiative, the HCCC is working with several existing entities and programs to develop a coordinated approach to revegetating marine shorelines (HCCC, undated). This initiative involves training Master Gardeners, Water Watchers, and other volunteer groups to provide site-specific planting plans for landowners that address soil and slope stability, sediment control, wildlife, microclimate, shade, nutrient input for detrital food webs, fish prey production, habitat/large woody debris structure, water quality, human health and safety, and aesthetics.

The Kitsap County Health District (2005) has also identified part of Upper Hood Canal as a restoration area. The goals of the Upper Hood Canal Restoration Project are to protect public health and the environment by identifying and correcting sources of fecal coliform contamination from failing onsite sewage systems and inadequate animal waste management, obtaining water quality data, and educating Upper Hood Canal residents about the low DO problem and actions they can take to reduce bacteria and nutrient concentrations in Hood Canal. Of particular concern are low DO levels resulting from algal blooms, which are triggered by increases in nutrients from failing onsite sewage systems, inadequate animal waste management (i.e., hobby farms), and stormwater flowing into Hood Canal. The restoration area extends approximately 20 miles along the eastern shore of Hood Canal from Olympic View Road in the north to the Kitsap County–Mason County line in the south. Most of this area lies directly south of NBK at Bangor, but a portion lies along the western edge of the southern part of the base.

5.2.2.3 Puget Sound Trend Data (Including Hood Canal)

Trend data in the Puget Sound region have been summarized in the 2007 Puget Sound Update—Ninth Report of the Puget Sound Assessment and Monitoring Program (PSAT, 2007a). These trends were used, where applicable, in Section 4.3, Cumulative Impacts to Environmental Resources, to help indicate the cumulative impacts of past, present, and future actions. Some of the relevant trends include the following:

- A decrease in marine birds (particularly scoters, loons, and grebes) and increase in California sea lions and harbor seals;
- A decline in native eelgrass in Hood Canal;
- An increase in the size and duration of phytoplankton blooms and a corresponding decrease in overall DO levels;
- A decrease in some fish stocks (salmon, rockfish, spiny dogfish, Pacific cod, and hake);
- Increased shoreline sediment erosion due to shoreline armoring and in-water structures; and
- An overall decline in fecal coliform levels.

5.2.2.4 Habitats of Migratory Marine Animals

Migratory or wide-ranging marine animals that may be present in the project area may be affected by natural events and anthropogenic activities in areas far removed from Hood Canal waters—on breeding grounds, migration routes, wintering areas, or other habitats within a species' range. Events and activities that affect the habitats and populations of these marine species outside Hood Canal include the following:

- Disease
- Natural toxins
- Weather and climatic influences
- Navigational errors
- Natural predation
- Fishing
- Hunting
- Ocean pollution
- Habitat modification or destruction
- Commercial shipping, fishing, and other vessel traffic
- Scientific whaling

5.3 Cumulative Impacts to Environmental Resources

Following is an assessment of the cumulative environmental impacts of the EHW-1 when combined with past, present, and reasonably foreseeable actions. The purpose of the cumulative impacts analysis is to identify and describe impacts of the proposed action that may be insubstantial by themselves but would be considered substantial in combination with the impacts of other actions and trends. The impacts of other actions are assessed using available information, and trends in environmental conditions are derived from the 2007 Puget Sound Update—Ninth Report of the Puget Sound Assessment and Monitoring Program (PSAT, 2007a).

Since the information available on past, present, and reasonably foreseeable actions varies in quality and level of detail, impacts of these actions were quantified where available data made it possible; otherwise, professional judgment and experience were used to make a qualitative assessment of impacts. In some cases, there may be a combination of both quantitative and qualitative analysis. Where this is the case, professional judgment was used to evaluate the impact.

Several major sources of quantitative information were available, particularly concerning past and present Navy actions. Among these were NEPA and ESA documentation, including environmental impact statements, environmental assessments, and biological assessments.

In this assessment of cumulative impacts, the impacts of the proposed action are represented. The proposed mitigation measures (Chapter 4) would be implemented to compensate for the impacts to marine habitats and species so that the proposed action would make no net contribution to cumulative impacts. Effects of this mitigation for specific resources are delineated in the following sections.

5.3.1 Bathymetry Cumulative Impacts

The ROI for bathymetry is defined as Hood Canal. The bathymetric impacts of the proposed action are localized.

The overall bathymetry of Hood Canal has not changed much over time, except for localized changes in water movement around in-water structures. Past and present placement of in-water structures during construction (e.g., anchors, pilings, floats, boat ramps) for Navy actions such as Marginal Wharf, Service Pier, KB Docks, and Delta Pier, may cause localized scouring and deposition. The overall bathymetry of Hood Canal has likely changed over time as a result of sediment delivered by the streams and rivers that enter it. However, such changes are probably restricted to the mouth of the tributaries and evidenced by deltaic sediment fans.

These localized changes in circulation have resulted in adverse as well as some beneficial impacts. Changes in current velocities have altered bottom sediment characteristics such as the ratio of fine to coarse-grained sediments near pilings, anchors, and boat ramps. However, increased turbulence has also resulted in greater mixing in the water column, which benefits water quality. Past and present actions are estimated to have altered circulation patterns within and immediately adjacent to the 24.7 acres of overwater structures at NBK at Bangor.

Future actions (Navy and non-Navy) would result in approximately 3 additional acres of impacted area, for a total estimated area of 27.7 acres. An additional unknown area has been affected by past non-Navy actions. The proposed EHW-2 would impact 6.3 to 8.5 acres, for a known total of 34 to 36 acres in which in-water structures have affected or would affect bathymetric conditions. The impacts of the proposed action would be strictly localized, however, compared to the circulation and current movement produced by tides, winds, and density differences throughout the entire Hood Canal water body, the changes to circulation from the proposed action are not expected to contribute to cumulative impacts in Hood Canal. Driving and extracting the piles would create a minor and temporary suspension of sediments. The Test Pile Program would occur in conjunction with the EHW-1 Pile Replacement Project and would likely cause temporary changes to bathymetry during the construction periods. The proposed action, in combination with other Navy and non-Navy past, present and reasonably foreseeable future actions, would not contribute to cumulative impacts in Hood Canal.

5.3.2 Geology and Sediment Cumulative Impacts

Sediment impacts include changes in the transport and distribution of sediments (sedimentation) as well as changes in sediment quality or characteristics. The ROI for geology and sediments is defined as Hood Canal and its watershed. Watershed drainage represents an important source of fresh water and sediments, as well as human-derived pollutants that contribute to the contaminant loading of Hood Canal. Water circulation in Hood Canal mixes, disperses, and redistributes the watershed loadings such that marine sediment quality conditions at different locations within Hood Canal reflect the magnitude and relative contributions of inputs from multiple sources within the ROI. The impacts of past and present actions are reflected in the description of existing sediment conditions in Section 3.2.

Past and present Navy and non-Navy actions involving land clearing and disturbance of soils has resulted in soil and sediment erosion along Hood Canal. The establishment of vegetation could become hindered due to soil and sediment loss contributing to further erosion. Eroded soils could then be carried into Hood Canal by stormwater runoff and thus impact water quality. Adverse impacts to geologically hazardous areas, such as steep slopes, have occurred as a result of past non-Navy projects. These projects have increased the stormwater runoff and/or overburdened the tops of slopes with structures, leading to slope failure. However, geologically hazardous areas are now managed more carefully by following the guidance or standards of local governments or agencies (e.g., Kitsap County Code for Geologically Hazardous Areas) and through application of construction BMPs for sloped surfaces, such as silt fencing, roughening sloped surfaces, and planting native vegetation. Standard stormwater construction BMPs have also reduced the amount of soil erosion that occurs during land disturbing activities.

Past and present actions involving in-water construction (i.e., pile driving and dredging) in Hood Canal have caused or are causing short-term disturbances to sediment. Pier replacement projects and shoreline armoring have resulted in erosion and coarsening of shoreline sediments in some areas of Hood canal. In-water structures, such as EHW-1, create accretion of sediments in some locations and erosion of sediments on the down-drift side of these structures. Future shoreline development and placement of in-water structures, including the Land-Water Interface and the Olympic View Marina, would likely add to existing erosion and accretion of shoreline sediments. Many of the in-water projects including marinas, boat ramps, and Navy piers have resulted in an increased use of boats in the nearshore area. Boats that operate in these areas have the potential to disturb sediments from their propeller wash. The impact is similar to what was described in Section 3.3, Water Resources, for in-water work, where there is a slight change in the ratio of fine- to coarse-grained sediment in localized areas. The cumulative impacts of in-water construction and propeller wash have been inconsequential when compared with movement of sediment by tides and currents.

Sediment quality has also been impacted by development over time. In some locations, chemicals discharged into Hood Canal via stormwater runoff, streams, and other sources have accumulated in sediments and been absorbed in the tissues of marine organisms. In general, however, levels of chemical contaminants and toxicity in Hood Canal sediments are low (WDOE, 2007). Current sediment quality in the vicinity of the proposed action is generally good (Hammermeister and Hafner, 2009). The organic content of sediment is low, and levels of all measured contaminants, such as metals, butyltins, polycyclic aromatic hydrocarbons, PCBs, and pesticides, are below thresholds specified in sediment quality standards.

The Test Pile Program would result in additional disturbance of shoreline sediments. The impacts to sediments resulting from the proposed action would be temporary and localized. Driving and extracting the piles would create a minor and temporary suspension of sediments. The Test Pile Program would occur in conjunction with the EHW-1 Pile Replacement Project and would cause temporary suspension of solids in the water column during construction periods. Piles used in the Test Pile Program would be removed at completion. The proposed action, in combination with Navy and non-Navy past, present, and reasonably foreseeable future events would not have a significant cumulative impact on geology and sediments.

5.3.3 Water Resources Cumulative Impacts

The ROI for marine water quality is defined as Hood Canal and its watershed. Watershed drainage represents an important source for freshwater and sediments, as well as human-derived pollutants associated with the watershed runoff that contributes to the contaminant loading of Hood Canal. Water circulation in Hood Canal mixes, disperses, and redistributes the watershed loadings such that marine water conditions at different locations within Hood Canal reflect the magnitude and relative contributions of inputs from multiple sources within the ROI.

The impacts of past and present actions are reflected in the description of existing water quality conditions in Section 3.3. Water quality in Hood Canal has been and is being impacted by past and present in-water and upland actions and would potentially be impacted by future actions. Specific impacts include (1) incidental spills associated with boat operations, such as fueling, or other activities conducted on piers, wharves, and floats; (2) sediment disturbance and turbidity from propeller wash in shallow areas; (3) toxin leakage attributable to the use over time of materials such as treated wood pilings; (4) stormwater runoff; and (5) nutrient and pollutant loading from septic systems or development. Most of these events, except for treated materials, result in periodic inputs of pollutants (i.e., fuel, oil, and other contaminants) directly to Hood Canal, which can impact turbidity, pH, temperature, salinity, DO, and biochemical oxygen demand (BOD).

Unless there is a major spill of material such as fuel, oil, or other toxic material transported or associated with boat traffic that would impact water quality conditions, incidental spills usually do not result in long-term cumulative impacts. Hood Canal is a large enough water body that it can absorb small spills, such as those that may occur when fueling vessels, without any long-term impacts to water quality.

Propeller wash in shallow areas impacts water quality by disturbing sediment and causing turbidity. However, this is typically a short-term impact and does not usually result in a cumulative impact to water quality because sediment settles out fairly rapidly.

Most of the waterfront structures at NBK at Bangor and other existing non-Navy sites are supported by pilings, many of which were treated with creosote, which is now known to contain toxic chemicals. Other wood materials historically used to construct docks, boathouses, and other facilities included pressure treated wood, which is now known to leach chromated copper arsenate and other pesticides. Over time, these materials are no longer being used and are being replaced with environmentally neutral materials that do not leak toxins (discussed below). Thus, the impacts to water quality from this source have decreased over time.

Upland development has caused localized deterioration in the water quality in Hood Canal, mainly from uncontrolled stormwater runoff, failing septic systems, and mismanagement of animal wastes. Stormwater runoff can carry contaminants, such as heavy metals and oils from hard surfaces such as roads, and nitrogen and phosphorus from lawn fertilizers into streams that empty into Hood Canal. While irregular in nature, stormwater-related inputs to water quality may be relatively intense during storm events. Contaminants in the stormwater runoff can adversely impact DO, BOD, pH, and other water quality parameters in localized areas.

Most development in the Hood Canal watershed (excepting NBK at Bangor) uses septic systems, and many older systems have failed over time. Fecal coliform bacteria and nutrients are periodically discharged into Hood Canal through stormwater runoff from areas with inadequate septic systems. Though fecal coliform bacteria are not harmful to humans, the presence of fecal coliform indicates the possible presence of pathogenic viruses or bacteria. Fecal coliform bacteria can also by absorbed and concentrated in shellfish making them unsuitable for human consumption.

Nutrients are a larger problem because they can cause algae to bloom. When algal blooms occur, they cause DO to be rapidly used up during bacterial decomposition of dead plankton. This rapid loss of DO can result in fish kills. Animal wastes from hobby farms or sites where animals are bred are also a source of nutrients. These sources of nutrients have long been recognized as causing the low DO problem in Hood Canal. Efforts have been made to eliminate the use of septic systems or to repair failing systems to the extent possible, particularly in nearshore areas, and to control point sources such as hobby farms. However, in the Hood Canal watershed, some future development would continue to use septic systems because sewers are not available in many areas.

Recent trend data point to an overall reduction in fecal coliform in the future (PSAT, 2007b), particularly in light of plans to construct new sewer lines in southern Hood Canal and other actions (e.g., Belfair Sewer Line; see also Section 5.2.2.2, Agency Plans for Improving Environmental Conditions in Hood Canal).

Although fecal coliform levels are expected to decrease, the State of the Sound Report (PSAT, 2007b) states that the overall trend is for continued deterioration of water quality in Hood Canal due to a rise in toxic contaminants and a lowering of DO levels, regarded as water quality parameters of major concern. Various waters in Puget Sound are listed as impaired by WDOE, including southern Hood Canal (PSAT, 2007b).

Most of the future actions would have no impact or variable (sometimes minimal) short-term impact, and some future actions would be designed to minimize such impacts. For example, all new piers, including the proposed action, would use concrete or steel pilings, which, unlike creosote-treated piles used in the past, would not have the potential for leaching toxic compounds into the water. Several proposed projects (e.g., the Belfair Sewer Line) and actions (e.g., initiatives reflected in Hood Canal Agency plans) would be implemented specifically to improve water quality in Hood Canal (see Section 5.2.2.2). The projects identified as Routine Operations and Maintenance and Transit Protection Systems Operations, which entail various port and vessel operation activities, could have longer-term impacts to water quality.

During the time frame of the proposed action, EHW-1 would be occurring. EHW-1 involves the replacement of wharf piles and removal of a fragmentation barrier and walkway. Impacts would be similar to those of the proposed action and with BMPs in place (similar to BMPs used for the Test Pile Program); cumulative impacts would not significantly affect long term water quality in the proposed project area. Bubble curtains would be used for noise mitigation during impact driving, but these curtains would also confine turbidity plumes and increase DO concentrations. Nevertheless, the proposed action would contribute incrementally to cumulative water quality impacts in Hood Canal overall. For mobile species such as fish, marine mammals, and marine birds, the water quality impacts of the proposed action could be additive with impacts from other actions in Hood Canal (see Sections 5.3.8, 5.3.9, and 5.3.10, respectively). Tribal use occurs south of the Test Pile Program and the EHW-1 Pile Replacement Project. Cumulative impacts are not anticipated to impact water quality in the area where tribal access and shellfish harvesting occurs.

If the construction periods for the proposed EHW-2 and other projects listed in Table 5.1overlap, there is little potential for the water quality impacts of the projects to overlap in space, because these impacts would be localized respective to the individual projects. However, all projects would contribute incrementally to cumulative water quality impacts in Hood Canal, and mobile species occurring at NBK at Bangor could be affected by the projects listed in Table 5.1 within a short time period. The proposed action, in combination with Navy and non-Navy past present and reasonably foreseeable future events would not have a significant cumulative impact on water resources due to the temporary and localized extent of the proposed project.

5.3.4 Air Quality Cumulative Conditions

The ROI for air quality is the Puget Sound Clean Air Agency (PSCAA) region, which encompasses localities in Kitsap County or the Hood Canal region, as the PSCAA is delegated by the state of Washington to regulate the state's Clean Air Act (CAA). Since short-term construction air quality impacts would be limited to the Kitsap County or Hood Canal region only, the cumulative air quality impacts are addressed in terms of contributions to the PSCAA region.

Existing air quality has been, is being, or would potentially be impacted by past, present, and future actions to varying degrees, depending on the project. For example, residences and facilities such as parks have had little impact to air quality, while vehicles and industrial operations may produce a number of emissions, including VOCs, nitrogen oxides, particulates, or other emissions. Water and land-based construction activities along Hood Canal such as the construction of piers, docks, marinas, homes and businesses may also result in air emissions.

The trend for air quality is fairly stable, since point sources have been targeted by regulations and are limited in their emissions. Also, outside the urban areas of the county, air emission sources such as woodstoves are fairly spread out due to large lot development, and any impacts are localized. The Hood Canal region is rated as good (the highest rating) in air quality (PSCAA, 2009a), is in compliance with all air quality standards, and is currently in an attainment area for all pollutants. Kitsap County is in attainment for all NAAQS. The most recent emissions inventory for the PSCAA shows that a rather low percentage of total emissions is associated with stationary and mobile sources in Kitsap County. Past development and subsequent operation of emission sources in Kitsap County have not contributed to exceedances of the NAAQS, and the region is in attainment for all applicable air quality standards.

Future Navy and non-Navy actions that produced sizeable air emissions would be required to install abatement measures to limit emissions and would be required to comply with permit conditions on the amount of air pollutants generated. Thus, it is not anticipated that future actions would result in violations of air quality standards. Planned future development in Kitsap County is consistent with or below the emissions estimates contained in the State Implementation Plan. The proposed action would generate short-term air emissions, such as VOCs, carbon monoxide, nitrogen oxide, and particulates from boats, vehicles, and equipment. However, the impacts would be localized, and individual emissions of these criteria pollutants would be well below the air quality standard compliance levels.

Combined emissions from concurrent construction of the Test Pile Program, the EHW-1 Pile Replacement, and the proposed EHW-2, would be well below air quality standard compliance levels. Emissions from the proposed action are not expected to significantly add to the cumulative impacts to existing air quality of all past, present, and reasonably foreseeable actions. This is because existing levels of criteria pollutants and greenhouse gas emissions are low, emissions from the proposed action would be localized, future point sources would be required to control emissions, and the level and the type of development that would occur in the reasonably foreseeable future would not produce substantial emissions.

5.3.4.1 Greenhouse Gases

It has been generally accepted in the scientific community that human-generated emissions of greenhouse gases over the past century have led to increasing global air temperatures. Greenhouse gases, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and fluorinated gases, have a propensity to trap heat in the atmosphere. CO2 is the predominant greenhouse gas emitted by human activities, primarily from the combustion of fossil fuels such as coal, oil, and natural gas. The observed increase in average global air temperatures since the mid-twentieth century is very likely a result of increased atmospheric concentrations of greenhouse gases (Intergovernmental Panel for Climate Change, 2007). This phenomenon is commonly referred to as "global warming." Global warming due to greenhouse gas emissions induces climate change through the complex interaction of increased temperature with various natural processes such as ocean and atmospheric circulation. Effects of climate change in turn create complex feedback loops, such as loss of reflective snow and ice cover, which increase the rate of climate change. Scientists are now in general agreement that climate change is occurring (American Meteorological Society, 2007), and that current trends are very likely to continue unless worldwide emissions and atmospheric concentrations of CO2 and other greenhouse gases are substantially reduced (Ledley et al., 1999; Energy Information Administration, 2008).

5.3.4.1.1 Climate Change

The effects of climate change may not be readily apparent in all geographic areas, including the immediate project area, as the effects occur on a global scale. Among the effects are rising air and ground temperatures, loss of sea ice, loss of protection from fall storms, and retreat of the permafrost boundaries. Sea ice has retreated by about 14 percent since 1978, and thinned by 60 percent since the 1960s, resulting in widespread effects on marine ecosystems, coastal climates, and human settlements. Recent warming has been accompanied by increases in forest disturbances, including insect infestations.

Effects of climate change on marine mammals are poorly understood due to lack of integrated baseline data (Burek et al., 2008). This lack of data on health, diseases, and toxic effects in marine mammals severely limits our ability to predict the effects of climate change on marine mammal health. The overall health of an individual animal is the result of complex interactions among immune status, body condition, pathogens and their pathogenicity, toxicant exposure, and the various environmental conditions that interact with these factors. Climate change could affect these interactions in several ways. There may be direct effects of loss of the sea ice habitat, elevations of water and air temperature, and increased occurrence of severe weather. Some of the indirect effects of climate change on animal health would likely include alterations in pathogen transmission due to a variety of factors, effects on body condition due to shifts in the prey base/food web, changes in toxicant exposures, and factors associated with increased human habitation in the Arctic (e.g., chemical and pathogen pollution in the runoff due to human and domestic-animal wastes and chemicals and increased ship traffic with the attendant increased risks of ship strike, oil spills, ballast pollution, and possibly acoustic injury). The extent to which climate change would impact marine mammal health would also vary among species, with some species more sensitive to these factors than others. Baseline data on marine mammal health parameters along with matched data on the population and climate change trends are needed to document these changes (Burek et al., 2008).

5.3.4.1.2 Ocean Acidity

It has been posited that the continued emission of CO2 is causing seawater to become more acidic as CO2 from the atmosphere dissolves in the oceans. Ocean acidification from the invasion of CO2 is a recognized phenomenon (Cicerone et al., 2004; Feely et al., 2004; Sabine et al., 2004). Scientists estimate that the oceans are now about 25 percent more acidic than they were at the start of the industrial revolution about 300 years ago. The negative effects of ocean acidification are likely to be felt on biological processes such as calcification (Orr et al., 2005; Kleypas and Eakin, 2007). Ocean acidification from CO2 invasion and reduced ventilation also may result in decreases in sound absorption for frequencies lower than 10 kHz (Hester et al., 2008). This would result in increases in ambient noise levels in ocean environments, and enhanced propagation of anthropogenic sound. The scale of potential acidification is presently unknown due to a lack of data and challenges associated with sampling on a basin-wide or regional scale. While this phenomenon is under study (Hester et al., 2008), the effects of CO2 emissions on ocean acidity and the resultant potential for enhanced sound propagation remain indeterminate due to incomplete information.

5.3.4.1.3 Greenhouse Gas Cumulative Effects

The potential effects of proposed greenhouse gas emissions are by nature global and cumulative impacts, as individual sources of greenhouse gas emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact to global climate change would only occur when proposed greenhouse gas emissions combined with greenhouse gas emissions from other manmade activities on a global scale.

Currently there are no formally adopted or published NEPA thresholds of significance for greenhouse gas emissions. Formulating such thresholds is problematic, as it is difficult to determine what level of proposed emissions would substantially contribute to global climate change. The greenhouse gas emissions associated with the proposed action would be low, and emissions would be localized. The effect being that the level and the type of development in prospect for the reasonably foreseeable future would not produce substantial emissions or have an appreciable contribution to cumulative emission impacts.

5.3.4.2 Navy Stewardship and Energy Conservation

In response to concerns over climate change, the Navy has initiated broad programs to reduce energy consumption and shift energy demand to renewable and alternative fuels to an extent consistent with its national security mission, thereby reducing emissions of CO2 and other greenhouse gases. A number of shore installation and fleet programs have substantially reduced the generation of greenhouse gases, primarily through the conservation of fossil fuels and electricity.

Ashore, the Navy has aggressively encouraged its installations to reduce energy use, both through facility competitions and through investments in solar, wind, and geothermal technologies. Since 1985, the Navy has sponsored a worldwide energy management program that has reduced its energy use by more than 29 percent (NAVFAC Public Affairs, 2005). At Pearl Harbor, for example, the installation of approximately 2,800 energy-efficient light fixtures has reduced electricity use by about 758 megawatt-hours per year, equal to 448 tons per year of CO2 emissions (NAVFAC Public Affairs, 2008). New air conditioning chillers also installed at this installation would save another 252 megawatt-hours of electricity per year, equal to about 149 tons per year of CO2 emissions. Implementing similar energy conservation measures at Navy shore installations worldwide has substantially decreased the Navy's carbon footprint, and the Navy continues to identify new energy conservation measures.

Energy conservation aboard Navy vessels at sea also has achieved substantial reductions in fuel consumption, and thus emissions of greenhouse gases. Naval Sea Systems Command has established an Energy Conservation Awards Program to reward leading fuel conservers among underway surface ships with special recognition and cash incentives. During the first half of 2009, this program reduced the Navy's fuel consumption by about 682,000 barrels, or about 346,000 tons of CO2 emissions (Navy News Service, 2009).

The Navy also is researching and implementing new technologies that may result in substantial additional fuel savings. The new amphibious assault ship Makin Island, using a new hybrid power propulsion system, saved an estimated 900,000 gallons of fuel (equal to about 11,000 tons of CO2) on its initial voyage from the Gulf of Mexico to San Diego. As new Navy ships are placed into service and older ships are retired, the overall fuel efficiency of the Navy's fleet would substantially increase (Biello, 2009).

The Navy is also investigating new hull-cleaning technologies that could substantially reduce drag from fouling of vessel hulls by marine organisms, potentially saving millions of gallons of fuel per year. Finally, the Navy has successfully tested the use of biofuels with camelina oil to power aircraft. The Green Hornet biofuel program is the first aviation test program to test and evaluate the performance of a 50/50 biofuel blend in supersonic (above mach 1) operations – a critical test point to successfully clear the F/A-18 E/F for biofuel operations through its entire flight envelope (Navy News Service 2010). Camelina jet biofuel produces 80 percent lower carbon emissions than conventional jet fuels (Biello, 2009).

These examples illustrate the Navy's leadership role in achieving large-scale energy reductions that would substantially contribute to a long-term national effort to mitigate global climate change.

5.3.5 Ambient Noise Cumulative Impacts

The ROI for evaluating cumulative impacts for airborne noise includes the waterfront and woodland areas near the project site, extending to the Vinland neighborhood just north of the NBK at Bangor northern property boundary, the waterfront industrial area encompassing Delta Pier and Marginal Wharf, and shoreline properties on the west side of Hood Canal, west and northwest of the project site.

Most past, present, and future actions have generated, are generating, or would generate some type of noise, either from a facility itself, from vehicles traveling to and from a site, or from humans. Noise is typically a nuisance factor for sensitive receptors such as residences, hospitals, or parks, where quiet conditions are important. This is particularly true during evening hours. Close proximity to high sound levels can result in physiological problems or hearing damage. Over time the trend has been for noise levels to increase as development has occurred, particularly during daytime hours when activity levels are highest. Noise levels tend to be fairly low outside the urban areas of Kitsap County due to development on large lots (greater than 5 acres) and a general lack of industrial activity. However, some industrial areas, such as the NBK at Bangor waterfront, generate higher noise levels.

Future Navy and non-Navy actions would also generate noise. For example, the proposed EHW-2 would produce noise associated with pile driving and the construction of the wharf. The type of noise and noise levels produced would be dependent on the specific project. The impact of these noise sources would depend on their location relative to sensitive receptors, but it is likely that some of these future actions would produce nuisance noise. There are requirements to limit the level of noise produced by residential, commercial, or industrial land uses. Thus, some future development would have requirements to provide soundproofing measures.

The proposed action would generate noise from equipment, superstructure construction, industrial activities, vessel movement, and humans. All actions would occur from two hours after sunrise to two hours before sunset. The proposed action would result in a temporary increase in noise in the vicinity of the project area. The closest residence is a small rural population approximately 1.5 miles to the north of NBK at Bangor. The impact pile driver would be estimated to produce a maximum peak level of 105 dBA re 20μPa at a distance of 50 feet from the pile (WSDOT, 2010). The vibratory hammer would be estimated to produce noise levels of 95 dBA re 20μPa at 50 feet (WSDOT, 2010). Impact and vibratory hammers would never operate simultaneously. Washington noise regulations (WAC 173-60-040) limit noise levels from a Class C source (i.e. the project) which affects a Class A receiving property (i.e. residence) to 60 dBA (daytime). The impact and vibratory hammer would be used intermittently and would produce sound levels at or below 60 dBA around the nearest residence 1.5 miles from NBK at Bangor. Any impacts from the proposed action would be temporary and would not have a significant impact on ambient noise along the Bangor waterfront at NBK nor violate State noise limits.

The cumulative impacts of pile driving noise to fish, marine mammals, marine birds, and surrounding communities are discussed in Sections 5.3.8, 5.3.9, 5.3.10, and 5.3.12. Tribal consultations have been concluded for this proposed action. The Suquamish, Skokomish Tribe, Jamestown S'Klallam, Port Gamble S'Klallam Tribes, Lower Elwha Klallam Tribe and the Point-No-Point Treaty Council did not object to the proposed action. The proposed action would be concurrent with EHW-1 which involves the replacement of wharf piles and removal of some of the wharf superstructure. The aspect of these actions which have the potential to result in cumulative impacts on airborne noise would be the concurrent use of impact hammers. However, though these projects are scheduled during the same time frame, the Navy has committed to limiting the use of an impact hammer to one project at any one time to eliminate this possibility. Vibratory pile driving would have the potential to overlap as a result of concurrent vibratory pile driving that may occur between Test Pile Program and EHW-1 or the Test Pile Program and other projects further down the Bangor waterfront at NBK. When two closely located pile driving projects occur at the same time, noise levels could increase by as much as 3 dB at sites roughly equidistant between the multiple pile driving rigs. The sound pressure levels used in the analysis in Section 3.5.2.2 were from the impact hammer which produces higher sound pressure levels than vibratory hammers. As a result, even with a 3 dB increase in airborne noise from the concurrent use of vibratory pile drivers, the noise levels generated between these actions would always be in compliance with Washington noise regulations. Additionally, any effect to the ambient noise would be temporary in nature from these construction activities. This action in combination with other past, present, and reasonably foreseeable actions would not contribute to a substantial increase in ambient noise for Hood Canal and the surrounding communities. Therefore, the proposed action would not contribute to cumulative noise impacts when added to other past, present, and future actions.

5.3.6 Marine Vegetation Cumulative Impacts

The ROI for evaluating cumulative impacts to marine vegetation is defined as Hood Canal. Recent regional surveys indicate decreasing eelgrass in Hood Canal (PSAT, 2007a), so the proposed action's potential to contribute to such impacts is important. Therefore, Hood Canal as a whole is relevant for determining cumulative impacts to marine vegetation, eelgrass in particular. Marine vegetation in Hood Canal would not be affected by actions outside Hood Canal.

The impacts of past and present actions are reflected in the description of existing marine vegetation conditions in Section 3.6. Marine vegetation in Hood Canal has been, is being, or would be disturbed by past, present, and future placement of in-water structures such as pilings and anchors, dredging, underwater fills, and construction of overwater structures. These impacts include temporary or permanent loss of vegetation, reduced productivity, and changes in the type or abundance of vegetation. Recent trend data indicate that some of the more sensitive and important vegetation for critical habitat in Hood Canal, such as eelgrass, has decreased over time; eelgrass coverage declined between 8 and 15 percent in every year between 2001–2002 and 2004–2005 (PSAT, 2007a). This decrease in abundance was primarily attributed to low dissolved oxygen in Hood Canal (PSAT, 2007a).

There is currently approximately 37.7 acres of eelgrass running in a strip along the intertidal/nearshore zone of the waterfront at NBK at Bangor. Based on the known extent of current eelgrass beds, an estimated 5.2 acres of eelgrass may have been lost over time due to placement of in-water structures such as pilings and anchors. Approximately 24.7 acres of overwater shading have been created by past actions at NBK at Bangor (Table 5.2). The overwater shading reduces the productivity of marine vegetation such as eelgrass and macroalgae. Information is not readily available to quantify the amount of shading and eelgrass loss attributable to all past and present non-Navy actions in Hood Canal, although that area is likely to be similar to or greater than the area affected by past and present Navy actions.

TABLE 5.2. CUMULATIVE LOSS OF MARINE VEGETATION AT NBK AT BANGOR (ACRES)

Parameter	Total Overwater Shading	Eelgrass Loss [1]	Macroalgae Loss [1]
Past Navy Waterfront Construction	24.7	5.2	Not determined
EHW-2 [2]	6.3 – 8.5	0.09 – 0.16	0.13 – 0.2
Service Pier Extension	0.83	To be determined	To be determined
Land/Water Interface	< 0.1	< 0.1	< 0.1
Non-Navy Future Hood Canal Projects	2	Not determined	Not determined
Total	**33.9 – 36.1**	**5.4 plus undetermined amount**	**0.14 – 0.3 plus undetermined amount**

1. For the purposes of cumulative impact assessment, eelgrass loss and macroalgae loss is the known areas of flora under the proposed structures.
2. Impacts to eelgrass and other marine vegetation from the proposed project would be mitigated as part of the Mitigation Action Plan.

It is estimated that known future actions at NBK at Bangor (Land-Water Interface and Service Pier Extension) would result in approximately 0.9 acre of shading and loss of less than 0.1 acre of eelgrass. Shading of eelgrass and macroalgae from the Service Pier Extension has not yet been determined. The location of the platform for the Electromagnetic Measurement Range has not yet been determined. These actions would be designed to avoid eelgrass beds to the fullest extent possible. Other future non-Navy actions involving the placement of pilings and anchors and resultant shading would also reduce the amount of eelgrass and macroalgae. Future actions impacting eelgrass would require mitigation (in compliance with the USACE rule on compensatory mitigation for losses of aquatic resources) such that there is no net loss of this resource. It is estimated that less than 1 acre of overwater structure would be created by the actions described in Table 5.1.

The estimated combined impact of past Navy actions, future non-Navy actions, and the EHW-1 and other future Navy actions is 33.9 to 36.1 acres of shading, as well as a loss of eelgrass and macroalgae; that is, actions that have contributed to past declines can be expected to contribute to future declines in eelgrass in Hood Canal (PSAT, 2007a). Hood Canal currently supports approximately 550 acres of eelgrass; northern Hood Canal (north of the tip of Toandos Peninsula) supports approximately 220 acres (Simenstad et al., 2008). Cumulative impacts to eelgrass beds could potentially affect the functions of these habitats, including primary productivity, habitat for invertebrates and epiphytic algae, and feeding and refuge for juvenile fish. However, because the proposed action is expected to have minor and temporary impacts on marine vegetation, is unlikely that the Test Pile Program would contribute to any lasting or noticeable cumulative impacts to the overall health and distribution of marine vegetation at NBK Bangor.

5.3.7 Benthic Invertebrates Cumulative Impacts

The ROI for evaluating cumulative impacts to benthic communities and shellfish is defined as Hood Canal. Regional surveys indicate a reduction in abundance and diversity for the benthic community in Hood Canal (PSAT, 2007a), so the proposed action's contribution to such impacts is important. Therefore, Hood Canal as a whole is relevant for determining cumulative impacts to benthic communities and shellfish. Benthic communities and shellfish in Hood Canal would not be affected by actions outside Hood Canal.

The impacts of past and present actions are reflected in the description of existing conditions for benthic invertebrates in Section 3.7. Past, present, and future Navy and non-Navy actions, including marinas, residential docks, boat ramps, and piers involving placement of pilings and anchors have resulted or would result in the direct loss of the natural benthic soft-bottom habitat. This habitat is replaced by the hard surfaces of pilings and anchors, and as a result, the types of benthic organisms have changed and are changing in these localized areas. Hard surfaces create sites for colonization by species adapted to these surfaces, such as mussels and sea anemones. Thus, the cumulative impact of in-water structures has been to replace native soft-bottom habitat with hard-surface habitat over time. This has adversely impacted some species (including prey species for juvenile salmonids) while benefiting others. It is estimated that approximately 2.4 acres of benthic soft-bottom habitat has been lost and converted to hard-surface habitat due to placement of in-water structures along the NBK at Bangor waterfront to date.

The overwater portion of structures has also increased shading and nighttime lighting impacts to benthic invertebrates. Shading can impact the abundance of some benthic organisms and lighting can increase predation rates. Shading and loss/alteration of soft-bottom habitat has impacted the type and abundance of benthic organisms that occur in the vicinity of these structures. In addition, in-water structures at the base have resulted in accretion of sediments in protected areas created by these structures, and possibly erosion in areas downdrift of these structures. The areas of accretion would favor benthic species typical of coarse sediments. The most relevant of these areas is an area of accretion about 2 acres in size within EHW-1. Any areas of erosion would result in adverse impacts to sediment-dwelling species. These changes would adversely affect foraging by juvenile salmon, which prefer species typical of fine-grained sediments and eelgrass beds, as well as food for marine mammals, fish, birds and humans.

The recent trend for the benthic community in Hood Canal is a reduction in abundance and diversity (PSAT, 2007a). This trend is strongest in southern Hood Canal and in deeper waters and includes decreases in the native Olympia oyster, which occurs intertidally in Hood Canal but has not been detected in surveys along the NBK at Bangor waterfront. Stress-sensitive species (i.e., those species that cannot tolerate poor water quality conditions such as low DO levels or high toxicant concentrations in sediments) are more abundant in northern Hood Canal, which includes NBK at Bangor, than in southern Hood Canal. Low DO levels are considered a likely cause of this trend, but other contributing factors such as sediment contamination is being investigated (PSAT, 2007a).

Future in-water structures would similarly result in a direct loss of benthic habitat and organisms. The conversion of soft-bottom habitat to hard surfaces from past, present, and other foreseeable future actions would include approximately 2.5 acres from Navy actions and an unquantified area from past non-Navy actions. In addition, the EHW-1 Pile Replacement Project would occur in the same timeframe in 2011 (July 16 to October 31). Approximately 2 acres is expected to experience accretion of sediments, and areas down-drift (north) of the proposed EHW-2 may experience erosion and loss of sediment-dwelling benthic community. The trend for Hood Canal as a whole is for decreasing abundance and diversity of the benthic community, although this trend is stronger in southern Hood Canal than in the NBK at Bangor area. The proposed action is temporary and would not contribute to any permanent cumulative losses to benthic communities.

5.3.8 Fish Cumulative Impacts

The ROI for evaluating cumulative impacts to marine fish is defined as Hood Canal. Depending on the species, there is varying potential for actions elsewhere in Hood Canal to impact fish affected by the Test Pile Program. Those species that are the most transitory would be Hood Canal salmonids, whereas resident species are more restricted in their movement. Juvenile salmonids originating from Hood Canal streams migrate northward along the shoreline. In general, upon exiting Hood Canal these fish turn west toward the Strait of Juan de Fuca and the Pacific Ocean and do not enter the waters of Puget Sound proper. Therefore, with respect to impacts from outside Hood Canal, resident Hood Canal fish species would not be affected by such actions. Migratory fish such as salmon move beyond Hood Canal, but the potential for human actions to affect these fish as they move between the mouth of Hood Canal and the Pacific Ocean is considered low. The contribution of effects on fish occurring in the ocean to cumulative impacts of the proposed action is very difficult to define, but it is acknowledged that there is such a contribution.

5.3.8.1 Salmonids

The impacts of past and present actions are reflected in the description of existing marine fish conditions in Section 3.8. Past actions have adversely impacted populations of salmonids (salmon, steelhead, and trout, including threatened and endangered species) in Hood Canal and tributaries through loss of foraging and refuge habitat in shallow areas, reduced function of migratory corridors, loss and degradation of spawning habitat in streams, interference with migration, adverse impacts to forage fish habitat and spawning, contamination of water and sediments, and depletion of DO. Another factor that has resulted in adverse impacts to salmonid abundance is the overharvest by fisheries. This impact has been greatest on native stocks. Practically all chum salmon and most Chinook salmon spawning in Hood Canal stream systems are derived from naturalized hatchery stock. Populations of pink salmon, coho salmon, bull trout, and steelhead are also in decline. The net result is that several Hood Canal salmonid species have been listed as threatened under the ESA. Existing Navy structures have affected salmonid and forage fish habitat, and similar to in-water structures throughout Puget Sound (Salo et al., 1980; Simenstad et al., 1999; Nightingale and Simenstad, 2001a; and Southard et al., 2006) have probably impeded and continue to impede juvenile salmon migration to some degree. Current and future waterfront projects at NBK at Bangor would be designed and implemented to minimize impacts to salmonid habitat and migration, and to forage fish. Design aspects include large spacing (e.g., 25 feet) between piles, increased structure height-over-water in nearshore waters, and building materials (e.g., grating) that allow the transmission of light.

The State of the Sound Report (PSAT, 2007b) describes several trends that may be indicative of cumulative impacts to the growth and development of salmonids. There is an increasing trend for toxics to be concentrated in the tissues of Puget Sound Chinook and coho salmon. These salmon have been found to have in their bodies 2 to 6 times the PCBs and 5 to 17 times the polybrominated diphenyl ethers (PBDEs) of other West Coast salmon populations. Wild salmon stocks declined from 93 to 81 healthy stocks between 1992 and 2002, and 7 stocks became extinct during that same period. Habitat loss and degradation, hatcheries and harvest management issues, commercial fishing, tribal fishing, and sport fishing contribute to impacts to fish stocks in Puget Sound in general.

Future Navy and non-Navy actions could have some of the same impacts as described above for past actions, notably habitat loss or alteration, and the decreased function of migratory corridors. However, federal or federally funded actions that have occurred since legislation, such as the ESA, MMPA, and NEPA, was enacted have been considering and are required to consider environmental impacts to threatened and endangered species, prepare analysis (including a biological assessment), and consult with federal regulatory agencies to minimize project impacts. Future actions are also required to go through this same process. Future actions at NBK at Bangor would be designed and implemented to minimize impacts to salmonids. For the proposed action, these measures include designing projects offshore away from intertidal and shallow subtidal habitats to the maximum extent practicable, limiting in-water work to the maximum extent practicable, observing work windows, taking measures to reduce construction-related noise, and effecting habitat mitigation. The above processes and actions would help to ensure that the impacts of projects are below levels that would endanger the continued existence of these species.

Currently, efforts are being made to reverse the decline of fish populations by regulating development and restoring fish habitat. Numerous salmon preservation and restoration groups have proposed and constructed habitat restoration projects in Hood Canal. Most of these projects are on the east and south sides of the canal. The majority of Hood Canal salmonid-bearing river systems also occur in the southern portion of the canal. Efforts to reduce construction impacts to salmonids and other fish have resulted in a schedule of in-water work periods that all projects must adhere to if authorized by state (WDFW) or federal (USACE) regulatory authorities. The work windows help minimize adverse impacts to migrating and spawning fish.

Individual fish may be exposed to impacts from pile installation/removal including sound pressure levels during pile driving operations which may result in injury or behavioral disturbance depending on the distance of the fish to sound source. Fish that occur in the immediate project area would be exposed to underwater noise that could injure or disturb fish or their larvae during pile driving activity. Because vibratory pile driving is the primary installation method, the most likely impact to fish from pile driving activities at the project area would be temporary behavioral disturbance. Any fish which are behaviorally disturbed may change their normal behavior patterns (i.e., swimming speed or direction, foraging habits, etc.) or be temporarily displaced from the area of construction. Any exposures would likely have only a minor effect and temporary impact on individuals and would not result in population level impacts. Indirect effects of pile driving operations, such as changes in water quality (i.e. dissolved oxygen, turbidity) are expected to be localized and short-term. Fish are expected to avoid areas with elevated suspended sediments or experience minor behavioral effects due to changes in turbidity. Any impacts to fish from water quality are expected to be minor and temporary.

As described in Section 3.8, Fish, implementation of the proposed pile driving activities for the Test Pile Program would have insignificant effects on fish. The Navy determined that the proposed action may affect, is likely to adversely affect the threatened Hood Canal summer-run chum salmon, Puget Sound Chinook salmon, Puget Sound steelhead. NMFS agreed with these determinations in the Biological Opinion and determined the proposed action would not likely jeopardize the continued existence of these species. The proposed action is likely to result in behavioral disturbance to these species of salmon from underwater sounds associated with pile driving; however, these effects would likely be localized, temporary disturbances to fish within the project area. Some incidence of injury could also occur depending on the distance of individual fish from the pile during installation.

Past, present, and future development projects have had, continue to have, or would be expected to have the potential to result in many of the impacts to salmonids described above, and add to declining population trends. Although there are ongoing and future actions and plans to improve conditions for salmonids in Hood Canal (described above), the impacts of the proposed action would result in short-term increases in underwater noise and turbidity, and long-term degradation of some nearshore physical habitats and biological communities, thereby contributing to cumulative impacts to these species. However, because impacts are short-term and localized if actual construction schedules for projects involving pile driving do not overlap, resulting cumulative impacts would be reduced accordingly.

Cumulative impacts to salmon have the greatest potential to occur during simultaneous pile driving exposure events from the Test Pile Program and other projects in the vicinity. For instance, during the time frame of the proposed action, the EHW-1 Pile Replacement Project would be occurring in July – Oct 2011. The EHW-1 project involves the installation of 28 steel pipe piles and the removal of 138 steel and concrete piles of varying sizes on the southwest corner of the wharf. The EHW-1 project impacts would be similar to those of the proposed action. Though not occurring during the same time period, the Test Pile Program shares a geographic overlap with the future construction of the second EHW at NBK at Bangor. The EHW-2 project involves the construction of a pile supported wharf (~1250 piles) to support TRIDENT submarine homeporting, maintenance, and operations at NBK at Bangor. The Navy has considered the cumulative effects that may result from these actions.

Of greatest concern to fish safety would be the potential for their acoustic injury zones to overlap spatially and temporally. While spatially, the zones are not large enough to overlap, the Navy has also committed that these projects would not simultaneously impact pile drive to limit the temporal overlap and ensure that the combined energy of two rigs operating at once, would not increase the potential injurious zones. With regard to impact pile driving, for the proposed action, only 18 test piles are anticipated to require impact proofing, however, should any of the piles being installed as part of the project fail to meet its necessary embedment depth during vibratory pile driving, there is a contingency that the Navy may need to impact pile drive the piles the rest of the depth. Any impact pile driving during the Test Pile Program would be limited to 100 strikes per day or a total of 1500 strikes during the duration of the project. With regard to the EHW-1 Project, the action is limited to impact pile driving only 5 piles per year, one per day, with a maximum of 15 minutes of pile driving per day. While the proposed EHW-2 project would occur after the completion of the Test Pile Program, because it would occur in the same location it may cumulatively affect the same fish populations. The proposed EHW-2 project has estimates that over three construction windows between 200-400 days of in-water impact pile driving may be necessary with a worst case scenario of up to 6,400 pile strikes per day. However, no more than one pile would be driven with an impact hammer at any one time amongst these projects. In addition, in July – October 2011 when the Test Pile Program and EHW-1 Project would co-occur, within a given day, the total number of impact hammer strikes that may be used by any combination of these projects would be limited to 100 strikes. Behavioral disturbance zones from vibratory pile driving would have the potential to overlap as a result of concurrent vibratory pile driving/removal that may occur between the Test Pile Program and EHW-1. When two closely located pile driving projects occur at the same time, noise levels could increase by as much as 3 dB at sites roughly equidistant between the multiple pile driving rigs. The concurrent use of vibratory hammers may result in a slight increase in the zone of behavioral harassment, but these impacts would be temporary.

With BMPs and mitigation in place (i.e. sound attenuation devices, the use of shutdown zones, etc.) cumulative impacts would not significantly affect fish populations in the project area. Nevertheless, the proposed action and other future actions would incrementally contribute to cumulative fish impacts in the Hood Canal overall. Continued adherence to the requirements of the ESA and MSFCMA by NBK at Bangor would limit disturbance to fish and ensure that important habitats do not become degraded.

5.3.8.2 Other Marine Fish Species

Prior to the 1980s, in-water construction of docks, piers, and boat ramps in Hood Canal impacted fish species presence and abundance (including threatened and endangered species) particularly when it was not yet recognized that in-water construction work should not occur during spawning of forage fish species such as sand lance, Pacific herring, and surf smelt. Underwater noise from pile driving, for example, can cause fish mortality, as well as changes in fish behavior. Since the 1980s, in-water construction has been limited to work windows that minimize adverse impacts to migrating juvenile salmonids. Even so, underwater construction noise continues to adversely impact the abundance and occurrence of some fish close to the construction activities.

Navy and non-Navy actions involving placement of in-water structures have changed and would continue to change fish habitat in and around these structures. In-water structures can impact fish in several ways: (1) increasing the presence of predators that prey on juvenile fish by providing structures for habitat that can attract these predators that would otherwise not be present; (2) posing a barrier to fish movement, particularly juvenile fish; (3) causing direct loss of marine vegetation such as eelgrass, which is important habitat for forage fish and other species; and (4) creating shade that reduces the productivity of aquatic vegetation and benthic organisms, which are preyed on by fish.

Water quality has been and is being impacted by past and present actions and could be impacted by potential future development. In particular, DO levels in Hood Canal are chronically impacted by nutrient levels from development activities that have increased over time. Nutrients can cause algal blooms that deplete DO and result in fish kills (see Section 4.3.2, Water Quality). Many of the other types of past and ongoing impacts described above for salmonids also apply to other marine species.

Trend data have shown a decrease in some fish species such as rockfish (including threatened and endangered species), spiny dogfish, Pacific cod, and hake, as well as increased toxics in the tissues of some species such as Chinook salmon (PSAT, 2007a). Habitat loss and degradation, hatcheries and harvest management issues, commercial fishing, tribal fishing, and sport fishing contribute to impacts to fish stocks in Puget Sound in general.

Future Navy and non-Navy actions could have impacts similar to those described above for past actions. Impacts to fish populations are expected to be reduced by (1) the protective measures taken to minimize impacts during construction activities, (2) the design elements that reduce long-term impacts to nearby habitats, and (3) the strengthened environmental planning and design of recent and future actions. Future actions, including Navy actions, would be designed and implemented to minimize impacts to fish and their habitat. In addition, many of the habitat restoration projects discussed above for salmonids would also benefit non-salmonid fish species.

Impacts on other marine fish and their habitats would be similar to those described above for salmonids. The impacts of turbidity and underwater noise generated during pile driving would also be expected to be similar.

Past, present, and future development actions have had, continue to have, or would be expected to result in many of the impacts to marine fish described above, and thus to add to declining population trends. Although ongoing and future actions and plans are intended to improve conditions for marine fish species in Hood Canal (described above), the impacts of the proposed action would result in short-term increases in underwater noise and turbidity (as described above for salmonids), and long-term degradation of some nearshore physical habitats and biological communities, thereby contributing to cumulative impacts to these species. It is not possible to define the significance of this contribution for the impacted species, except that it would occur at a time of a downward trend for these populations. All construction-related actions at NBK at Bangor are designed and implemented to minimize impacts to marine fish species. These measures include designing projects offshore away from highly productive intertidal and shallow subtidal habitats to the maximum extent practicable, limiting in-water work to the maximum extent practicable, observing work windows, and taking measures to reduce construction-related noise. Although these actions do not necessarily mean that the proposed action and all future actions would have no impact to marine fish species, such actions would help to ensure that the impacts of projects were below levels that would endanger the continued existence of these species.

As described in Section 3.8 Fish, implementation of the proposed action would have insignificant effects of fish. The proposed action would have no effect on the green sturgeon and Pacific eulachon. Forage fish species occurring along the Hood Canal in the vicinity of the proposed action be affected, but are not likely to be adversely affected. The Navy received concurrence from USFWS that the proposed action may affect, but would not likely adversely affect the bull trout. The Navy determined that the proposed action may affect, is likely to adversely affect the threatened Puget Sound/Georgia Basin distinct population segments (DPSs) of canary rockfish and yelloweye rockfish; and the endangered bocaccio of the Puget Sound/Georgia Basin. NMFS agreed with these determinations in the Biological Opinion and determined the proposed action would not likely jeopardize the continued existence of these species. Cumulative impacts on other marine fish and their habitats would be similar to those described above for salmonids.

5.3.9 Marine Mammals Cumulative Impacts

The ROI for evaluating cumulative impacts to marine mammals is defined as Hood Canal. Depending on the species, there is a varying potential for actions elsewhere in Hood Canal to affect marine mammals affected by the Test Pile Program. Resident harbor seals are unlikely to be affected by actions outside Hood Canal. Other marine mammal species (sea lion species and cetaceans) are migratory or wide-ranging and may be affected by such actions. The contribution of effects on marine mammals occurring in the ocean and inland waters outside of Hood Canal to cumulative impacts of the Test Pile Program is very difficult to define, but it is acknowledged that there is such a contribution.

Construction and operation of past, present and future waterfront projects have resulted in increased human presence, underwater and airborne noise, boat movement, and other activities, which have likely impacted some water-dependent wildlife such as marine mammals in the area. Increased anthropogenic noise in the marine environment has the potential to cause behavioral reactions in marine mammals including avoidance of certain areas. However, the abundance and coexistence of these species with existing anthropogenic activities suggests that cumulative effects have not been significant. Population trend data for Hood Canal indicate that most of the marine mammal species expected to be in the project area are either stable or increasing in recent years based on NMFS stock assessment reports despite past and present actions (Carretta et al., 2008; Allen and Angliss, 2010). For instance, the U.S. stock of California sea lions is nearly at its carrying capacity, harbor seals within the inland waters of WA are at their optimum sustainable population level, and the Eastern stock of Steller sea lions was recently proposed as a candidate for removal from the ESA based on an increase in population size of ~3.0% per year since 1970 (NMFS, 2008d). Continued regulation of marine mammal exposures to anthropogenic disturbance by NMFS under the MMPA, coupled with stock assessments, documentation of mortality causes, and research into acoustic effects, ensure that cumulative effects would be minimized. The regulatory process also ensures that each project proposing take of marine mammals is assessed in light of the status of the species and other actions affecting it in the same region.

Past, present, and future development have contributed and would contribute to a continuing increase in concentrations of toxic materials and PCBs in waters such as Hood Canal (PSAT, 2007a). There are numerous sources and pathways for toxics to enter the water. For example, toxics may enter marine waters through the following: surface water runoff, aerial deposition, wastewater discharges, combined sewer overflows, groundwater discharge, leaching from contaminated bottom sediments, direct spills into marine waters, and migrating biota such as salmon. These contaminants are affecting the health of marine mammals. For example, the levels of contaminants in harbor seals have increased dramatically over the past 20 years (PSAT, 2007a).

Future Navy and non-Navy waterfront projects may have similar impacts to past and present actions including increased anthropogenic sound (both airborne and underwater), increased human presence, increased boat movements and other associated activities. These actions could result in behavioral impacts to local populations of marine mammals, such as temporary avoidance of habitat, decreased time spent foraging, increased or decreased time spent hauled out (depending on the activity), and other minor behavioral impacts. Most impacts would likely be short-term and temporary in nature and unlikely to affect the overall fitness of the animals. However, some projects such as the construction of the proposed EHW-2 at NBK at Bangor may result in more moderate impacts due to longer construction timelines (3-5 years). Impacts to marine mammals are still expected to primarily result from behavioral disturbance from underwater sound pressure levels; however, indirect impacts to marine mammals may occur as a result of impacts to their prey base (fish) during the construction and ultimate operation of the wharf. Potential effects to their prey base could include habitat disturbance during construction and overwater shading from the completed structure during its operational life. Impacts during construction are expected to be temporary. Overwater shading would be a long–term impact, but the effect to marine mammals is expected to be minimal. Overwater shading may result in a reduction in the amount or quality of submerged aquatic vegetation (SAV) which may in turn affect forage fish due to a reduction in quality habitat. However, the reduction in forage fish habitat as a result of the proposed EHW-2 would be minimal in comparison to the total habitat available in Hood Canal. Therefore, any reduction in forage fish populations would not be expected to have an adverse impact to marine mammals or their overall fitness. Additionally, proposed projects along the Bangor waterfront at NBK, such as the Test Pile Program, would occur in an area that already has industrial uses with higher than normal activity and noise levels. Thus, marine mammals in the area may be habituated to these higher levels of ongoing activity and less impacted by ongoing waterfront development.

The primary impact of the proposed action to marine mammals is behavioral disturbance from underwater sound generated by impact and vibratory pile installation/removal operations. A total of 1,187 behavioral exposures are predicted from vibratory and impact installation/removal of piles associated with the Test Pile Program. No instances of behavioral harassment from airborne sound pressure levels are anticipated. Additionally, no injurious impacts are predicted to result from any portion of the proposed action. Any marine mammals which are behaviorally disturbed may change their normal behavior patterns (i.e. swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any exposures would likely have only a minor effect and temporary impact on individuals and would not result in population level impacts. Indirect effects of pile driving operations, such as changes in water quality (i.e. dissolved oxygen, turbidity) are expected to be localized and short-term and would not result in impacts to marine mammals. Impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe of the project, and because vibratory pile driving is the primary installation and removal method, which produces lower sound pressure levels and is therefore less harmful to fish.

As described in Section 3.9, Marine Mammals, implementation of pile driving at the Test Pile Program site would have insignificant effects on marine mammals, and would not likely adversely affect the ESA-listed Steller sea lion or Southern Resident killer whale. The proposed action may result in behavioral disturbance to marine mammals from underwater sounds associated with pile driving/removal; however, these effects would be limited to localized, temporary disturbances to marine mammals within the Test Pile Program project area.

Past, present, and future development projects have had, are having, and would have the potential to result in many of the impacts to mammals described above, and could also have additional impacts to the species, their habitat, and prey. For instance, fishing operations in the area could reduce local abundance of forage fish or result in by-catch of marine mammals. Because marine mammals are highly mobile, the noise impacts of the proposed action could be cumulative with underwater and airborne noise impacts to marine mammals from other actions and activities in Hood Canal region. However, because the expected impacts of the proposed action on marine mammals in general would be temporary, cumulative impacts to marine mammals associated with pile driving noise are considered unlikely.

Cumulative impacts to marine mammals have the greatest potential to occur during simultaneous pile driving exposure events from the Test Pile Program and other projects in the vicinity. For instance, during the time frame of the proposed action, a pile replacement project at the existing EHW-1 facility would be occurring. The EHW-1 Pile Replacement Project would involve the installation of twenty eight 30-inch diameter steel piles and the removal of 96 concrete and 42 steel piles (sizes ranging from 12-24 inches). These activities would occur immediately north of the Test Pile Program location and would produce similar impacts to the proposed action. The Navy has considered the cumulative effect that may result from these actions. Of greatest concern to marine mammal safety would be the potential for their acoustic injury zones to overlap spatially and temporally. While spatially, the zones are not large enough to overlap, the Navy has also committed that the two projects would not simultaneously impact drive to limit the temporal overlap and ensure that the combined energy of two impact rigs operating at once, would not increase the potential injurious zones. With regard to impact pile driving, the EHW-1 Pile replacement project is limited to impact pile driving only 5 piles per year, one per day, with a maximum of 15 minutes of pile driving per day. With regard to the Test Pile Program, only 18 test piles are anticipated to require impact proofing, however, should any of the piles being installed as part of the proposed action fail to meet its necessary embedment depth due to vibratory pile driving, there is a contingency that the Navy may need to impact drive the piles the rest of the depth. Any impact pile driving during the Test Pile Program would be limited to 100 strikes or 15 minutes per day.

In addition, in July – October 2011 when the Test Pile Program and EHW-1 Project would co-occur, within a given day, the total number of impact hammer strikes that may be used by any combination of these projects would be limited to 100 strikes. While the proposed EHW-2 project would occur after the completion of the Test Pile Program, because it would occur in the same location it may cumulatively affect the same marine mammal populations. The proposed EHW-2 project has estimated that over three construction windows between 200-400 days of in-water impact pile driving may be necessary with a worst case scenario of up to 6,400 pile strikes per day. However, no more than one pile would be driven with an impact hammer at any one time amongst these projects, not simultaneously. Due to the project's duration impacts to marine mammal populations may occur over a longer duration, however pile driving from the proposed EHW-2 project is expected to only result in behavioral harassment to marine mammals. Behavioral disturbance zones from vibratory pile driving would have the potential to overlap as a result of concurrent vibratory pile driving/removal that may occur between the Test Pile Program and EHW-1. When two closely located pile driving projects occur at the same time, noise levels could increase by as much as 3 dB at sites roughly equidistant between the multiple pile driving rigs. However, due to the fact that the morphology of the Hood Canal constrains the geographical extent of the marine mammal behavioral zone, the area affected by vibratory pile driving would not increase cumulatively. Any behavioral impacts would be temporary in nature.

Additionally, with BMPs and mitigation in place (i.e. sound attenuation devices, visual surveillance, and the use of shutdown zones) cumulative impacts would not significantly affect marine mammal populations in the proposed project area. Nevertheless, the proposed action and the EHW-1 Pile Replacement Project would contribute incrementally to cumulative marine mammal disturbance impacts in Hood Canal overall. However, continued adherence to the requirements of the ESA and MMPA by NBK at Bangor would limit disturbance to marine mammals and ensure that important habitats do not become degraded. Furthermore, existing regulatory mechanisms and mitigation measures would protect marine mammals (see Sections 3.9 and Chapter 4) and further decrease the likelihood of potential cumulative impacts to these species.

5.3.10 Birds Cumulative Impacts

The ROI for evaluating cumulative impacts to marine birds is defined as Hood Canal. Depending on the species, there is a varying potential for actions elsewhere in Hood Canal to affect marine birds affected by the Test Pile Program. Resident species are unlikely to be affected by actions outside Hood Canal. Migratory or wide-ranging marine bird species, however, may be affected by such actions. The contribution of effects on marine birds occurring in other inland waters and the ocean to cumulative impacts of the Test Pile Program is very difficult to define, but it is acknowledged that there is such a contribution.

Construction and operation of past and present waterfront projects, such as Delta Pier and KB Docks, as well as any future Navy or non-Navy actions have resulted or would result in increased human presence, noise, boat movement, and other activities, driving away some water-dependent wildlife such as marine birds from these areas. Marine birds typically avoid areas with continuous activity or periodic loud noise. Often, birds will return to these areas when human presence is lower or there is less activity.

Trend data for Hood Canal indicate that marine bird species have been on the decline. Of the 30 most common marine birds, 19 have experienced declining populations of 20 percent or more over the past 20 years. It is unknown what is causing this decline, but possible reasons include increased predation, habitat loss, changing migration patterns, decreases in forage fish populations, hunting, and disturbance to breeding grounds in the Arctic (PSAT, 2007a). The population of the marbled murrelet, a species listed as threatened under the ESA, declined more than 20 percent in the Puget Sound region between the 1970s and 1990s but has been fairly stable in recent years (PSAT, 2007a). The principal reason for the earlier decline was loss of nesting habitat (old-growth forest).

Future Navy and non-Navy waterfront projects may have similar impacts to those of the past and present actions, including increased anthropogenic sound (both airborne and underwater), increased human presence, increased boat movements and other associated activities. These actions could result in behavioral impacts to local populations of birds, such as temporary avoidance of habitat, decreased time spent foraging, increased or decreased time spent hauled out (depending on the activity), and other minor behavioral impacts. Most impacts would likely be short-term and temporary in nature and unlikely to affect the overall fitness of the animals. However, some projects such as the construction of the proposed EHW-2 at NBK at Bangor may result in more moderate impacts due to longer construction timelines (3-5 years). Impacts to birds are still expected to primarily result from behavioral disturbance from underwater/airborne sound pressure levels; however, indirect impacts to birds may occur as a result of impacts to their prey base (fish) during the construction and ultimate operation of the wharf. Potential effects to their prey base could include habitat disturbance during construction and overwater shading from the completed structure during its operational life. Impacts during construction are expected to be temporary and could include increase in turbidity, resuspension of sediments, and decreases in DO levels. Overwater shading would be a long-term impact, but the effect to birds is expected to be minimal. Overwater shading may result in a reduction in the amount or quality of SAV which may in turn affect forage fish due to a reduction in quality habitat. However, the reduction in forage fish habitat as a result of the proposed EHW-2 would be minimal in comparison to the total habitat available in Hood Canal. Therefore, any reduction in forage fish populations would not be expected to have an adverse impact to marine birds or their overall fitness. Additionally, proposed projects along the NBK Bangor waterfront, such as the Test Pile Program, would occur in an area that already has industrial uses with higher than normal activity and noise levels. Thus, marine birds in the area may be somewhat used to these higher levels of activity and less impacted by ongoing waterfront development.

The primary impact of the proposed action to marine birds is behavioral disturbance from underwater sound generated by the impact/vibratory hammer. Of most concern, is the ESA threatened marbled murrelet. No instances of behavioral harassment from airborne sound pressure levels are anticipated, however, some behavioral disturbance could occur due to underwater sound associated with impact pile driving. Any marbled murrelets or other birds which are behaviorally disturbed may change their normal behavior patterns or be temporarily displaced from the area of construction. Any exposures would likely have only a minor effect and temporary impact on individuals and would not result in population level impacts. Indirect effects of pile driving operations, such as changes in water quality (i.e. dissolved oxygen, turbidity) are expected to be localized and short-term and would not result in impacts to marine birds. Impacts to marbled murrelet and other birds prey species are expected to be minor and temporary due to the short timeframe of the project, and because vibratory pile driving, which is the primary installation and removal method produces lower sound pressure levels and are therefore less harmful to marbled murrelets.

Overall, the proposed action may impact marbled murrelets and other marine birds through pile driving noise and temporary, localized water quality changes (turbidity) in nearshore habitats. However, through mitigation efforts, these impacts would be minimized and mitigated as described in Section 4.4, Mitigation Measures and Regulatory Compliance.

As described in Section 3.10 (Birds) implementation of pile driving and removal at the Test Pile Program project area would have no significant effect on most marine birds, including migratory bird populations. The Navy concluded that the proposed action may affect, and is likely to adversely affect the ESA-listed marbled murrelet. However, in consultation with USFWS under Section 7 of the ESA, the Service concluded that the proposed action may affect, but is not likely to adversely affect the marbled murrelet as a result of the following: The USFWS Washington Office concluded in their letter of concurrence that "exposure to underwater sound pressure levels that reach or exceed 150 dBrms re: 1µPa may cause behavioral response such as avoidance, interrupted resting or feeding. However, due to the inclusion of the in-water timing restriction during the breeding season to reduce the likelihood of delayed feeding attempts of young, the fact that pile driving is not continuous throughout the day, and that monitoring results show that marbled murrelets continue to forage in situations where they are exposed to sound levels at or above 150 dBrms re: 1µPa, we do not expect any measurable alterations in the normal behavior of marbled murrelet. Thus, effects to marbled murrelets from potential noise-related disturbances are considered insignificant." Therefore, the USFWS Washington Office determined that these exposures did not constitute harassment under the ESA, and that the proposed action would not likely adversely affect the marbled murrelet.

Past, present, and future development projects have had, are having, and would have the potential to result in many of the impacts to marine birds described above, and add to past or current declining population trends. Because marine birds are highly mobile, the noise impacts of the proposed action could be cumulative with underwater and airborne noise impacts to marine birds from other actions and activities in Hood Canal region. However, because the expected impacts of the proposed action on marine birds in general would be temporary, cumulative impacts to marine birds associated with pile driving noise are considered unlikely.

Cumulative impacts to marbled murrelets have the greatest potential to occur during simultaneous pile driving exposure events from the Test Pile Program and other projects in the vicinity. For instance, during the time frame of the proposed action, a pile replacement project at the existing EHW-1 facility would be occurring. The Navy has considered the cumulative effect that may result from these actions. As discussed in Section 5.3.9 for marine mammals, of greatest concern to bird safety (including the marbled murrelet) would be the potential for their acoustic injury zones to overlap spatially and temporally. While spatially, the injury zones are not large enough to overlap, the Navy has committed that the two projects (Test Pile Program and EHW-1 Pile Replacement Project) would not simultaneously impact drive to limit the temporal and spatial overlap and ensure that the combined energy of two impact rigs operating at once, would not increase the potential injurious zones. With regard to impact pile driving during the proposed action, only 18 test piles are anticipated to require impact proofing. However, should any of the piles being installed as part of the proposed action fail to meet its necessary embedment depth due to vibratory pile driving, there is a contingency that the Navy may need to impact drive the piles the rest of the depth. Any impact pile driving during the Test Pile Program would be limited to 100 strikes or 15 minutes per day. With regard to EHW-1 pile replacement, impact pile driving is limited to only 5 piles per year, one per day, with a maximum of 15 minutes of pile driving per day. In addition, in July – October 2011 when the Test Pile Program and EHW-1 Project would co-occur, within a given day, the total number of impact hammer strikes that may be used by any combination of these projects would be limited to 100 strikes. Additionally, similar to the discussion provided in Section 5.3.9 for marine mammals, the construction of the proposed EHW-2, though occurring after the Test Pile Program, could have cumulative impacts on the same populations of marbled murrelets or other birds species affected by the Test Pile Program. Impacts to marbled murrelets and other bird species from the proposed EHW-2 project could occur over a longer duration, but impacts from pile driving are expected to result in only behavioral harassment.

With regard to vibratory pile driving, there could be an overlap in the behavioral disturbance zones when the pile installation/removal for the Test Pile Program and EHW-1 pile replacement project co-occur. Vibratory pile hammers produce significantly lower initial sound pressure levels than impact hammers and are not known to cause injury to birds (including the marbled murrelet). When two closely located pile driving projects occur at the same time, noise levels could increase by as much as 3 dB at sites roughly equidistant between the multiple pile driving rigs. The current use of vibratory hammers may result in a slight increase in the zone of behavioral harassment, but these impacts would be temporary.

With BMPs and mitigation in place (i.e. sound attenuation devices, visual surveillance, the use of shutdown zones), cumulative impacts would not significantly affect bird populations (including the marbled murrelet) in the proposed project area. Nevertheless, the proposed action and other future actions would contribute incrementally to cumulative disturbance of marbled murrelet and other birds in Hood Canal overall. However, continued adherence to the requirements of EO 13186 and the Bald and Golden Eagle Protection Act (16 USC 668a-d dated June 8 1940 as twice amended) by NBK at Bangor would limit disturbance to birds and ensure that important habitats do not become degraded. Furthermore, existing regulatory mechanisms and mitigation measures would protect bald eagles and the ESA-listed marbled murrelet (see Section 3.10, Birds) and further decrease the likelihood of potential cumulative impacts to these species.

5.3.11 Cultural and Tribal Resources Cumulative Impacts

The ROI for evaluating cumulative impacts to cultural and tribal resources is NBK at Bangor. Cultural resources are unique as well as finite in nature, so that an adverse impact to a single historic property affects the complement of historic properties within the ROI. Continued construction projects and modifications to Navy facilities have the potential to adversely affect historic properties. However, the Navy would comply with Section 106 of the NHPA for the EHW-2 project and other reasonably foreseeable further actions within the ROI. This includes mitigation of adverse impacts that could not be avoided or minimized, thereby addressing the cumulative impact of those undertakings. The Navy has an active consultation process in place, with emphasis on protection and avoidance of areas of traditional cultural importance, as well as access to the resources found on the installation. Because of this ongoing process, traditional resources on NBK at Bangor would continue to be protected and accessible.

Cultural resources have the potential to be affected by past and present actions. Activities such as the construction of piers, docks, marinas, and other shoreline and in-water construction are examples. Federal laws and regulations have been established to protect and preserve traditional cultural resources. The Navy has an active consultation process in place, with emphasis on protection and avoidance of areas of traditional cultural importance, as well as access to the resources found on the installation. Because of this ongoing process, traditional resources on NBK at Bangor would continue to be protected and accessible. Access to Native American tribal resources on NBK Bangor is also allowed for American Indian tribes with treaty rights. As such, the Navy consults with Native American tribes regarding the impacts to tribal access and fishing rights.

The trend associated with cultural resources is ongoing identification and preservation of resources. Federal laws and regulations have been established to protect and preserve archaeological and cultural resources. Future Navy or non-Navy actions that involve earth disturbance have some potential for disturbing archaeological resources. However, some potential for such disturbance may go unrecognized and unrecorded. Future Navy actions that involve alterations to NRHP-eligible buildings or structures, the construction of new buildings or structures, or square footage reductions all have the potential for direct or indirect impacts to historic properties.

American Indian traditional resources, such as traditional use areas (e.g., cedar growth for bark gathering), subsistence resources (e.g., shellfish), and special places (religious and traditional), have been impacted over time as a result of land development and population growth. Traditional use areas and subsistence resources are known to lie outside of the project area. Impacts to cultural resources include loss of access to traditional use areas, conversion of a traditional area or special place to another land use, and reduction in the abundance of tribal resources for economic, subsistence, or ceremonial/religious uses.

The Navy will continue to consult with affected Native American tribes regarding Navy activities that may have the potential to significantly affect protected tribal resources at NBK at Bangor. The proposed action would not affect access to or use of tribal traditional resource areas. Construction of the proposed action may impact Hood Canal adult salmon and steelhead, which are tribal resources. Although some adult salmon and steelhead could be injured during impact pile driving, the impact would be localized and no significant impacts to the overall quantity of available adult salmon and steelhead in Hood Canal are expected with the construction or operation of the proposed project.

Future Navy or non-Navy actions may impact cultural resources and tribal Usual and Accustomed areas and treaty-reserved resources. However, most of these traditional use areas, subsistence resources, and special places, have been identified and are would be avoided whenever possible. Access to these resources is also allowed for Native American tribes with treaty rights. Additionally, the Navy will consult with the SHPO and Native American tribes regarding any future projects such as the EHW-1 Pile Replacement Project and the proposed EHW-2 project. For future Navy projects that require USACE permits, the Navy will comply with the USACE/EPA rule on compensatory mitigation for aquatic resources. Additionally, for non-Navy projects requiring USACE permits, USACE considers the potential effects on traditional resources and, in its decision making regarding permit issuance, may consult with the affected tribes.

Traditional use areas, subsistence resources, and special places (religious and traditional) may have been impacted over time as a result of land development and population that resulted in increased use of natural resources such as fish and shellfish. Impacts to cultural resources include loss of access to traditional areas, conversion of a traditional area or special place to another land use, and reduction in the abundance of resources used for subsistence or ceremonial/religious uses. The proposed action would not impact traditional resources nor would it contribute to cumulative impacts to tribal resources. Native America tribes have U&A land approximately 1.1 miles from EHW-1 for shellfish harvesting and Native American tribes partake in cedar bark collection throughout NBK at Bangor. Although some adult salmonids could be injured during impact pile driving, the impact would be localized and no significant impacts to the overall quantity of available adult salmon and steelhead in Hood Canal are expected with the construction or operation of the proposed project. The Navy has consulted with Northwest Regional NMFS offices to minimize the impacts to the fish species, minimizing impacts to the Native American Tribes who would utilize these resources. Surveys performed at NBK at Bangor have provided detailed accounts of the cultural resources located on the base. EHW-1 and Delta Pier are potentially eligible for NRHP due to its cold war era association. No submerged archaeological sites are expected to occur in the vicinity of the proposed action. Although the potential to encounter cultural resources during construction exists, the Navy takes care to ensure the proper consultations and procedures are followed. As such, the Navy minimizes impacts to cultural resources occurring on the base.

The proposed action, because of its temporary nature (July 16 to October 31, 2011), in combination with any past, present or future Navy and non-Navy actions, is unlikely to produce any lasting or noticeable cumulative impacts to treaty-reserved resources. On June 18, 2010, a government-to-government meeting with the Chairman of the Suquamish Tribe was held. The Suquamish indicated they had no objection to the Test Pile Program. On July 29, 2010 a government-to-government meeting with the Chairman of the Skokomish Tribe was held. The Skokomish Tribe did not express any concern over the proposed Test Pile Program. A government-to-government meeting occurred on August 31, 2010 with the Jamestown S'Klallam and Port Gamble S'Klallam Tribes, Lower Elwha Klallam Tribe and the Point-No-Point Treaty Council. No adverse comments on the Test Pile Program were presented (Appendix C). Therefore, operation of the proposed action would not contribute to cumulative impacts to cultural or tribal resources and access when combined with other past, present, and future actions.

5.3.12 Environmental Health and Safety Cumulative Impacts

The ROI for evaluating cumulative impacts to environmental health and safety is defined as NBK at Bangor and the immediately surrounding area. For potential noise impacts to environmental health and safety, the ROI is expanded to the waters of Hood Canal and areas on the Toandos Peninsula likely to be affected by construction noise from the proposed action.

Environmental health and safety has the potential to be affected by past and present actions. Activities along Hood Canal such as the construction of piers, docks, marinas, and other in-water and shoreline construction are examples. These actions produce ambient and underwater noise, can stir up contaminants in the sediments, can affect tribal access and have the potential to contaminate the water with toxins and chemicals from fuel spills and other accidental discharges. Tribal access may be restricted due to contaminant levels. OSHA standards are always in effect to protect the health and safety of workers and staff. In the Explosive Handling Wharf area (the Test Pile Program is in this area), SWFPAC implements restrictions to minimize risks to environmental and human health and safety. They include:

(1) No fuels or oils may be left overnight and must be removed at the end of each work day.

(2) Compliance with the security directions of Security Force personnel is mandatory.

Other than EHW-1 there is no past or present Navy action that involves handling explosives at the Bangor waterfront at NBK. There has never been an accident at EHW-1 that jeopardized the safety of the base, the local population, or the environment. The Navy's strategic weapons programs use a layered safety system that includes highly trained personnel, detailed administration, and specifically designed equipment to ensure its missiles and weapons are safe and reliable.

Future Navy and non-Navy actions have the potential to affect the environmental health and safety of Hood Canal residents. Sediment contaminants, toxins and other pollutants, noise and other impacts result from in-water and shoreline construction. Although Navy actions occur in restricted areas where the public cannot gain access except through permission of the base Commander, non-Navy actions can occur in public areas where more precautionary measures must be taken (due to increased risk to the public).

The proposed action would last no more than 40 days and would occur in the restricted waters of NBK at Bangor. As a result, there would not be any impacts to public safety or access because the public is restricted from the area where the proposed action would occur. No boaters, scuba divers, or swimmers are allowed in Naval Restricted Area #1 without permission, therefore cumulative impacts are not possible. SWFPAC restrictions outlined above create a safer work environment and OSHA guidelines would always be followed.

Residences on the west side of Hood Canal are approximately 4 miles from the project area. As a result, noise associated with pile driving would attenuate to allowable levels per the Washington noise regulations (WAC 173-60-040). The lack of adverse cumulative impacts of ambient noise is discussed in Section 5.3.5. Boat traffic along Hood Canal could increase as a result of increase construction due to the proposed EHW-2 project, the EHW-1 project, and other future Navy in-water construction projects. Overall noise at the NBK Bangor waterfront is anticipated to remain similar to existing conditions once the proposed EHW-2 is constructed and operational, because a portion of the operations and boat traffic currently occurring at the existing EHW and other waterfront facilities would be diverted to the proposed EHW-2.

Tribal consultations have been concluded for this proposed action. The Suquamish Tribe, Skokomish Tribe, Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe, Lower Elwha

Klallam Tribe, and the Point-No-Point Treaty Council did not object to the proposed action (Appendix C). This action in combination with other past, present and reasonably foreseeable actions would not have a significant effect to environmental health and safety for Hood Canal and the surrounding communities. Therefore, operation of the proposed action would not contribute to cumulative environmental health and safety impacts when added to other past, present, and future actions.

5.3.13 Socioeconomics Cumulative Impact

The ROI for evaluating cumulative impacts to socioeconomics and environmental justice is defined as the surrounding communities in which actions at NBK at Bangor are most likely to contribute to cumulative socioeconomic impacts (i.e., Silverdale, Poulsbo, and Bremerton, all of which are located on the Kitsap Peninsula and within Kitsap County).

Socioeconomic conditions have been or are being profoundly changed by past and present development. For example, NBK at Bangor has become one of the primary employers in Kitsap County. Development of the TRIDENT base and other military installations has increased the population, long-term employment opportunities, and income of Kitsap County, as well as the demand for housing and various public services (e.g., police, fire, emergency and medical services, schools). It is estimated that approximately 40,000 citizens—military personnel, civilians, and contractors—work for the military in Kitsap County.

Population, housing, and economic activity are increasing at a moderate rate in Kitsap County. These changes are attributable to development, population in-migration, changes in economic conditions, and changes in social or political factors. Past actions such as the Hood Canal Bridge East Half Replacement and West Half Rehabilitation Project- Water Shuttle may be short in duration but do provide a context for which to base socioeconomic impacts to Kitsap County. Present actions such as the Olympic View Marina and Belfair Sewer Line may provide economic boosts in the county for a more extended period of time since these projects would occur over a longer timeframe.

Employment and income would be generated from future Navy and non-Navy actions. Demand for housing and public and social services are anticipated to increase resulting from the migration of workers to the surrounding communities. However, these conditions would vary over time based on the changing conditions associated with the uncertainty of future projects. For example future projects such as the Thorndyke Resources Operation Complex

(T-ROC) Conveyor and Pier and the Port Gamble Dock may never take place due to permitting issues while projects such as the Misery Boat Launch and the Pleasant Harbor Marina and Golf Resort could provide economic benefit not only from construction but from the operation of the boat launch, marina and golf resort.

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, EO 13045, Environmental Health Risks and Safety Risk to Children, EO 12898 and EO 13045 must be addressed for all future government (including Navy) actions. As such, any future projects that would have a significant impact to any of these EO's would undergo extreme scrutiny.

The impacts associated with the proposed action would be associated with a small increase in contractor activity on the NBK Bangor waterfront. The proposed action would have a temporary and localized impact to employment, income, and the demand for public services. The proposed action is anticipated to employ approximately 30 people with 12-15 of those workers performing the marbled murrelet and marine mammal monitoring. The population of Kitsap County would not be significantly impacted as a result of the proposed action. The proposed action would not result in any substantial impacts to socioeconomic conditions in Kitsap County. In addition to the proposed action, other waterfront projects are proposed for the Hood Canal and the Bangor waterfront at NBK. These projects are transient in nature and would not contribute to a significant cumulative impact. The proposed action would not contribute to cumulative impacts when considered with other past, present, and future actions. This is because the small increase in staff and dependents would only have a localized impact to employment, income, and demand for public services.

The proposed action would have no impact to minority or low income (environmental justice) populations (including Native Americans), because there are no low income or minority populations located within the range of impacts from the project. The proposed action would not impact the access granted to tribes for shellfish harvesting and cedar bark collection. Likewise, the proposed action would have no impact to the protection of children, because there are not any children located within the range of impacts from this project. There would be no disproportionately high and adverse environmental, human health and socioeconomic affects upon Minority and Low-Income populations, Indian Tribes or children. Therefore, there would be no cumulative impact to environmental justice populations or the protection of children as a result the proposed action in combination with other past, present, and future actions.

5.3.14 Coastal and Shoreline Management

The ROI for coastal and shoreline management is defined as the Hood Canal shoreline and coastal resources. The preservation of natural resources within the coastal zone is regulated through Washington's CZMP, which governs development within the coastal zone. Past, present, and future actions within the project vicinity have been and would be subject to guidelines for preservation of natural resources within the coastal zone stipulated in Washington's CZMP. Washington's CZMP has been adopted by WDOE, and all past development projects have been approved pursuant to the adopted CZMP, ensuring compliance with the federal CZMA. The Kitsap County Shoreline Management Master Program is the instrument by which the county regulates continued development within the coastal zone. Over the years, the county has employed the Shoreline Management Master Program to ensure consistency with shoreline preservation guidelines intended to minimize impacts to natural resources. Future Navy and non-Navy actions in the project vicinity would also be modified during the project review process to ensure consistency with the CZMA, Washington's CZMP, SMA, and Kitsap County Shoreline Management Master Program provisions for protection of shoreline resources. For the proposed action to be approved, the CZMA requires that it be found consistent to the maximum extent practicable with the Washington SMA. This determination would be made by the Navy and approved or rejected by WDOE. The consistency determination is intended to ensure that the project is consistent to the maximum extent practicable with the enforceable policies of the SMA. The consistency determination will demonstrate that the proposed action minimizes coastal impacts to the extent feasible. Impacts to coastal and shoreline management would be the same for all proposed alternatives.

On December 16, 2010 Washington Department of Ecology concurred with the Navy's assessment that the Test Pile Program is consistent Washington's CZMP, see Appendix A. The Test Pile Program would be unlikely to add to the cumulative impacts to the coastal zone of past, present, and other reasonably foreseeable future actions.

5.4 CONCLUSION

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, and other natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Human labor is also considered an irretrievable resource. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

Implementation of the proposed action would involve the consumption of fuel, oil, and lubricants for the vibratory hammer, the impact hammer and the barges/tugboats. Human energy invested in the Test Pile Program would be irretrievably lost. Implementation of the proposed action would not result in significant irreversible or irretrievable commitment of resources.

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development option reduces future flexibility in pursuing other options, or that giving over a parcel of land or other resources to a certain use often eliminates the possibility of other uses being performed at that site.

In the short-term, effects to the human environment with implementation of the proposed action would primarily relate to the pile driving activities associated with the Test Pile Program. Air quality, ambient and underwater noise, marine mammals, birds, fish and sediments would all expect to be impacted in the short-term. In the long-term, productivity of the area would not be affected by the Test Pile Program. All impacted resources would be expected to recover from the effects of the Test Pile Program. The proposed action would not result in any impacts that would reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

Implementation of the proposed action would not result in significant impacts to the environment. The Test Pile Program would utilize mitigation measures and monitoring to ensure marine mammals, fish and birds are protected to the maximum extent possible. Implementation of the proposed action, in conjunction with other past, present, and reasonably foreseeable future actions, would not be expected to result in significant cumulative impacts to the environment.

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APPENDIX A

Coastal Consistency Determination

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DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00598
17 Aug 10

Washington Department of Ecology Northwest Region
Shorelands and Environmental Assistance Program
Attn: Ms. Rebekah Padgett
3190 160th Avenue SE
Bellevue, WA 98008-5452

Dear Ms. Padgett:

SUBJECT: FEDERAL COASTAL CONSISTENCY DETERMINATION FOR THE TEST PILE PROGRAM AT THE WATERFRONT OF NAVAL BASE KITSAP BANGOR, WASHINGTON

The United States (U.S.) Department of the Navy (Navy) is preparing an Environmental Assessment to analyze the potential impacts of a proposed action which involves the installation/removal of test piles at the Naval Base Kitsap Bangor Waterfront, in Washington. To comply with Subpart C of the National Oceanic and Atmospheric Administration, 15 CFR 930 and Coastal Zone Management Act §307(c)(1), the Navy is submitting a Coastal Zone Consistency Determination (CCD) for Federal Facilities (Enclosure 1).

The Test Pile Program will gather geotechnical and noise propagation data to validate the design concept and environmental analyses for the proposed second Explosive Handling Wharf (EHW-2) and future projects at the Bangor waterfront. The NBK Bangor waterfront is situated in the Hood Canal and is located in Kitsap County. The action alternative is the driving and subsequent removal of 29 piles into the Hood Canal. No facilities will be constructed or alterations to the shoreline will occur as part of the action. A detailed description of the action is attached in Enclosure 2.

Pursuant to Section 307 of the CZMA, the Navy has determined that implementing the action alternative is consistent, to the maximum extent practicable, with Washington's Coastal Zone Management Program.

SUBJECT: FEDERAL COASTAL CONSISTENCY DETERMINATION FOR THE TEST PILE PROGRAM AT THE WATERFRONT OF NAVAL BASE KITSAP BANGOR, WASHINGTON

Our point of contact is Mr. Greg Leicht, (360)315-5411, or gregory.leicht@navy.mil.

Sincerely,

J. H. TRAVERS, CDR, USN

For

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

Enclosures: 1. Determination of Consistency
2. Excerpt - Air Section: Test Pile Program Environmental Assessment

COASTAL CONSISTENCY DETERMINATION FOR THE TEST PILE PROGRAM – NBK BANGOR WATERFRONT NAVAL BASE KITSAP BANGOR SILVERDALE, KITSAP COUNTY, WA

This document provides the State of Washington with the U.S. Department of Navy's (Navy) Consistency Determination under Section 307 ©(1) of the federal Coastal Zone Management Act (CZMA) of 1972, as amended, for the proposed Test Pile Program for NBK Bangor Waterfront at Naval Base Kitsap-Bangor.

Proposed Federal Action:

As part of the U.S. Navy's sea-based strategic deterrence mission, the Navy Strategic Systems Programs (SSP) directs research, development, manufacturing, test, evaluation, and operational support of the TRIDENT Fleet Ballistic Missile (TRIDENT) program. The proposed action (also called the Test Pile Program) is to install and remove up to 29 test and reaction piles, conduct testing on select piles, and measure in-water noise propagation during pile installation and removal. Geotechnical and noise data collected during pile installation and removal will be integrated into the design, construction, and environmental planning for the Navy's proposed second Explosives Handling Wharf (EHW-2). The Navy proposes to install the test piles in the location planned for EHW-2 (south of the existing Explosives Handling Wharf); however, other future projects can also benefit from the geotechnical and noise propagation data gathered from driving the test piles.

The Test Pile Program will involve driving 18 steel piles, ranging in size from 30 inches in diameter to 60 inches in diameter, at predetermined locations within the proposed footprint of EHW-2. Some piles will be installed more than one time. Eleven additional piles will be installed to perform lateral load and tension load tests on the original 18 test piles. The pile lengths will range from 100 feet to 197 feet. All piles will be driven to an initial embedment depth with a vibratory hammer, and select piles will be driven an additional 10-15 feet (approximate) with an impact hammer. Noise attenuation measures will be used during all impact hammer operations and some vibratory hammer operations. The proposed action would also include the removal of all test piles. Hydroacoustic monitoring will be accomplished to assess effectiveness of noise attenuation measures. The presence of marine mammals and marbled murrelets will also be monitored during pile installation and removal.

Project Location:

NBK Bangor is located on Hood Canal and utilizes various piers and docks. The proposed location for the Test Pile Program is immediately south of Explosive Handling Wharf #1 (EHW-1). Two restricted areas are associated with NBK Bangor, Naval Restricted Areas 1 and 2 (33 CFR 334.1220). Naval Restricted Area 1 covers the area north and south along the Hood Canal encompassing the NBK Bangor waterfront. The regulations associated with Naval Restricted Area 1 state that no person or vessel shall enter this area without permission from the

Commander, Naval Submarine Base Bangor, or his/her authorized representative. Naval Restricted Area 2 encompasses the waters of Hood Canal within a circle of 1,000 yards diameter centered at the north end of NBK Bangor and partially overlapping Naval Restricted Area 1. The regulations associated with Naval Restricted Area 1 state that navigation will be permitted within that portion of this circular area not lying within Area No. 1 at all times except when magnetic silencing operations are in progress. Figure 1 depicts a plan view of the study area location and Figure 2 indicates the restricted areas associated with NBK Bangor.

PERMITTING AND ENVIRONMENTAL ASSESSMENT

Prior to implementation of the proposed action, the Navy will obtain all appropriate permits and authorizations applicable to the proposed action including:

- Federal Coastal Consistency Determination concurrence by the State of Washington Department of Ecology, Coastal Zone Management Program in accordance with the CZMA.
- Permit from the US Army Corps of Engineers (USACOE), Seattle District in accordance with Section 10 of the Rivers and Harbors Appropriation Act of 1899.
- Section 106 consultation with the Washington State Historic Preservation Officer (SHPO).
- Government to government consultations with federally recognized American Indian Tribes.
- Coordination with the U.S. Fish and Wildlife Service (USFWS) on Endangered Species Act (ESA) and Migratory Bird Treaty Act (MBTA).
- Consultation with National Marine Fisheries Service (NMFS) on ESA, Marine Mammal Protection Act (MMPA), and Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA).

PROGRAM AND POLICY ANALYSIS

The CZMA, enacted in 1972, created the National Coastal Management Program for management and control of the uses of and impacts on coastal zone resources (16 USC 1451-1465). The program is implemented through federally approved state coastal management programs (CMPs). Washington was the first state to receive federal approval of a Coastal Zone Management Program in 1976. The Department of Ecology's Shorelands and Environmental Assistance Program is responsible for implementing Washington's Program.

Federal approval of a state CMP triggers the CZMA Section 307 federal consistency determination requirement. Section 307 mandates that federal actions within a state's coastal zone be consistent to the maximum extent practicable with the enforceable policies of the state CMP. The CZMA applies to lands within the coastal zone, which includes Hood Canal. However, the CZMA excludes "…lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government, its officers or agents" (16 USC 1453 definition of coastal zone). The consistency determination for these federal properties is then conducted to determine if project-related impacts to the neighboring properties would be consistent under CZMA regulations.

Washington's Coastal Zone Management Program (CZMP) defines Washington State's coastal zone to include the 15 counties with marine shorelines: Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, Wahkiakum, and Whatcom. The CZMP applies to activities within the 15 counties, as well as activities outside these counties, which may impact Washington's coastal resources. Most, but not all, activities and development outside the coastal zone are presumed to not impact coastal resources.

Under the program, activities that impact any land use, water use, or natural resource of a coastal zone must comply with six laws, or "enforceable policies". These include:

- Shoreline Management Act;
- State Environmental Policy Act;
- Clean Air Act;
- Clean Water Act;
- Ocean Resources Management Act; and,
- Energy Facility Site Evaluation Council

CONSISTENCY DETERMINATION

Statutes addressed as part of the Washington Coastal Management Program consistency review and considered in the analysis of the proposed action are noted in the following table.

Statute	Scope	Consistency
Shoreline Management Act	Designated preferred uses for protected shorelines. Provides for the protection of shoreline natural resources and public access to shoreline areas. Protected shorelines include the following: • Marine waters; • Streams with greater than 20 cubic feet per second of mean annual flow; • Lakes 20 acres or larger; • Upland areas e.g., shorelands, that extend 200 feet landward from the edge of these waters; and, • Wetlands and floodplains associated with any of the above waters. Under the Shoreline Management Act, each city and county adopts a shoreline master program based on state guidelines but tailored to the specific needs of the city or county. Kitsap County has developed a Shoreline Management Master Program under Title 22 of the Kitsap County Code. Among the exemptions included is an exemption for any activity that "does not interfere with the normal public use of surface water."	**CONSISTENT** The Test Pile Program will be conducted along the east shoreline of the Hood Canal in the NBK Bangor Waterfront area. Naval Restricted Area 1 covers the area along the Hood Canal encompassing the NBK Bangor waterfront. The regulations associated with Naval Restricted Area 1 state that no person or vessel shall enter this area without permission from the Commander, Naval Submarine Base Bangor, or his/her authorized representative. The proposed action will be conducted entirely within this designated Naval Restricted Area. As a result, "the activity does not interfere with the normal public use of surface water" and is thus exempt from substantial development permitting requirements in accordance with Wash. Rev. Code Chapter 90.58 and the Kitsap County Master Shoreline Management Master Program (Kitsap County Code Chapter 22).

Statute	Scope	Consistency
State Environmental Policy Act (SEPA)	Requires state and local agencies to consider likely environmental consequences of a proposal before approving or denying the project.	**NOT APPLICABLE** The proposed action is a Federal action subject to the National Environmental Policy Act (NEPA), and is exempt from SEPA.
State Clean Air Act	Addresses the state's policy concerning air quality.	**CONSISTENT** Both temporary construction total annual emissions and projected annual operating emissions are below the 250 ton per year (tpy) significance threshold for all criteria pollutants. Potential impacts on air quality are discussed further in the EA (air section included).
State Clean Water Act	Addresses the state's policy concerning water quality and wetlands.	**CONSISTENT** The project review by the USACE is being made pursuant to Section 10 of the Rivers and Harbors Act. Section 401 of the Clean Water Act requires an applicant for a federal permit to obtain water quality certification from the State before commencing work in waters of the U.S. Water quality certification for the proposed placement of 29 test piles in the Hood Canal south of Explosive Handling Wharf #1 (EHW-1) will be initiated upon submittal of the JARPA and completed as part of the permitting process.

Statue	Scope	Consistency
Ocean Resources Management Act	Establishes the state's policy for leasing tidal or submerged coastal lands from Cape Flattery to Cape Disappointment.	**NOT APPLICABLE** The proposed action does not affect ocean uses involving renewable and/or non renewable resources that occur on Washington's coastal waters.
Energy Facility Site Evaluation Council	Addresses the state's policy for permitting the development of new energy-generating facilities.	**NOT APPLICABLE** The proposed action does not include the construction of any energy-generating facilities.

CONCLUSION

The proposed action will be undertaken in a manner is consistent to the maximum extent practicable with the enforceable policies of Washington's approved coastal zone management program

Figure 1 Study Area

Figure 2 NBK Bangor Restricted Areas

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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

December 16, 2010

Captain M.J. Olson
Naval Base Kitsap
120 South Dewey Street
Bremerton, WA 98314

Dear Captain Olson:

RE: **Coastal Zone Consistency for Test Pile Program Project, Naval Base Kitsap, Hood Canal, Kitsap County, Washington**

On August 19, 2010, U.S. Department of the Navy (Navy) submitted a Certification of Consistency with the Washington State Coastal Zone Management Program (CZMP). On October 15, 2010, the Department of Ecology (Ecology) and Navy jointly agreed to a CZM extension. Pursuant to Section 307(c)(3) of the Coastal Zone Management Act of 1972 as amended, Ecology concurs with Navy's determination that the proposed work is consistent with Washington's CZMP.

If you have any questions regarding Ecology's consistency determination please contact Rebekah Padgett at (425) 649-7129.

YOUR RIGHT TO APPEAL

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of this Order:

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel Rd SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

CONTACT INFORMATION

Please direct all questions about this Order to:

Rebekah Padgett
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008
(425) 649-7129
rpad461@ecy.wa.gov

MORE INFORMATION

Pollution Control Hearings Board Website
www.eho.wa.gov/Boards_PCHB.aspx
Chapter 43.21B RCW - Environmental Hearings Office – Pollution Control Hearings Board
http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21B
Chapter 371-08 WAC – Practice And Procedure
http://apps.leg.wa.gov/WAC/default.aspx?cite=371-08

Sincerely,

Erik Stockdale

Erik Stockdale, Unit Supervisor
Northwest Regional Office
Shorelands and Environmental Assistance Program

ES:rrp:cja

By certified mail: 7010 1060 0000 7466 4066

cc: Greg Leicht, Naval Base Kitsap
Catherine Blackwell, U.S. Army Corps of Engineers
Lisa Lewis, Kitsap County
e-cc: Joe Burcar, Ecology
Raman Iyer, Ecology
Loree' Randall, Ecology
ecyrefedpermits@ecy.wa.gov

APPENDIX B

Air Emission Calculations

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Test Piles emissions calculations for boat, From EPA AP-42, Vol II

E=A*EF

E=emissions
A=activity rate
EF=emissions factor

Assumptions
internal combustion diesel engine with 600 HP or less for the vibratory hammer and the pile driver
50.75 hours total for vibratory hammer & pile driver
no emissions control reductions
A=50.75 hours
boat operates 100% of the time the vibratory hammer and/or pile driver are operating
approximately 60 year old 44-foot tugboat

Calculations explanations

Nox	where A=50.75 hours per year, E=0.031 lbs./hp-hr
CO	where A=50.75 hours per year, E=6.68 E-03 lbs./hp-hr
SOx	where A=50.75 hours per year, E=2.05 E-03 lbs./hp-hr
PM10	where A= 50.75 hours per year, E=2.20 E-03 lbs./hp-hr
CO2	where A= 50.75 hours per year, E=1.15 lbs./hp-hr

Nox	**943.95 lbs.**	**0.47 tons**	emissions for activity	EF=0.031
CO	**203.41 lbs.**	**0.10 tons**	emissions for activity	EF=6.68 E-03
SOx	**62.42 lbs.**	**0.03 tons**	emissions for activity	EF=2.05 E-03
PM10	**66.99 lbs.**	**0.03 tons**	emissions for activity	EF=2.20 E-03
CO2	**35017.50 lbs.**	**17.51 tons**	emissions for activity	EF=1.15
	36249.00 lbs.	**18.15 tons**	SUM emissions for activity	

Test Piles emissions calculations for vibratory hammer and pile driver combined (Proposed action only, no emissions associated with the (No Action Alternative), From EPA AP-42, Vol II

E=A*EF

E=emissions
A=activity rate
EF=emissions factor

<u>Assumptions</u>
internal combustion diesel engine with 600 HP or less for the vibratory hammer and the pile driver
50.75 hours total for vibratory hammer & pile driver
no emissions control reductions
A=50.75 hours
boat operates 100% of the time the vibratory hammer and/or pile driver are operating
approximately 60 year old 44-foot tugboat

<u>Calculations explanations</u>

Nox	where A=50.75 hours per year, E=0.031 lbs./hp-hr
CO	where A=50.75 hours per year, E=6.68 E-03 lbs./hp-hr
SOx	where A=50.75 hours per year, E=2.05 E-03 lbs./hp-hr
PM10	where A=50.75 hours per year, E=2.20 E-03 lbs./hp-hr
CO2	where A=50.75 hours per year, E=1.15 lbs./hp-hr

Nox	**943.95**	**lbs.**	**0.47**	**tons**	emissions for activity	EF=0.031
CO	**203.41**	**lbs.**	**0.10**	**tons**	emissions for activity	EF=6.68 E-03
SOx	**62.42**	**lbs.**	**0.03**	**tons**	emissions for activity	EF=2.05 E-03
PM10	**66.99**	**lbs.**	**0.03**	**tons**	emissions for activity	EF=2.20 E-03
CO2	**35017.50**	**lbs.**	**17.51**	**tons**	emissions for activity	EF=1.15
	36294.00	**lbs.**	**18.15**	**tons**	**SUM emissions for activity**	
			36.29	**tons**	**SUM TOTAL for boat, pile driver and vibratory hammer**	

APPENDIX C

Tribal Consultations

This appendix contains the following letters:

1. Letter to the Suquamish Tribe dated July 6, 2010
2. Letter to the Skokomish Tribal Nation dated August 17, 2010
3. Letter to the Port Gamble S'Klallam Tribe dated September 10, 2010
4. Letter to the Jamestown S'Klallam Tribe dated September 10, 2010
5. Letter to the Pont No Point Treaty Council dated September 10, 2010
6. Letter to the Lower Elwha Klallam Tribe dated September 10, 2010

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DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00486
6 Jul 10

Suquamish Tribe
The Honorable Leonard Forsman
P.O. Box 498
Suquamish, WA 98392

Dear Chairman Forsman:

Thank you for meeting with me on June 15, 2010. I know your time is valuable and I appreciate the time you and your staff spent meeting with me. I especially appreciate being invited to participate in the ground breaking ceremony for the Suquamish Veterans Memorial. Native Americans have traditionally played a significant role in the defense of the Nation and I was proud to be included in the ceremony.

In our meeting I presented information on projects which the Navy is considering for implementation at several Naval Base Kitsap facilities. Attached to this letter are our notes of the meeting, including our understanding of your questions and comments. After listening to your thoughts, I understood you had no objection to some of the projects, and I have reflected as such in the notes. Government-to-Government consultation can be reinitiated on these at any time, and as mentioned at the meeting the Navy would bring any notable project changes to the Tribe for consideration.

Please do not hesitate to contact me or my staff if you have any questions on these or other topics. I can be reached at 360-627-4000 (work) 360-340-6543 (cell), or mark.j.olson@navy.mil. My Environmental Director, Mr. Greg Leicht can be reached at 360-315-5411 (work), 360-649-1623(cell), or gregory.leicht@navy.mil.

Sincerely,

M. J. OLSON
Captain, U.S Navy
Commanding Officer

Enclosures: 1. Meeting Notes from Suquamish-Naval Base Kitsap Government-to-Government meeting on 15 June 2010
2. Presentation slides from 15 June 2010 Naval Base Kitsap - Suquamish Tribe Government to Government Consultation

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00597
17 Aug 10

The Honorable Guy Miller
Skokomish Tribal Nation
80 N. Tribal Center Rd.
Skokomish, WA 98584

Dear Chairman Miller,

Thank you for meeting with me on July 29, 2010. I know your time is valuable and I appreciate the time you, the council members, and staff spent meeting with me.

In our meeting I presented information on projects which the Navy is considering for implementation at Naval Base Kitsap Bangor and Zelatched Point. Attached to this letter are our notes of the meeting, including responses to questions and comments. After listening to your thoughts, I understand you have no objection to some of the projects, and I have reflected that in the notes. Government-to-Government consultation can be reinitiated on these at any time, and the Navy would certainly bring any notable project changes to the Tribe for consideration.

Please do not hesitate to contact me or my staff if you have any questions on these or other topics. I can be reached at 360-627-4000 (work) 360-340-6543 (cell), or mark.j.olson.navy.mil. My Environmental Director, Mr. Greg Leicht can be reached at 360-315-5411 (work), 360-649-1623(cell), or gregory.leicht@navy.mil.

Sincerely,

M. J. OLSON
Commanding Officer
Naval Base Kitsap

Enclosure: (1) Meeting Notes from Skokomish-Naval Base Kitsap Government-to-Government meeting on 29 July 2010
(2) Presentation slides from 29 July 2010 Naval Base Kitsap - Skokomish Tribe Government to Government Consultation

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/ 00666
10 SEP 10

The Honorable Jeromy Sullivan
Chairman, Port Gamble S'Klallam Tribe
31912 Little Boston Road NE
Kingston, WA 98346

Dear Chairman Sullivan:

As you may be aware, I met with Jessica Coyle and Tamara Gage and representatives of the Jamestown S'Klallam Tribe, Lower Elwha Klallam Tribe, and Point No Point Treaty Council on August 31, 2010. I appreciate the time Ms. Coyle and Ms. Gage spent meeting with me and the valuable input they provided.

In our meeting I presented information on projects which the Navy is considering for implementation at Naval Base Kitsap Bangor and Zelatched Point. Attached to this letter are our notes of the meeting, including responses to questions and comments. After listening to your thoughts, I understand you have no objection to some of the projects, and I have reflected that in the notes. Government-to-Government consultation can be reinitiated on these at any time, and the Navy would certainly bring any notable project changes to the Tribe for consideration.

Please do not hesitate to contact me or my staff if you have any questions on these or other topics. I can be reached at 360-627-4000 (work) 360-340-6543 (cell), or mark.j.olson.navy.mil. My Environmental Director, Mr. Greg Leicht can be reached at 360-315-5411 (work), 360-649-1623(cell), or gregory.leicht@navy.mil.

Sincerely,

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

Enclosures: (1) Meeting Notes from Naval Base Kitsap - Jamestown S'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010
(2) Presentation Slides from Naval Base Kitsap - Jamestown 'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010

Copy to: Jessica Coyle & Tamara Gage

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/ 00663
10 SEP 10

The Honorable W. Ron Allen
Chairman, Jamestown S'Klallam Tribe
1033 Old Blyn Highway
Sequim, WA 98382

Dear Chairman Allen:

As you may be aware, I met with Kelly Toy and Scott Chitwood and representatives of the Lower Elwha Klallam Tribe, Port Gamble S'Klallam Tribe and Point No Point Treaty Council on August 31, 2010. I appreciate the time Ms. Toy and Mr. Chitwood spent meeting with me and the valuable input they provided.

In our meeting I presented information on projects which the Navy is considering for implementation at Naval Base Kitsap Bangor and Zelatched Point. Attached to this letter are our notes of the meeting, including responses to questions and comments. After listening to your thoughts, I understand you have no objection to some of the projects, and I have reflected that in the notes. Government-to-Government consultation can be reinitiated on these at any time, and the Navy would certainly bring any notable project changes to the Tribe for consideration.

Please do not hesitate to contact me or my staff if you have any questions on these or other topics. I can be reached at 360-627-4000 (work) 360-340-6543 (cell), or mark.j.olson.navy.mil. My Environmental Director, Mr. Greg Leicht can be reached at 360-315-5411 (work), 360-649-1623(cell), or gregory.leicht@navy.mil.

Sincerely,

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

Enclosures: (1) Meeting Notes from Naval Base Kitsap - Jamestown S'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010
(2) Presentation Slides from Naval Base Kitsap - Jamestown 'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010

Copy to: Kelly Toy & Scott Chitwood

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/ 00665
10 SEP 10

Randy Harder
Executive Director, Point No Point Treaty Council
7999 NE Salish Lane
Kingston, WA 98346

Dear Mr. Harder:

As you may be aware, I met with Randy Hatch and Chris Weller and representatives of the Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe and the Lower Elwha Klallam Tribe on August 31, 2010. I appreciate the time Mr. Hatch and Mr. Weller spent meeting with me and the valuable input they provided.

In our meeting I presented information on projects which the Navy is considering for implementation at Naval Base Kitsap Bangor and Zelatched Point. Attached to this letter are our notes of the meeting, including responses to questions and comments. After listening to your thoughts, I understand you have no objection to some of the projects, and I have reflected that in the notes. Government-to-Government consultation can be reinitiated on these at any time, and the Navy would certainly bring any notable project changes to the Tribe for consideration.

Please do not hesitate to contact me or my staff if you have any questions on these or other topics. I can be reached at 360-627-4000 (work) 360-340-6543 (cell), or mark.j.olson.navy.mil. My Environmental Director, Mr. Greg Leicht can be reached at 360-315-5411 (work), 360-649-1623(cell), or gregory.leicht@navy.mil.

Sincerely,

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

Enclosures: (1) Meeting Notes from Naval Base Kitsap - Jamestown S'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010
(2) Presentation Slides from Naval Base Kitsap - Jamestown 'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010

Copy to: Randy Hatch & Chris Weller

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/ 00664
10 SEP 10

The Honorable Francis Charles
Chairwoman, Lower Elwha Klallam Tribe
2851 Lower Elwha Road
Port Angeles, WA 98362

Dear Chairwoman Charles:

As you may be aware, I meet with Doug Morrill and representatives of the Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe and Point No Point Treaty Council on August 31, 2010. I appreciate the time Mr. Morrill spent meeting with me and the valuable input he provided.

In our meeting I presented information on projects which the Navy is considering for implementation at Naval Base Kitsap Bangor and Zelatched Point. Attached to this letter are our notes of the meeting, including responses to questions and comments. After listening to the thoughts of the tribal representatives, I understand there are no objections to some of the projects, and I have reflected that in the notes. Government-to-Government consultation can be reinitiated on these projects at any time, and the Navy would bring any notable project changes to the Tribe for consideration.

Please do not hesitate to contact me or my staff if you have any questions on these or other topics. I can be reached at 360-627-4000 (work) 360-340-6543 (cell), or mark.j.olson.navy.mil. My Environmental Director, Mr. Greg Leicht can be reached at 360-315-5411 (work), 360-649-1623(cell), or gregory.leicht@navy.mil.

Sincerely,

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

Enclosures: (1) Meeting Notes from Naval Base Kitsap - Jamestown S'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010
(2) Presentation Slides from NBK - Jamestown 'Klallam, Port Gamble S'Klallam and Lower Elwha Klallam Tribes Government-to-Government meeting on 31 August 2010

Copy to: Doug Morrill

APPENDIX D

SHPO Concurrence Letter

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DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00444
23 Jun 10

Allyson Brooks, PhD
State Historic Preservation Officer
Department of Archaeology and Historic Preservation
P.O. Box 48343
Olympia, WA 98504-8343

Dear Dr. Brooks:

SUBJECT: REQUEST FOR CONCURRENCE ON A DETERMINATION OF NO HISTORIC PROPERTIES AFFECTED BY TEST PILE PROGRAM AT NAVAL BASE KITSAP BANGOR WATERFRONT. DAHP LOG NO: 022210-11-USN

The U.S. Navy recently consulted with your office on geotechnical testing in the vicinity of the Explosives Handling Wharf at Naval Base Kitsap Bangor, Kitsap County, Washington (Enclosure 1). The Navy is now considering additional work in the form of a pile test program. The purpose of the pile test program is to provide data for design of a second Explosives Handling Wharf (EHW-2). The Navy will initiate consultation on the EHW-2 project, but the pile test program is required to finalize project design. In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470f), and its implementing regulation, 36 CFR 800, the Navy is submitting a determination of effects to historic properties from this proposed undertaking. The action will require a permit from the U.S. Army Corps of Engineers.

The pile test program will consist of installation and removal of up to 29 steel piles to assess pile-driving effectiveness, evaluate pile capacities, and evaluate sound attenuation measures. Piles will range in size from 30 to 60 inches in diameter. Enclosure 2 shows locations of 18 piles. Some of these piles will be removed and reinstalled adjacent to other piles to conduct lateral, tension, and compression load tests. The pile lengths will range from 100 feet to 190 feet. The piles will be removed at the end of the program.

There are no recorded submerged historic properties, downed aircraft, shipwrecks, traditional fishing features or other structures in the offshore area. There are, however, three

SUBJECT: REQUEST FOR CONCURRENCE ON A DETERMINATION OF NO HISTORIC PROPERTIES AFFECTED BY TEST PILE PROGRAM AT NAVAL BASE KITSAP BANGOR WATERFRONT. DAHP LOG NO: 022210-11-USN

prehistoric shell middens located along the waterfront at Naval Base Kitsap Bangor (45KP106, the Floral Point Shell Midden, 45KP107, the Amberjack Road Shell Midden, and 45KP108, the Carlson Spit Shell Midden).

Tribal consultation for the EHW-2 project has been initiated with the Suquamish, Skokomish, Port Gamble S'Klallam, Jamestown S'Klallam, and Lower Elwah Klallam Tribes, and is currently ongoing.

The Area of Potential Effect (APE) for this undertaking is shown in Enclosure 2. The probability that historic properties exist offshore is too low to warrant archaeological monitoring.

The Navy requests your concurrence on our determination of *No Historic Properties Affected* from the pile test program south of the existing Explosives Handling Wharf. If you require further information or have any questions, please contact Bill Kalina at (360) 396-5353 or william.kalina@navy.mil.

Sincerely,

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

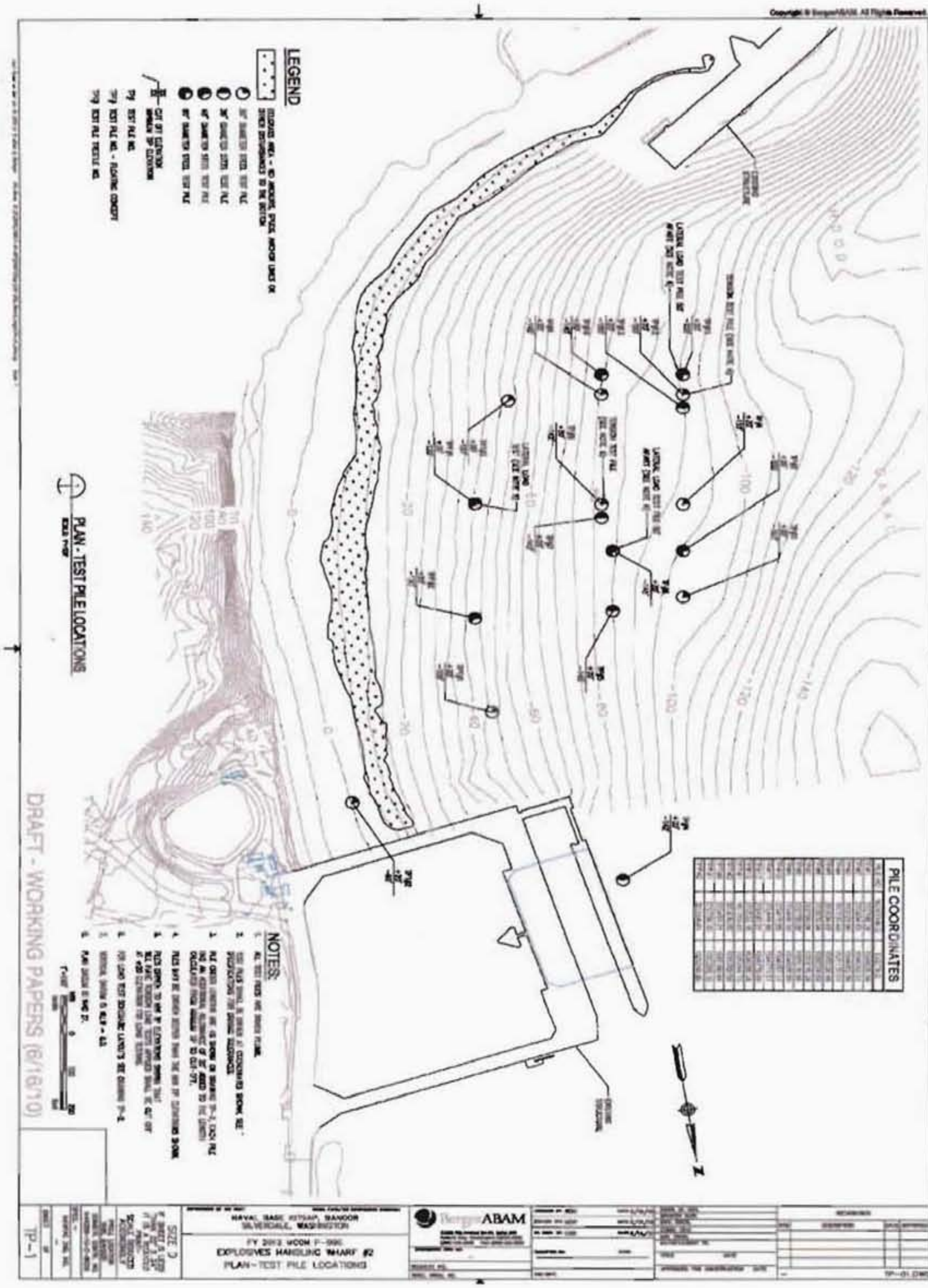
Enclosures: 1. Site Location Map
2. APE for pile test program

Copy to:
Ms. Kris Miller, Skokomish Tribe
Mr. Dennis Lewarch, Suquamish Tribe
Ms. Marie Hebert, Port Gamble S'Klallam Tribe
Ms. Vicky Carroll, Jamestown S'Klallam Tribe
Ms. Francis Charles, Lower Elwah S'Klallam Tribe

Source. Base map prepared from DeLorme Topo 7.0, 2007.

Site Location Map

Enclosure (1)



APE for Pile Test Program

Enclosure (2)

STATE OF WASHINGTON

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION

1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501
Mailing address: PO Box 48343 • Olympia, Washington 98504-8343
(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov

June 28, 2010

Captain M. J. Olson
Naval Base Kitsap
120 South Dewey Street
Bremerton, Washington 98314-5020

Re: Pile Testing at Explosives Handling Wharf Project
Log No: 022210-11-USN

Dear Captain Olson:

Thank you for contacting our department. We reviewed the materials you provided for the proposed Pile Testing at Explosives Handling Wharf Project at Naval Base Bangor, Kitsap County, Washington.

We concur with your determination of No Historic Properties Affected.

We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on the behalf of the State Historic Preservation Officer in conformance with Section 106 of the National Historic Preservation Act and its implementing regulations 36CFR800. Should additional information become available, our assessment may be revised.

In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity must stop, the area secured, and the concerned tribes and this department notified. Thank you for the opportunity to comment and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360) 586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

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APPENDIX E

Essential Fish Habitat Assessment

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UNITED STATES
DEPARTMENT
OF THE NAVY

TEST PILE PROGRAM
NBK BANGOR WATERFRONT

FINAL
ESSENTIAL FISH HABITAT ASSESSMENT

Quillback rockfish Photo credit: NOAA

NAVAL BASE
KITSAP BANGOR

SILVERDALE,
KITSAP COUNTY,
WASHINGTON

Prepared by:

NAVFAC Atlantic
6506 Hampton Blvd.
Norfolk, VA 23508

August 2010

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LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
cm	Centimeters
CSL	Cleanup Screening Level
dB	Decibel
DO	Dissolved oxygen
EA	Environmental Assessment
EFH	Essential Fish Habitat
EHW	Explosives Handling Wharf
FMC	Fishery Management Council
FMP	Fishery Management Plan
FR	Federal Register
HAPC	Habitat Areas of Particular Concern
HUD	Habitat Use Database
km	Kilometers
m	Meters
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MHHW	Mean higher high water
MLLW	Mean lower low water
MRA	Marine Resources Assessment
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
Navy	United States Department of the Navy
NBK	Naval Base Kitsap
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Units
PAH	Polycyclic aromatic hydrocarbon
PFMC	Pacific Fishery Management Council
PSU	Practical salinity units

LIST OF ACRONYMS AND ABBREVIATIONS (cont.)

rms	Root mean square
SEL	Sound Exposure Level
SSP	Strategic Systems Programs
TOC	Total organic carbon
TRIDENT	TRIDENT Fleet Ballistic Missile Program
U.S.	United States
U.S.C.	United States Code

1.0 INTRODUCTION

As required by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the purpose of this document is to present the findings of the Essential Fish Habitat (EFH) Assessment conducted for the United States (U.S.) Department of the Navy's (Navy) proposed Test Pile Program. The objective of this EFH Assessment is to evaluate how the actions proposed as part of the Test Pile Program may affect EFH designated by the Pacific Fishery Management Council (PFMC) and implemented by the National Marine Fisheries Service (NMFS) within its area of influence.

This EFH Assessment will include a description of the proposed action; an overview of the EFH designated within the activity area, an analysis of the direct and cumulative effects on EFH for the managed fish and their food resources; the Navy's views regarding the effects of the proposed activity; and proposed mitigation measures selected to minimize any potential adverse effects that could result from the proposed activity.

Additional detail regarding the Navy's proposed Test Pile Program, the affected environment, and the potential environmental effects associated with ongoing and proposed naval activities is contained in the Draft Environmental Assessment (EA) for the Test Pile Program - NBK Bangor Waterfront (July 2010). The Marine Resources Assessment (MRA) for the Pacific Northwest Operating Area (DoN 2006) also contains comprehensive descriptions of the marine environment including climate, marine geology, physical, chemical, and biological oceanography, marine habitats, and protected species in the project area.

2.0 PROPOSED ACTION

The Naval Base Kitsap (NBK) Bangor is situated adjacent to Hood Canal in Kitsap County, Washington approximately 20 miles (32 kilometers [km]) west of Seattle (Figure 2–1). The NBK Bangor provides berthing and support services to Navy submarines and other fleet assets. The entirety of NBK Bangor, including the land areas and adjacent water areas in Hood Canal, is restricted from general public access.

As part of the Navy's sea-based strategic deterrence mission, the Navy Strategic Systems Programs (SSP) directs research, development, manufacturing, test, evaluation, and operational support of the TRIDENT Fleet Ballistic Missile (TRIDENT) Program. As part of this mission, SSP is proposing to construct and operate a second Explosives Handling Wharf (EHW-2) adjacent to the existing Explosive Handling Wharf at NBK Bangor. The proposed EHW-2 is needed to ensure the Navy has in place the facilities required to load and offload missiles and to perform routine operations and upgrades necessary to maintain the TRIDENT Program. To inform the design of the proposed EHW-2, the Navy is proposing to conduct a study to test

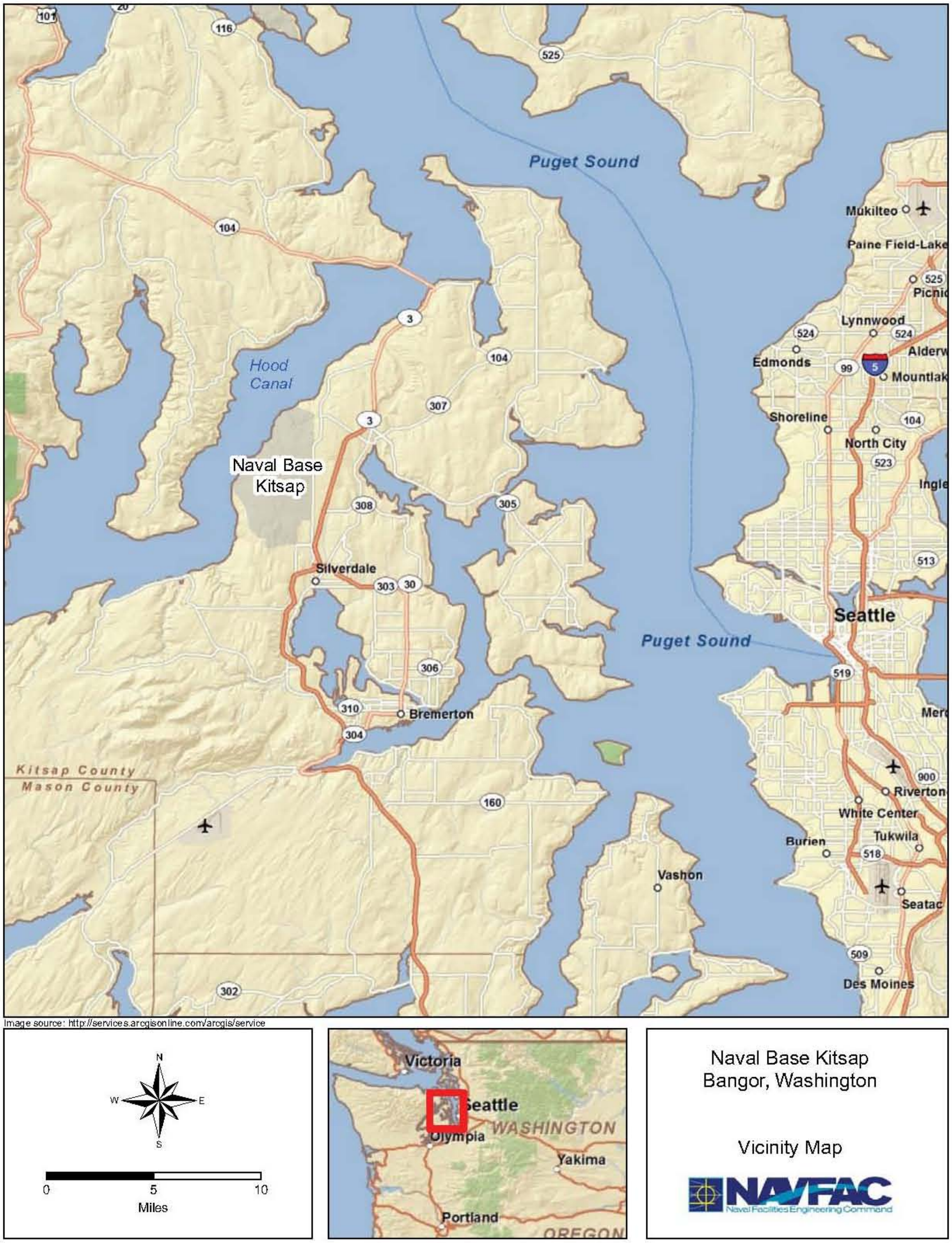

Figure 2-1. Location of Naval Base Kitsap in Bangor, WA.

various types of piles and noise attenuation strategies. The proposed action (also called the Test Pile Program) is to install and remove up to 29 test and reaction piles, conduct testing on select piles, and measure in-water noise propagation during pile installation and removal. Geotechnical and noise data collected during pile installation and removal will be integrated into the design, construction, and environmental planning for the Navy's proposed EHW-2. The Navy proposes to install the test piles in the location planned for the proposed EHW-2 (south of the existing Explosives Handling Wharf; Figure 2-2); however, other future projects can also benefit from the geotechnical and noise propagation data gathered from driving the test piles.

The Test Pile Program will involve driving 18 hollow steel piles, ranging in size from 30 to 60 inches (76.2 to 152.4 centimeters [cm]) in diameter and having a thickness of 0.75 inches (1.9 cm), at predetermined locations within the proposed footprint of EHW-2 (Figure 2-3). Eleven additional reaction piles will be installed to perform lateral load and tension load tests on the original 18 test piles. The test and reaction piles will range in length from 100 to 197 feet (30.5 to 60 meters [m]) and will be placed in water depths of 10 to 100 feet (3 to 30.5 m). All piles will be vibratory driven for their initial embedment depths and then will be impact driven for their final 10 to 15 feet (3 to 4.6 m). However, piles meeting excessive resistance using the vibratory hammer will be impact driven to the design depth. Noise attenuation measures will be used during all impact hammer operations and two of the piles driven with vibratory hammers. The proposed action would also cover the removal of all test piles at the completion of the program through the use of vibratory hammers. Hydroacoustic monitoring will be performed to assess the effectiveness of the noise attenuation measures. The entire Test Pile Program will not exceed more than 40 days in duration.

3.0 ESSENTIAL FISH HABITAT

In 1996, the MSFCMA was reauthorized and amended by the Sustainable Fisheries Act (Public Law 104-267). The reauthorized MSFCMA mandated numerous changes to the existing legislation designed to prevent overfishing, rebuild depleted fish stocks, minimize bycatch, enhance research, improve monitoring, and protect fish habitat. One of the most significant mandates in the MSFCMA that came out of the reauthorization was the EFH provision, which provides the means to conserve fish habitat.

The EFH mandate requires that the regional fishery management councils (FMCs), through federal fishery management plans (FMPs), describe and identify EFH for each federally managed species; minimize, to the extent practicable, adverse effects on such habitat caused by fishing; and identify other actions to encourage the conservation and enhancement of such habitats. Congress defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 United States Code [U.S.C.] 1802[10]). The term “fish” is defined in the MSFCMA as “finfish, mollusks, crustaceans, and all other forms of

Figure 2-2. The proposed project area in relation to the existing Explosive Handling Wharf.

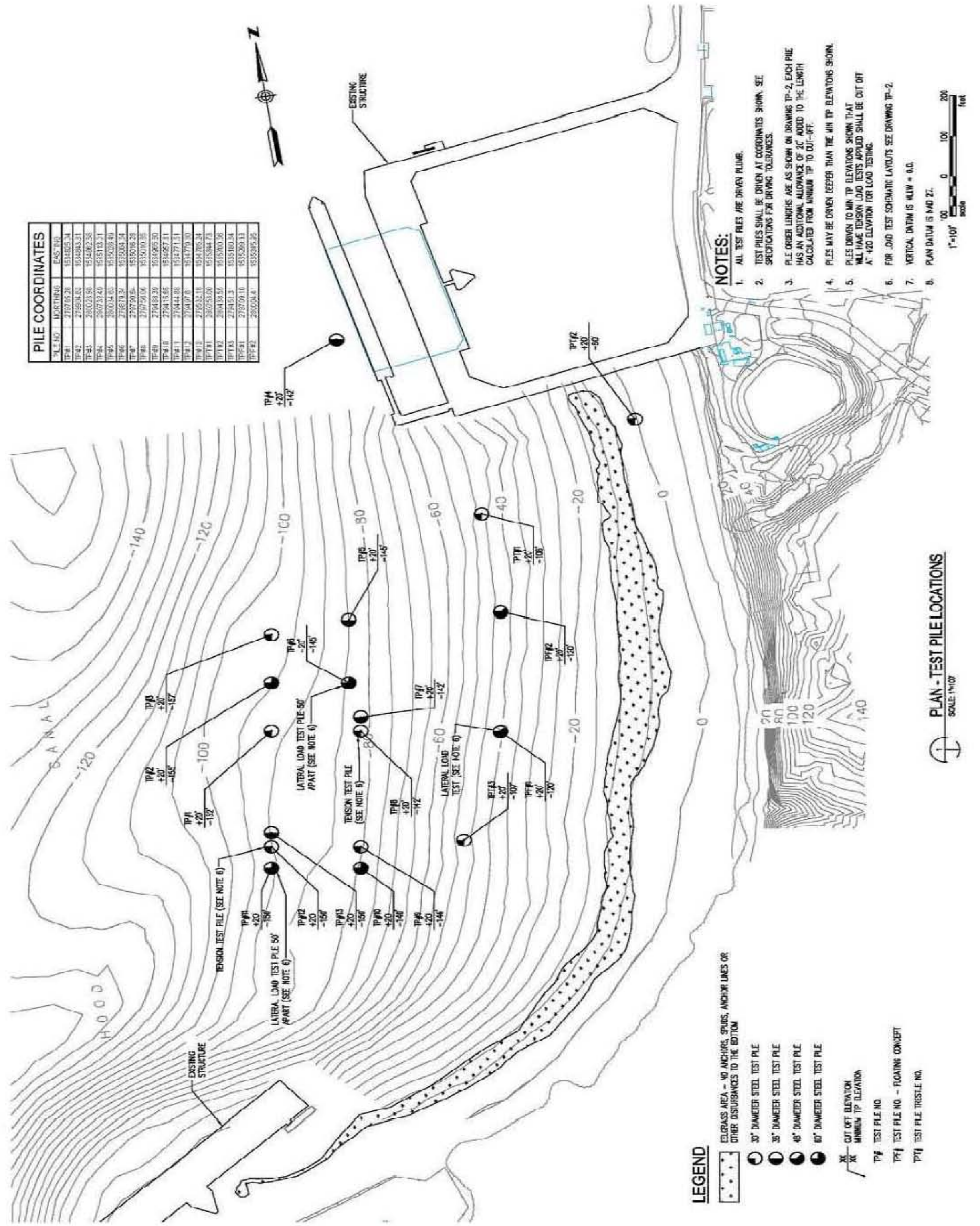

Figure 2-3. A depiction of the planned locations of the piles to be tested during the Test Pile Study in relation to the existing Explosives Handling Wharf at NBK Bangor.

marine animals and plant life other than marine mammals and birds." The regulations for implementing EFH clarify that "waters" include all aquatic areas and their biological, chemical, and physical properties, while "substrate" includes the associated biological communities that make these areas suitable fish habitats (50 Code of Federal Regulations [CFR] 600.10). Habitats used at any time during a species' life cycle (i.e., during at least one of its lifestages) must be accounted for when describing and identifying EFH (NMFS 2002).

Authority to implement the MSFCMA is given to the Secretary of Commerce through the NMFS. The MSFCMA requires that EFH be identified and described for each federally managed species. The MSFCMA also requires federal agencies to consult with the NMFS on activities that may adversely affect EFH or when the NMFS independently learns of a federal activity that may adversely affect EFH. The MSFCMA defines an adverse effect as "any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions" (50 CFR 600.810).

In addition to EFH designations, areas called Habitat Areas of Particular Concern (HAPC) are also designated by the regional FMCs. Designated HAPC are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation (50 CFR 600.805-600.815). Regional FMCs may designate a specific habitat area as an HAPC based on one or more of the following reasons: 1) importance of the ecological function provided by the habitat; 2) the extent to which the habitat is sensitive to human-induced environmental degradation; 3) whether, and to what extent, development activities are, or will be, stressing the habitat type; and 4) rarity of the habitat type (NMFS 2002). Categorization as HAPC does not confer additional protection or restriction to the designated area.

This EFH Assessment analyzes the potential effects of Navy activities to fish and EFH in the context of the MSFCMA. To help identify Navy activities falling within the adverse effect definition for EFH, the Navy has determined that temporary or minimal impacts are not considered to "adversely affect" EFH. The EFH Final Rule (67 Federal Register [FR] 2354) and 50 CFR 600.815(a)(2)(ii) were used as guidance for this determination, as they highlight activities with impacts that are more than minimal and not temporary in nature, as opposed to those activities resulting in inconsequential changes to habitat. Temporary effects are those that are limited in duration and allow the particular environment to recover without measurable impact (NMFS 2002). Minimal effects are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions (NMFS 2002). While these criteria were established to pertain to fishing activities, in the absence of similar criteria/guidance for non-fishing impacts on EFH and pursuant to the preamble of the EFH Final

Rule which states that "Federal agencies retain the discretion to make their own determinations as to what actions may fall within NMFS' definition of 'adverse effect'" (67 FR 2347), it is the policy of the Navy that these same criteria are to be used for determining whether the Navy's non-fishing impacts reduce the quality and/or quantity of EFH (i.e., fall within the adverse effect definition) (OPNAVINST 5090.1B).

3.1 Essential Fish Habitat Designations

The PFMC is responsible for designating EFH for all federally managed species occurring in the coastal and marine waters off the coasts of Washington, Oregon, and California, including the Puget Sound. The PFMC designated EFH for these species within the FMPs for each of the four primary fisheries that they manage: Pacific Coast Groundfish, Pacific Coast Salmon, Coastal Pelagic Species, and West Coast Fisheries for Highly Migratory Species (PFMC 1998, 2003, 2007, 2008). Of these fisheries, only three (groundfish, salmon, and coastal pelagic species) contain species for which EFH has been designated within Hood Canal or in the vicinity of NBK Bangor.

3.1.1 Groundfish

Pacific coast groundfish species are considered sensitive to over-fishing, the loss of habitat, and water and sediment quality (PFMC 2008). The groundfish EFH consists of the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem (PFMC 2008). The PFMC (2008) identifies the overall area designated as groundfish EFH for all species covered in the FMP as all waters and substrate within "depths less than or equal to 3,500 m [~ 11,500 feet] to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow." Furthermore, the PMFC (2008) has also designated EFH for each individual groundfish species by lifestage. These designations are contained within Appendix B of the FMP. Using the Pacific Habitat Use Relational Database (HUD) developed by the PFMC, it was determined which groundfish species and lifestages have EFH designated within the vicinity of the Test Pile Program site. A table of these species/lifestages is contained within the Appendix of this EFH Assessment. The management unit in the Pacific Coast Groundfish FMP includes 83 groundfish species (PFMC 2008). Of these, 32 were identified through the analysis of the HUD as having EFH designated in the vicinity of NBK Bangor. Based on the analysis, the primary habitats designated as EFH for these species include:

- The epipelagic zone of the water column, including macrophyte canopies and drift algae;
- Unconsolidated sediments consisting of mud, sand, or mixed mud/sand;
- Hard bottom habitats composed of boulders, bedrock, cobble, gravel, or mixed gravel/cobble;

- Mixed sediments composed of sand and rocks; and
- Vegetated bottoms consisting of algal beds, macrophytes, or rooted vascular plants.

3.1.2 Salmon

Designated EFH for Pacific salmon extends from the nearshore and tidal submerged environments within state territorial waters of Washington, Oregon, and California north of Point Conception out to the exclusive economic zone (200 miles) offshore (PFMC 2003). In addition to the marine and estuarine waters, salmon species have a defined freshwater EFH, which includes all lakes, streams, ponds, rivers, wetlands, and other bodies of water that have been historically accessible to salmon (PFMC 2003), including the waters of NBK Bangor. For the Pacific salmon fishery, EFH (which includes Hood Canal), is identified using U.S. Geological Survey (USGS) hydrologic units, as well as habitat association tables and life history descriptions of each life stage (PFMC 2003). Pacific salmon species EFH is primarily affected by the loss of suitable spawning habitat, barriers to fish migration (habitat access), reduction in water and sediment quality, changes in estuarine hydrology, and decreases in prey food source (PFMC 2003).

3.1.3 Coastal Pelagic Species

The EFH designations for coastal pelagic species are based on the geographic range and in-water temperatures where these species are present during a particular life stage (PFMC 1998). Specific EFH boundaries (i.e., the habitat necessary to provide sufficient fishery production) are based on best available scientific information and described in the Coastal Pelagics Fishery Management Plan (PFMC 1998). These boundaries include the waters of NBK Bangor. Two species identified as coastal pelagic species are known to occur in Hood Canal waters: northern anchovy and market squid (SAIC 2006; Bhuthimethee et al. 2009). Aside from their value to commercial Pacific fisheries, coastal pelagic species are also recognized for their importance as food for other fish, marine mammals, and birds (63 FR 13833). Coastal pelagic species are considered sensitive to overfishing, the loss of habitat, reduction in water and sediment quality, and changes in marine hydrology, including entrainment through water intakes (PFMC 1998). The primary threats to the proposed krill EFH have not yet been defined by NMFS.

3.2 HABITAT AREAS OF PARTICULAR CONCERN DESIGNATIONS

In addition to designating EFH, the PMFC is also responsible for identifying HAPC for federally managed species. Out of the four fisheries managed by the PFMC, HAPC has only been identified for groundfish. The four HAPC designated for these species include seagrass, canopy kelp, rocky reef, and estuarine habitats along the Pacific coast, including Puget Sound. Two of these HAPC, estuarine habitats and seagrass, are located within the vicinity of the Test Pile Program site.

3.3 DESCRIPTIONS OF HABITATS

3.3.1 Water Column

The values for several water quality parameters (temperature, salinity, dissolved oxygen [DO], and turbidity) that were measured at a series of shallow, nearshore, and deeper, offshore sampling locations along the NBK Bangor waterfront in 2005 and 2006 (Phillips et al. 2009). The sampling stations include locations near the proposed project area (Figure 3-1). Water quality at NBK Bangor is good by most measures and meets applicable standards. Although DO is low in much of Hood Canal, this problem is less pronounced in northern Hood Canal, the location of NBK Bangor, than elsewhere in the canal. At NBK Bangor, DO almost always meets standards in nearshore waters including within the proposed project area.

3.3.1.1 Stratification, Salinity, and Temperature

The waters of Hood Canal surrounding the new EHW project area are stratified, with less saline, warmer water overlying colder, more saline bottom waters. The salinity of the upper water layer is sensitive to the amount of freshwater input and may become more diluted during heavy precipitation (URS Consultants, Inc. 1994). Variances due to seasonal changes (such as freshwater input, wind-induced mixing, and solar heating) are common (URS Consultants, Inc. 1994).

Freshwater input into Hood Canal comes from creeks, rivers, groundwater (including artesian wells [deep underground aquifer]), and stormwater outfalls. The freshwater inputs affect the salinity in Hood Canal. Artesian wells also contribute to freshwater inputs, with estimated flows of 2,000 to 2,500 gallons per minute (WDOE 1981). Overland flow from much of the western portion of NBK Bangor is routed to Hood Canal through a series of stormwater outfalls. Saltwater and freshwater mixing zones exist at the mouths of each of these streams and outfalls (URS Consultants, Inc. 1994).

Between June 2005 and July 2006, surface water salinity levels along the NBK Bangor waterfront ranged from 26 to 35 practical salinity units (PSU) (Phillips et al. 2009). Salinity measurements with depth reflected a stratified water column, with less saline surface water overlying cooler saline water at depth. The transition between the lower salinity surface waters and higher salinity subsurface waters occurred at a depth of about 33 feet (Phillips et al. 2009). The lowest surface water salinity (26.7 PSU) was measured in January 2006 when input from fresh water may have been high due to winter storms and runoff. The range of salinity along the NBK Bangor waterfront is typical for marine waters in Puget Sound (Newton et al. 1998, 2002).

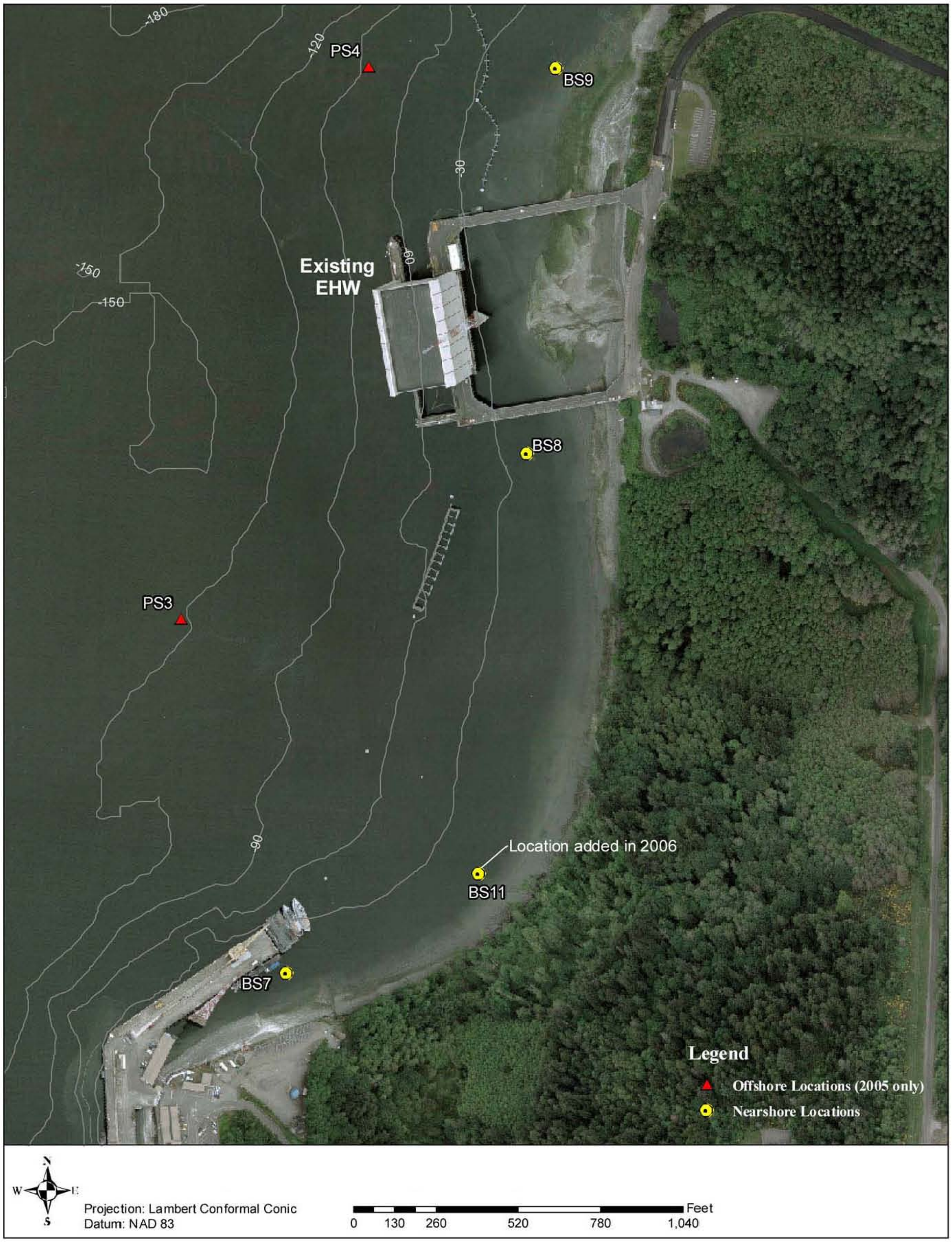

Figure 3-1. Water quality monitoring stations at the site of the proposed Test Pile Program at Naval Base Kitsap Bangor (Phillips et al. 2009).

The temperature of marine surface waters designated as being of extraordinary quality should average less than 13.0°C (55ºF), or 0.3°C (0.5ºF) above natural levels and those designated as being of excellent quality should average less than 16.0oC (60.8^{o}F) or 0.3oC (0.5^{o}F) above natural levels (WAC 173-201A). Temperatures for the nearshore locations (water depth ranging from 1 to 60 m) met extraordinary quality standards during the winter months (January to May 2006) and excellent quality standards during the summer months (July to September 2005 and June 2006). Nearshore areas are susceptible to greater temperature variations due to seasonal fluxes in solar radiation input. Water temperatures at the offshore locations (water depths ranging from 20 to 60 meters) met extraordinary quality standards in July 2005, September 2005, and March through May 2006 and excellent quality standards during late summer (August).

3.3.1.2 Dissolved Oxygen

Data from the Washington State Department of Ecology's Marine Water Quality Monitoring Program for 1998 to 2000 and Hood Canal Dissolved Oxygen Program for 2002 to 2004 show that Hood Canal is particularly susceptible to low DO levels (Newton et al. 2002; HCDOP 2005). The NBK Bangor and the proposed project area are located along the northern stretch of Hood Canal, which is less affected by these seasonal episodes of low DO. From 2003 through 2008, DO concentrations in Hood Canal off the southern boundary of NBK Bangor ranged from approximately 3.8 to 11.8 milligrams per liter (mg/L) at depths of 33 feet (HCDOP 2009). For this same time period, DO concentrations in surface waters ranged from approximately 5 to 13.8 mg/L. The concentrations fluctuate seasonally, with higher DO concentration in the spring and early summer and lower DO concentrations in late summer and fall. The lowest concentration during this period occurred during October 2006.

Mean DO measurements recorded between July 2005 and June 2006 indicate that nearshore stations at the NBK Bangor waterfront consistently met extraordinary quality standards for DO. However, at offshore stations, these ratings ranged from fair to extraordinary quality standards (Phillips et al. 2009). These measurements are in the upper range of DO conditions measured historically throughout Hood Canal during the late summer and fall periods (Warner 2007).

3.3.1.3 Turbidity

Turbidity is a measure of the amount of light scatter related to total suspended solids in the water column and is measured in Nephelometric Turbidity Units (NTUs). Sources of turbidity in Hood Canal waters may include plankton, organic detritus from streams and other storm or wastewater sources, fine suspended sediment particulates (silts and clays), and re-suspended bottom sediments and organic particulates. Suspended particles in the water have the ability to absorb heat from sunlight, which then raises water temperature and reduces light available for photosynthesis.

Washington State-designated extraordinary quality marine surface waters should have an average turbidity reading of less than 5 NTUs (WAC 173-201A). Turbidity measurements were collected along the NBK waterfront, including in the vicinity of the proposed project area, from July 2005 through May 2006, except for October to December 2005 (Phillips et al. 2009). These mean monthly turbidity measurements for both nearshore and offshore waters ranged from 0.7 to 3 NTU and were consistently within the Washington State standards for extraordinary water quality.

3.3.2 Sediments

Sediment supply, distribution, deposition and erosion rates, grain size, organic content, and chemistry are all critical factors that determine the presence or absence of marine plants and animals at specific locations. Existing sediment information for NBK Bangor is based on results from sampling at the project area during 2007 (Hammermeister and Hafner 2009); sampling locations are shown in Figure 3-2. Sediment quality at the project area is generally good; levels of contaminants meet applicable state standards.

3.3.2.1 Physical and Chemical Properties of Sediments

The marine sediments at BNK Bangor are composed of gravelly sands with some cobbles in the intertidal zone, transitioning to silty sands in the subtidal zone (Hammermeister and Hafner 2009). Subsurface coring studies conducted in 1994 found the presence of glacial till approximately 6 feet below mud line in the intertidal zone, increasing to over 10 feet in the subtidal zone (URS Consultants, Inc. 1994). The composition of sediment samples from the project area ranged from 65 to 100 percent for sand, less than 1 to 7 percent for gravel, 2 to 32 percent silt, and 2 to 11 percent clay.

Sediment parameters (such as total organic carbon [TOC], metals, and organic contaminants) were used to characterize sediment quality. TOC, which provides a measure of how much organic matter occurs in the sediments, was less than 1 percent at the project area. A range of 0.5 to 3 percent is typical for Puget Sound marine sediments, particularly those in the main basin and in the central portions of urban bays (PSWQAT and PSEP 1997). Total sulfide concentrations range from not detected (i.e., below the detection limit of 0.4 milligrams per kilogram [mg/kg]) to 82.6 mg/kg. Ammonia concentrations range from 1.3 to 6.2 mg/kg. There are no sediment quality standards (SQS) for TOC, sulfides, or ammonia concentrations.

3.3.2.2 Metals

Concentrations of metals in the sediments at the proposed project area are comparable to background levels for Puget Sound and fall below sediment quality guidelines (e.g., SQS values and Cleanup Screening Level [CSL] values) established by the Washington State Sediment

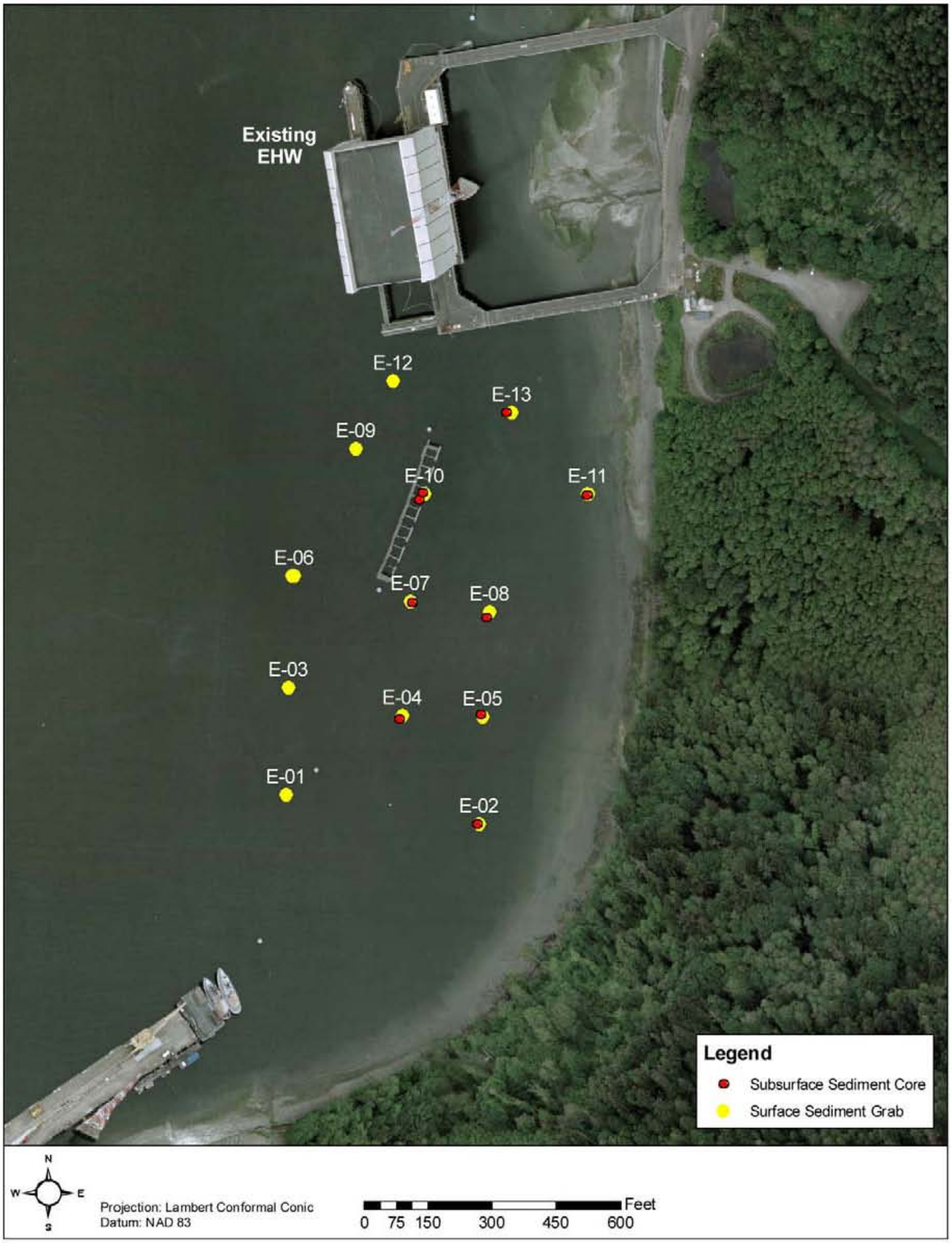

Figure 3-2. Sediment sampling locations at the site of the proposed Test Pile Program at Naval Base Kitsap Bangor (Hammermeister and Hafner 2009).

Management Standards (Hammermeister and Hafner 2009). For example, cadmium concentrations ranged from less than 0.1 to 0.3 mg/kg, which were below the standards of 5.1 and 6.7 mg/kg for SQS and CSL, respectively.

3.3.2.3 Organic Contaminants

The primary source of organotin (butyltin) compounds in marine sediments is residues from anti-fouling paints applied to vessel hulls (Danish EPA 1999). Use of organotins in anti-fouling paints for ships less than 82 feet (25 m) in length and non-aluminum hulls was banned in 1988 by the Organotin Anti-Fouling Paint Control Act. Organotin concentrations within the sediments at the proposed project area contain tri-n-butyltin concentrations up to 7.5 micrograms per kilogram (µg/kg) or 870 µg/kg TOC. While there is no existing sediment quality standard for organotins, Meador et al. (2002) proposed a threshold value of 6,000 µg/kg TOC for tributyltin in sediments as protective of juvenile salmonids. Thus, concentrations in sediments near the proposed project area are below this threshold.

Concentrations of individual polycyclic aromatic hydrocarbon (PAH) compounds in sediments near the proposed project area varied from not detected to 10 mg/kg TOC (Hammermeister and Hafner 2009). Concentrations of individual PAH compounds, as well as the summed concentrations, were below the corresponding SQS and CSL values.

Concentrations of other classes of organic contaminants, such as chlorinated aromatics, phthalate esters, phenols, and other miscellaneous extractable compounds, typically were at or below the analytical detection limits and consistently below the SQS and CSL values.

3.3.3 Benthic Communities

Benthic invertebrates are comprised of bottom dwelling animals that live burrowing or buried in the soft sediments (infauna) and those that live attached to hard bottom substrates (epifauna). Four major groups (Phylum) are found in Hood Canal and in the vicinity of the proposed project area: 1) marine worms (Annelids); 2) snails and bivalves (Molluscs); 3) crabs and other crustaceans (Arthropods); and 4) seastars and sea urchins (Echinoderms).

A recent survey of four different areas along the NBK Bangor waterfront found consistently greater benthic community development in the subtidal zone compared to the intertidal zone and variable community development within and among survey areas (Weston 2006). A mean total of 2 to 12 species with a mean total abundance of 3 to 67 individuals per square foot (0.10 m^2) was observed in the intertidal zone. Subtidal values varied from a mean total of 36 to 77 species and a mean total abundance of 301 to 736 individuals per square foot (0.10 m^2).

The soft-bottom benthic community within the vicinity of the proposed project area is dominated by marine worms, crustaceans, and molluscs across the tide zone, although in the intertidal zone other organisms also may be numerically abundant (Weston 2006; WDOE 2007).

3.3.4 Marine Vegetation

Marine vegetation within the NBK Bangor waterfront includes eelgrass, kelp, and green, red, and brown algae. Marine vegetation in the vicinity of the proposed project area includes primarily eelgrass, kelp (including *Laminaria* sp.), and green and red algae. Most forms of macroalgae were documented in the shallow subtidal zone between 0 and 10 feet below MLLW, often growing in the direct presence of eelgrass (Morris et al. 2009).

3.3.4.1 Eelgrass

One of the most important marine vegetation types to the marine ecosystem is eelgrass. Eelgrass beds produce large amounts of carbon that fuel nearshore food webs. This environment offers habitat to various lifestages of many marine species. Shellfish, such as crabs and bivalves, use eelgrass beds for habitat and nursery areas. Eelgrass is crucial habitat for juvenile salmonids, which use eelgrass beds as migratory corridors, for protection from predators, and for foraging (Mumford 2007). Well-established eelgrass beds were documented in 2007 in all survey areas along the NBK Bangor shoreline in shallow water depths ranging from 0 to 20 feet below the mean lower low water (MLLW) line (Morris et al. 2009). A dense band of eelgrass covering approximately 0.5 acre occurs in the inshore area of the existing Explosives Handling Wharf from MLLW to 5 feet below MLLW (Figure 3-3) (Morris et al. 2009). South of the existing Explosives Handling Wharf, a 2,400-foot (723-m) long, 3.3-acre (13,355-m^2) continuous eelgrass bed occurs below the MLLW line to a depth of -10 feet MLLW (Morris et al. 2009).

3.3.4.2 Kelp

Understory kelp (*Laminaria* sp.) provide a large source of photosynthesized nutrients to the seafloor (from fragmentation and decomposition) and important multi-species vertical habitat in deeper marine waters (Mumford 2007). Two narrow bands of understory kelp occur in the vicinity of the proposed project area approximately 330 feet (100 m) to the south of the existing Explosives Handling Wharf and shoreward of the existing Explosives Handling Wharf between the entrance and exit trestles (Figure 3-4). This species occurs in the subtidal zone. The southern band is approximately 1,600 feet (488 m) long and covers 2.3 acres (9,308 m^2). The northern band behind the existing Explosives Handling Wharf extends to the north covering 4,300 feet (1,311 m) and covering over 13.8 acres (56,250 m^2). No attached, canopy-forming kelp beds (e.g., bull kelp) occur at the proposed project area (Morris et al. 2009).

3.3.4.3 Macroalgae

Sea lettuce is the most common green algae in the vicinity of the proposed project area. It grows from the lower-intertidal subzone to depths of more than 50 feet (15 m) below MLLW in protected areas along the waterfront (Figure 3-4) (Pentec 2003; Morris et al. 2009). Boulders in the nearshore marine habitats at the proposed project area are typically encrusted with sea lettuce

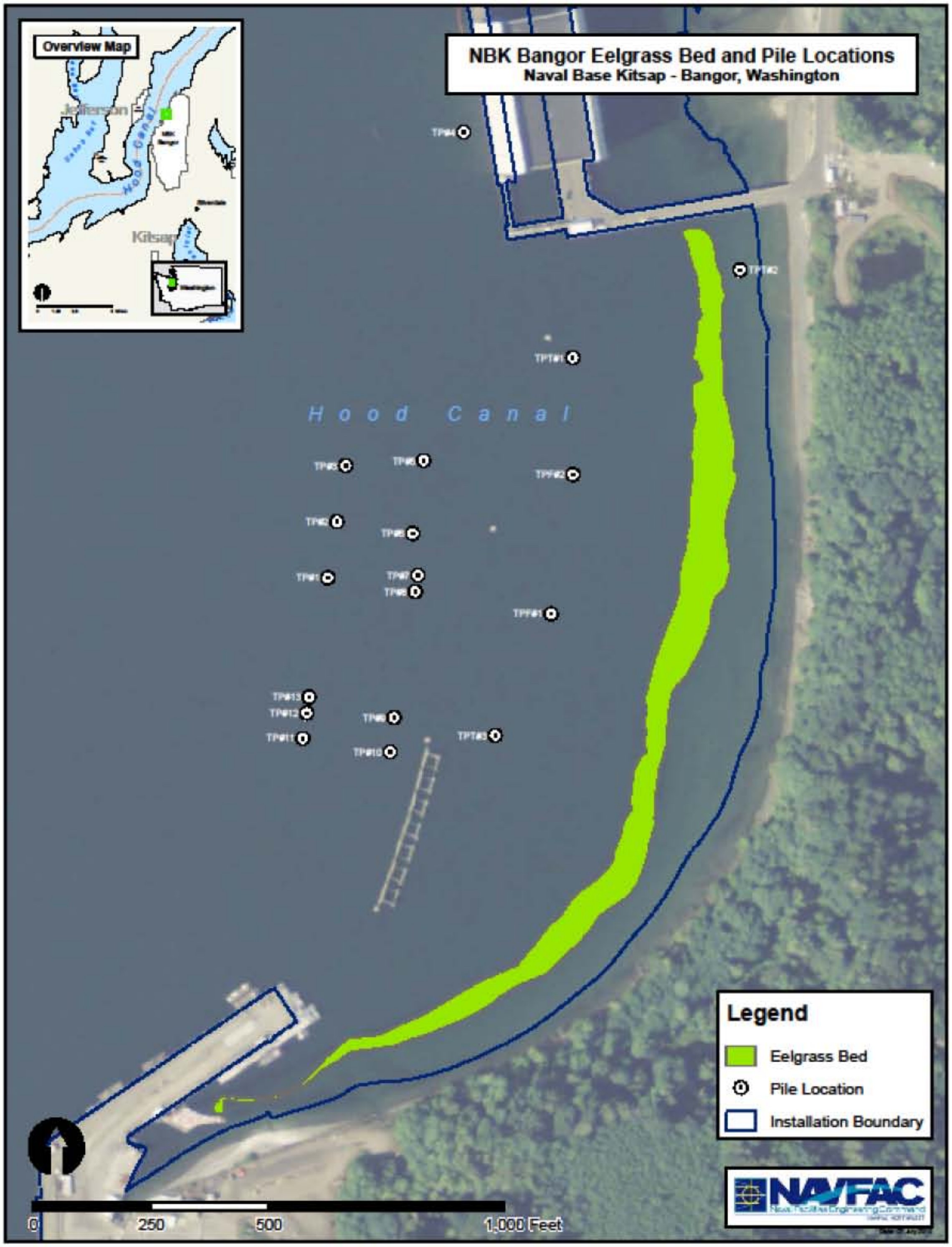

Figure 3-3. Eelgrass bed at Naval Base Kitsap Bangor in relation to location of the piles to be driven as part of the proposed Test Pile Program.

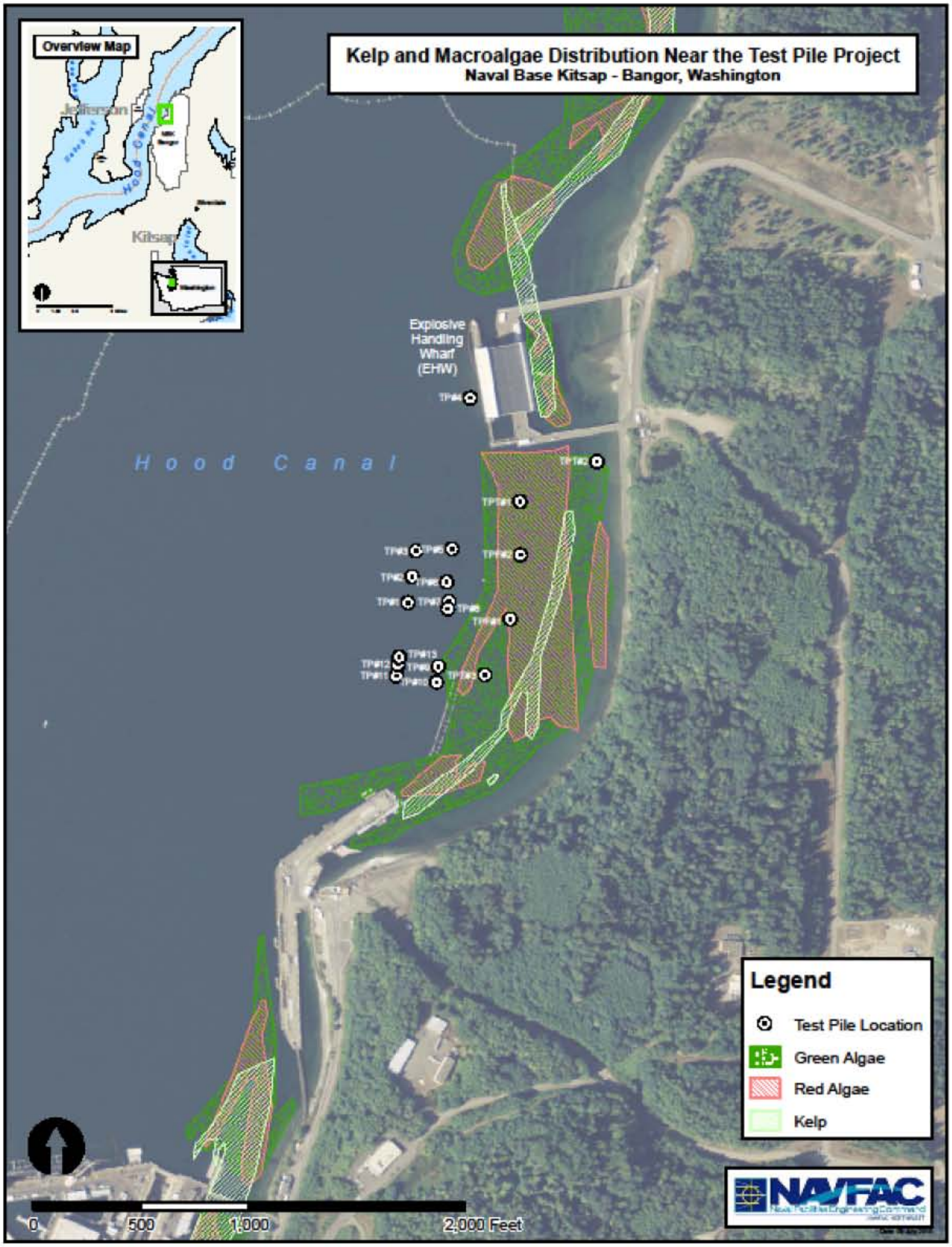

Figure 3-4. **Kelp and algae beds at Naval Base Kitsap Bangor in relation to location of the piles to be driven as part of the proposed Test Pile Program.**

(Pentec 2003). Sea lettuce has a high nutrient value (Kirby 2001) and provides an important source of marine nitrogen, as detritus, that supports eelgrass growth.

Red algae of the genera *Endocladia*, *Mastocarpus*, *Ceramium*, *Porphyra*, and *Gracilaria* are present at the proposed project area in the intertidal zones (Pentec 2003) (Figure 3-4). During the 2007 survey, red algae (primarily *Gracilaria*) became more abundant at water depths between 10 feet (3 m) and 25 feet (7.6 m) below MLLW but also occurred out to depths of 60 feet (18 m) below MLLW (Morris et al. 2009).

Brown algae are found in a variety of forms, including encrusting varieties on rocks and boulders, filaments, and drift kelp. Understory kelp (*Laminaria* sp.) are a form of brown algae and were discussed above. Several leafy brown algae species (e.g., *Egregia*) are present in the vicinity of the proposed project area. Rock weed (*Fucus* spp.) is common, attached to rocks and cobble in the intertidal barnacle zone.

4.0 ASSESSMENT OF IMPACTS AND MITIGATION MEASURES

This section will examine the potential impacts to designated EFH and federally managed fish species. Identifiable impacts that would be generated by the proposed Test Pile Program on each component of designated EFH are described, as are any potential environmental consequences of those impacts. In addition, measures that would be taken by the Navy to prevent or minimize any potential impacts to EFH are presented.

4.1 IMPACTS TO ESSENTIAL FISH HABITAT

The evaluation of impacts to marine fish and their habitat is based on whether the species or fishery has particular sensitivity to the proposed action’s activities and/or a substantial or important component of the species or fishery’s habitat would be lost as a result of the implementation of the proposed Test Pile Program.

The greatest impact during Test Pile Program would occur while the piles are being driven. Pile driving would exceed the underwater noise thresholds for fish, established for both behavior and injury, and result in the greatest potential for adverse impacts to marine fish. Positioning and anchoring the construction barges and pile driving unit would locally increase turbidity, disturb benthic habitats and forage fish, and shade marine vegetation in the immediate project vicinity. Project related impacts to salmonid populations, which includes ESA-listed species, would be minimized by adhering to the in-water work period designated for northern Hood Canal waters, when less than five percent of all salmonids that occur in NBK Bangor nearshore waters are expected to be present (SAIC 2006). Mitigation measures to reduce the presence of ESA-listed and other fish during installation and removal of piles and observance of the in-water work window would reduce impacts.

4.1.1 Sound Levels

Pile driving would result in increased underwater noise levels in Hood Canal. As many fish use their swim bladders for buoyancy, they are susceptible to rapid expansion/decompression due to peak pressure waves from underwater noises (Hastings and Popper 2005). At a sufficient level this exposure can be fatal. Recently, underwater noise effects criteria for fish were revised and accepted for in-water projects following a multi-agency agreement (FHWG 2008).

For impact pile driving, the underwater noise threshold criteria for fish injury from a single pile strike occurs at a sound pressure level of 206 decibel (dB) peak pressure within a circle centered at the location of the driven pile out to a distance of approximately 13 feet (4 m) assuming properly functioning sound attenuation devices (e.g., bubble curtains) are used (10 dB reduction included for this distance). However, as the impact hammer driven piles for this project would likely require an average of approximately 100 strikes each, the approach requires using Sound Exposure Level (SEL) as the threshold. Therefore, the applicable criteria for injury from impact pile driving to fish would be 187 dB accumulated SEL for a fish greater than or equal to 2 grams in weight within a circle centered at the location of the driven pile out to a distance of approximately 112 feet (34 m) and 183 dB accumulated SEL for fish less than 2 grams in weight within a circle centered at the location of the driven pile out to a distance of approximately 207 feet (63 m) assuming properly functioning sound attenuation devices are used (10 dB reduction included for these distances) (FHWG 2008) (Figure 4-1).

Table 4-1. Interim criteria (FHWG 2008) and distance to effect for fish.

Effect	Criteria	Distance (meters) to Effect for Impact Hammer	Distance (meters) to Effect for Vibratory Pile Driving
Onset of Injury for all fish	Peak 206 dB	4	N/A
Onset of Injury for fish < 2 grams	Cumulative SEL 187 dB	34	N/A
Onset of Injury for fish $\geq$ 2 grams	Cumulative SEL 183 dB	63	N/A
Extent of behavioral impacts[1]	150 dB rms	2,154	1,000

[1] Behavioral criteria was not set forth by the Fisheries Hydroacoustic Working Group, so as a conservative measure, the NMFS and the U.S. Fish and Wildlife Service generally use 150 dB rms as the threshold for behavioral effects to ESA-listed fish species (salmon and bull trout) for most biological opinions evaluating pile driving, however there are currently no research or data to support this threshold.

During pile driving, the associated underwater noise levels would result in behavioral response, including avoidance of the project area, and would have the potential to cause injury. Average underwater baseline noise levels acquired along the NBK Bangor waterfront were measured at a level of 114 dB re 1μPa (Slater 2009). Sound during impact pile driving would be detected above the average background noise levels at any nearby location in Hood Canal with a direct acoustic path (e.g., line-of-sight from the driven pile to the receiver location). The 150 dB root mean square (rms) re 1μPa behavioral threshold would be exceeded within a circle centered at the location of the impact driven pile out to a distance of approximately 1.34 miles (2.15 km) (in a direct line-of-sight manner) assuming properly functioning sound attenuation devices are used (10 dB reduction included for this distance). The affected area includes most of the NBK Bangor waterfront and portions of the Toandos Peninsula shoreline (Figure 4-1). Locations beyond these points would receive lower noise levels because an interposing land mass would impede propagation of the sound.

Fish in the project area may display a startle response during initial stages of pile driving, and would likely avoid the immediate project vicinity during pile driving activities. However, field investigations of Puget Sound salmonid behavior, when occurring near pile driving projects (Feist 1991; Feist et al. 1992), found little evidence that normally nearshore migrating salmonids move further offshore to avoid the general project area. In fact, some studies indicate that construction site behavioral responses, including site avoidance, may be as strongly tied to visual stimuli as to underwater sound (Feist 1991; Feist et al. 1992). Therefore, it could be assumed that salmonids may alter their normal behavior, including startle response and avoidance of the immediate project area, but occurrence within most of the 1.34 miles (2.15 km) disturbance area would not change.

To further minimize the underwater noise impacts during pile driving, a vibratory driver would be used whenever possible to drive piles, and an impact hammer primarily used to proof load the piles to verify bearing load capacity, and not as the primary means to drive piles. When using the vibratory driver method, the distances at which the underwater noise thresholds occur would be reduced to 0.62 miles (1 km) for behavioral disruption. There are currently no criteria for injury to fish from vibratory pile driving (Table 4-1 and Figure 4-1).

All pile driving activities would be conducted during the allowable in-water work period, July 16 to February 15 to reduce potential impacts to fish. NBK Bangor fish surveys in the 1970s and 2005 to 2008 indicate that greater than 95 percent of the juvenile salmonids in this part of Hood Canal occur during the closure period (Schreiner et al. 1977; Salo et al. 1980; Bax 1983; SAIC 2006; Bhuthimethee et al. 2009). However, adult salmonids and other marine fish species occur in northern Hood Canal waters during the allowable in-water work period. In addition, some juvenile fish would similarly occur, and may be impacted by elevated underwater sound during construction activities. To help protect these fish, a soft-start approach (noise attenuator) would

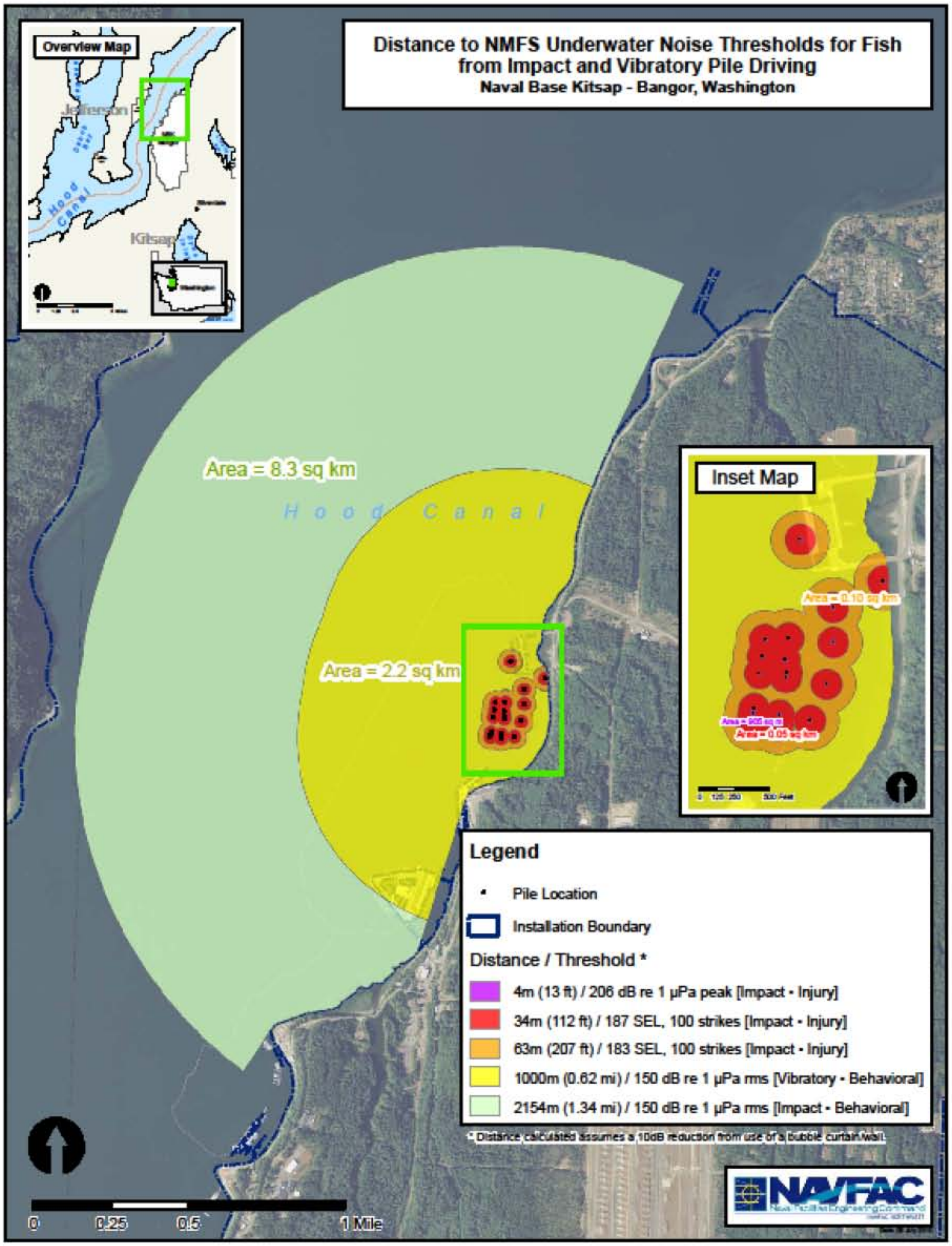

Figure 4-1. Distance to underwater noise thresholds for fish from impact and vibratory hammering occurring during the proposed Test Pile Program at NBK Bangor.

be used to allow time for fish to move away from the immediate project area, further reducing the number of fish potentially exposed to harmful levels of underwater sound.

4.1.2 Water Column

The primary potential impact to water column EFH, aside from the elevated noise levels, would be the result of the re-suspension of bottom sediments from pile installation and removal as well as barge and tug operations, such as anchoring and propeller wash. These changes would be spatially limited to the project area, including areas potentially impacted by anchor drag and areas immediately adjacent to the testing sites that could be impacted by plumes of re-suspended bottom sediments. These re-suspended bottom sediments could have an adverse affect on water column EFH through a variety of means, including an increase in turbidity, a reduction in the amount of DO present in the water, and re-suspension of contaminants formerly buried in the sediments.

During pile installation, bottom sediments, which may contain chemically reduced organic materials, would be re-suspended. Subsequent oxidation of sulfides, reduced iron, and organic matter associated with the suspended sediments would consume some DO in the water column. However, the impacts of sediment re-suspension from pile installation and removal on DO concentrations would be minimal. Additionally, a bubble curtain/wall would be used as mitigation for in-water sound during construction activities. Use of a bubble curtain/wall would increase DO concentrations in marine waters at the proposed project area by: 1) increasing the rate of vertical mixing of site waters; and 2) promoting dissolution of air bubbles, thereby increasing oxygen saturation levels. The impacts to DO from use of a bubble curtain would be relatively greater than those associated with sediment re-suspension, and a net increase in DO levels would be expected. Overall, the Test Pile Program would result in no measurable change to existing DO levels at the NBK Bangor waterfront or in Hood Canal in general. The proposed action would not result in violations of water quality standards for DO nor a local decrease in DO to a level impacting the health of fish.

An additional potential adverse impact to water quality from pile installation and removal is the potential release of sediment-bound metals and organic contaminants into the water column. However, sediments tested at NBK Bangor and the proposed project area contained low concentrations of metals and organic contaminants that fall below sediment quality guidelines (Foster Wheeler Environmental Corporation 2001; Hammermeister and Hafner 2009). Therefore, increases in chemical contaminant concentrations in marine waters as a result of sediment re-suspension during pile installation or removal operations would be minimal.

4.1.3 Benthic Habitats and Communities

The primary impact to benthic habitats designated as EFH would be the disruption of the epifauna/infauna associated with it. The barge anchors, spuds, and test piles would result in a temporary loss of benthic habitat, as well as direct mortality of less motile benthic organisms. Indirect impacts to habitat and benthic organisms are likely to result from turbidity caused by driving and removing barge anchors, spuds, and the test piles. The area within a 150-foot radius of the pile driving footprint could have higher levels of turbidity. Disturbed sediments would eventually redeposit upon the existing benthic community. Suspension and surface deposit feeders would be the most susceptible to burial. However, these impacts are minor and temporary in nature. Benthic organisms, particularly annelids, are very resilient to habitat disturbance and are likely to recover to pre-disturbance levels within two years (CH2M Hill 1995; Parametrix 1994, 1999; Anchor Environmental 2002; Romberg 2005). During the pile driving period (40 days), juvenile salmonids and other marine fish species may experience a loss or reduction of available benthic prey at the project area due to the disturbance of pile installation, however, in-water work would occur during the time frame when few salmonids would be present, therefore adverse affect to benthic prey availability are not anticipated.

4.1.4 *Marine Vegetation*

Aquatic vegetation habitat is of principal concern to marine fish for foraging and refuge. Within the vicinity of NBK Bangor, a relatively narrow band of eelgrass and another consisting of kelp occur along nearly the entire shoreline (Morris et al. 2009) (Figures 3-3 and 3-4). Coverage by red and green algae throughout the study site is more extensive (Figure 3-4). Marine surveys at NBK Bangor have shown that eelgrass is only present in water down to 20 feet MLLW (Morris et al. 2009), which is well above the location of all but one test pile (Figure 3-3). With the exception of this single pile, all other test piles used during the study will be in waters deeper than 40 feet, thus eelgrass will be minimally impacted. None of the test piles will occur in close proximity to any of the kelp beds in the area. However, at least five of the piles will be installed directly within areas of containing red and green algae. The driving of the test piles will result in direct mortality of marine vegetation within the pile driving footprints, as well as indirect impacts resulting from the test piles, barge anchors, and spuds. These indirect impacts to marine vegetation are likely to occur from turbidity caused by pile driving, as well as the removal of barge anchors, spuds, and the test piles. The area within a 150-foot (46-m) radius of the pile driving footprints could have higher levels of turbidity. However, these impacts are minor and temporary in nature. Disturbed sediments would eventually redeposit and any disturbed marine vegetation will be expected to recover within a relatively short period of time.

4.2 ENVIRONMENTAL CONSEQUENCES

Designated EFH within the vicinity of the proposed Test Pile Program will be impacted in the following manner:

- Temporary disturbance and displacement of fish;
- Increased sediment loads and turbidity in the water column;

- Limited disruption of marine vegetation and benthic communities; and
- Temporary loss of benthic prey species to fish.

All of the effects above are either temporary or short-term, and would be further offset by the mitigations measures that will be set in place. As a result, the environmental impacts from the proposed Test Pile Program will have negligible to minor effects on designated EFH within Hood Canal. The potential impacts to EFH are summarized in Table 4-2.

Table 4-2. Summary of potential impacts to EFH by impact type as a result of the proposed Test Pile Program.

Type of Impact	Temporary (Recovery: days to weeks)	Short Term (Recovery: < 3 years)	Long Term (Recovery: ≥ 3 to < 20 years)	Permanent (Recovery: ≥ 20 years)
Sound pressure levels	√			
Disruption to fish populations	√			
Disruption to benthic epifauna/infauna		√		
Disruption of aquatic vegetation		√		
Disruption of sediments	√			
Sedimentation/turbidity	√			

4.3 PROPOSED MITIGATION MEASURES AND GUIDELINES FOR EFH PROTECTION

The NMFS (2004) has developed a series of conservation measures pertaining to pile installation and removal that, if incorporated in project plans, would minimize impacts to EFH and marine fish species. Many of these measures, as well as several additional ones, have been incorporated into the design of the proposed Test Pile Program to reduce the overall level of impact. The mitigation measures to be implemented during the proposed project are as follows:

- *Vibratory Hammer Use* – All piles will be driven as deep as possible through the use of a vibratory hammer. Impact hammers will only be used to drive the pile the final 10 to 15 feet (3 to 4.6 m) and will be limited to 100 strikes per day. All piles will be removed through the use of a vibratory hammer, rather than the direct pull or clamshell methods, to reduce the amount of sediments suspended in the water column.
- *Sound Attenuation Devices* – Sound attenuation devices (e.g., bubble curtain, bubble wall, etc.) will be utilized during all impact pile driving operations. Impact pile driving is only expected to be required to "proof" or drive the last 10-15 ft of each pile. The Navy will also test the feasibility and effectiveness of using sound attenuation devices with vibratory hammers. The Navy will employ a bubble curtain/wall on two of the vibratory driven piles to

test the practicability of this concept and analyze the extent to which the air interface reduces the source energy level.

- *Acoustic Measurements* – Acoustic measurements will be used to empirically verify the proposed shutdown and buffer zones.
- *Timing Restrictions* - The Navy has set timing restrictions for pile driving activities to avoid in-water work when ESA-listed salmonid populations are most likely to be present. Therefore, all in-water work would occur only during the work window from July 16 through February 15 to minimize the number of fish exposed to underwater noise and other disturbance.
- *Soft Start* - Providing additional protection for marine fish, pile driving will include the use of a soft start as part of normal construction procedures. Depending on the type of impact hammer used, the soft start would consist of either a “ramp up” or a “dry-fire.” Ramp-up involves slowly increasing the power of the hammer and noise produced over the ramp-up period. Specifically, NMFS requires that the first three initial hammer strikes are at less than full capacity (i.e., approximately 40 percent energy levels) with no less than a one minute interval between each strike, followed by two subsequent 3-strike sets (72 FR 25748). Likewise, “dry firing” of a pile driving hammer is a method of raising and dropping the hammer with no compression of the pistons, producing a lower-intensity sound rather than the full power of the hammer. In addition, if practicable, a soft start will also be used with vibratory installation. When vibratory hammers are used, the soft start requires that contractors initiate noise from the vibratory hammers for 15 seconds at reduced energy levels followed by a one minute waiting period. This procedure would be repeated two additional times. This will allow marine fish the opportunity to leave the area prior to the hammer operating at full capacity.
- *Daylight Construction* – Pile driving will only be conducted during daylight hours.

5.0 CONCLUSIONS

The primary impact during the proposed Test Pile Program will be the level of increased sound energy in the water. The effects to fish caused by the increased noise levels include disturbance, avoidance, injury, and even death. The level of impact is directly proportionate to the distance between the fish and the sound source. The Navy has adopted a number of mitigation measures and operational guidelines to reduce the level of impact pile driving operations will have on marine fish in the vicinity. Because the piles being driven are hollow steel piles, in accordance with the conservation measures set forth by NMFS (2004), the Navy will use a vibratory hammer to drive each pile into the sediment to the deepest extent possible. However, due to the need to ensure the stability of the test piles while conducting the load bearing tests, each pile will be driven the final 10 to 15 feet using an impact hammer. To limit the amount of ensonification of the water resulting from the impact hammering, a sound attenuation device (e.g., bubble curtain or bubble wall) will be utilized during all impact hammering operations to reduce the transmission of the sound through the water column. Furthermore, the use of impact hammers will be limited to 100 strikes per day. In addition to these measures, all work will be limited to the in-water work window of July 16 through February 15 when juvenile salmon are not typically present within the vicinity of the proposed project area. These measures, in conjunction with the short duration of the proposed project (40 days) should greatly reduce the impact of the noise levels as a result of the pile driving activities.

The installation and subsequent removal of the piles, along with the activities associated with barge anchoring and spuds, will have a localized impact on marine vegetation and the benthic epifauna/infauna within the immediate vicinity of each pile or anchoring site. However, to minimize impacts to marine vegetation, all of the test piles have been placed to avoid eelgrass and kelp beds along the NBK Bangor waterfront. While some disruption to marine vegetation and benthic communities is unavoidable as a result of the placement and recovery of the test piles, barge anchoring, and associated sedimentation, these impacts will be temporary in duration, with a minimal and localized zone of influence. Areas of disruption are expected to recover to pre-disruption levels within a single growing season.

The water column may experience increased sedimentation and turbidity during operational periods. However, due to the relatively low levels of organic contaminants and metals contained within the sediments at NBK Bangor, there will be temporary and minimal degradation of the water column, with little to no impact on DO levels in the vicinity of the proposed project area.

Overall, the proposed Test Pile Program will temporarily degrade in-water habitat as a result of the elevated noise levels. However, due to the temporary nature of the activities and the minimal level of impact, in light of the proposed mitigation measures and work guidelines for the project, the activities associated with the proposed Test Pile Program will not have an adverse affect on designated EFH for marine fish species within the vicinity of NBK Bangor and Hood Canal.

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7.0 LIST OF PREPARERS

J. Carter Watterson, Marine Fisheries Biologist
Naval Facilities Engineering Command Atlantic
M.S. Marine Sciences, University of South Alabama
B.A. Biology, University of Richmond
Years of Experience: 17

APPENDIX

Essential Fish Habitat Designations
by Species and Lifestage for Pacific Coast Groundfish Based on the
Pacific Fishery Management Council's Habitat Use Database

Table A-1. Species and lifestages belong to the Pacific coast groundfish management unit with EFH designated in the vicinity of Hood Canal and the Naval Base Kitsap Bangor.

Species	Lifestage	Habitats Designated for Inland Seas (Puget Sound)		
		Level 2	Level 3	Level 4
Sharks, Rays, & Skates				
Big skate (*Raja binoculata*)	Adults	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
	Eggs	Benthos	Unconsolidated	Unknown
	Juveniles	Benthos	Unconsolidated	Unknown
Longnose skate (*Raja rhina*)	Adults	Benthos	Unconsolidated	Unknown
Spiny dogfish (*Squalus acanthias*)	Adults	Benthos	Unconsolidated	Mud
		Intertidal Benthos	Unconsolidated	Mud
		Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Unconsolidated	Mud
		Intertidal Benthos	Unconsolidated	Mud
		Water Column	Epipelagic Zone	Unknown
Ratfish				
Spotted ratfish (*Hydrolagus colliei*)	Adults	Benthos	Hard Bottom	Bedrock
				Cobble
			Unconsolidated	Mud
	Eggs	Benthos	Hard Bottom	Bedrock
				Gravel/Cobble
			Unconsolidated	Sand
	Juveniles	Benthos	Hard Bottom	Bedrock
				Gravel/Cobble
			Unconsolidated	Mud
Roundfish				
Cabezon (*Scorpaenichthys marmoratus*)	Adults	Benthos	Hard Bottom	Bedrock
				Cobble
				Unknown
			Unconsolidated	Sand
			Vegetated Bottom	Algal Beds/Macro
				Rooted Vascular
		Intertidal Benthos	Tide Pool	Unknown
	Eggs	Benthos	Hard Bottom	Unknown
			Vegetated Bottom	Algal Beds/Macro
	Juveniles	Benthos	Hard Bottom	Bedrock
			Vegetated Bottom	Algal Beds/Macro

Table A-1. Species and lifestages belong to the Pacific coast groundfish management unit with EFH designated in the vicinity of Hood Canal and the Naval Base Kitsap Bangor (continued).

Species	Lifestage	Habitats Designated for Inland Seas (Puget Sound)		
		Level 2	Level 3	Level 4
Roundfish (continued)				
Cabezon (*Scorpaenichthys marmoratus*)	Juveniles	Intertidal Benthos	Tide Pool	Unknown
		Water Column	Epipelagic Zone	Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Kelp greenling (*Hexagrammos decagrammus*)	Adults	Benthos	Hard Bottom	Bedrock
				Unknown
			Vegetated Bottom	Algal Beds/Macro
	Eggs	Benthos	Hard Bottom	Unknown
			Vegetated Bottom	Algal Beds/Macro
	Juveniles	Benthos	Hard Bottom	Bedrock
			Vegetated Bottom	Algal Beds/Macro
		Water Column	Epipelagic Zone	Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Lingcod (*Ophiodon elongatus*)	Adults	Benthos	Hard Bottom	Bedrock
				Boulder
			Vegetated Bottom	Algal Beds/Macro
				Rooted Vascular
	Eggs	Benthos	Hard Bottom	Bedrock
	Juveniles	Benthos	Unconsolidated	Gravel
				Mud
				Sand
	Larvae	Water Column	Epipelagic Zone	Unknown
Pacific whiting/hake (*Merluccius productus*)	Adults	Water Column	Epipelagic Zone	Unknown
	Juveniles	Water Column	Epipelagic Zone	Unknown
Sablefish (*Anoplopoma fimbria*)	Adults	Benthos	Unconsolidated	Mud
	Eggs	Water Column	Epipelagic Zone	Unknown
	Juveniles	Water Column	Epipelagic Zone	Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Rockfish				
Black rockfish (*Sebastes melanops*)	Adults	Benthos	Artificial Structure	Artifical Reef
			Hard Bottom	Bedrock
				Boulder
			Vegetated Bottom	Algal Beds/Macro
				Rooted Vascular

Table A-1. Species and lifestages belong to the Pacific coast groundfish management unit with EFH designated in the vicinity of Hood Canal and the Naval Base Kitsap Bangor (continued).

Species	Lifestage	Habitats Designated for Inland Seas (Puget Sound)		
		Level 2	Level 3	Level 4
Rockfish (continued)				
Black rockfish (*Sebastes melanops*)	Adults	Water Column	Epipelagic Zone	Macrophyte Canopy
				Unknown
	Juveniles	Benthos	Artificial Structure	Artifical Reef
			Hard Bottom	Bedrock
				Boulder
			Tide Pool	Unknown
			Vegetated Bottom	Algal Beds/Macro
				Rooted Vascular
		Water Column	Epipelagic Zone	Macrophyte Canopy
				Unknown
Blue rockfish (*Sebastes mystinus*)	Adults	Benthos	Hard Bottom	Bedrock
			Vegetated Bottom	Algal Beds/Macro
		Water Column	Epipelagic Zone	Macrophyte Canopy
				Unknown
	Juveniles	Benthos	Hard Bottom	Bedrock
		Water Column	Epipelagic Zone	Macrophyte Canopy
				Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Bocaccio (*Sebastes paucispinis*)	Juveniles	Benthos	Hard Bottom	Bedrock
		Water Column	Epipelagic Zone	Macrophyte Canopy
				Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Brown rockfish (*Sebastes auriculatus*)	Adults	Benthos	Artificial Structure	Artifical Reef
			Hard Bottom	Bedrock
				Boulder
			Mixed Bottom	Sand/Rock
			Vegetated Bottom	Rooted Vascular
	Juveniles	Benthos	Hard Bottom	Bedrock
				Boulder
				Cobble
			Vegetated Bottom	Algal Beds/Macro
				Rooted Vascular
		Water Column	Epipelagic Zone	Unknown

Table A-1. Species and lifestages belong to the Pacific coast groundfish management unit with EFH designated in the vicinity of Hood Canal and the Naval Base Kitsap Bangor (continued).

Species	Lifestage	Habitats Designated for Inland Seas (Puget Sound)		
		Level 2	Level 3	Level 4
Rockfish (continued)				
China rockfish (*Sebastes nebulosus*)	Adults	Benthos	Hard Bottom	Bedrock
				Boulder
				Cobble
			Vegetated Bottom	Algal Beds/Macro
		Unknown	Unknown	Unknown
	Juveniles	Benthos	Hard Bottom	Unknown
			Vegetated Bottom	Algal Beds/Macro
		Water Column	Epipelagic Zone	Unknown
Copper rockfish (*Sebastes caurinus*)	Adults	Benthos	Artificial Structure	Artifical Reef
			Hard Bottom	Bedrock
				Boulder
			Mixed Bottom	Sand/Rock
			Vegetated Bottom	Algal Beds/Macro
	Juveniles	Benthos	Hard Bottom	Bedrock
				Cobble
			Mixed Bottom	Sand/Rock
			Vegetated Bottom	Algal Beds/Macro
		Water Column	Epipelagic Zone	Drift Algae
				Macrophyte Canopy
				Unknown
Quillback rockfish (*Sebastes maliger*)	Adults	Benthos	Artificial Structure	Artifical Reef
			Mixed Bottom	Mud/Cobble
			Vegetated Bottom	Algal Beds/Macro
	Juveniles	Benthos	Biogenic	Sponges
			Hard Bottom	Unknown
			Mixed Bottom	Sand/Rock
			Vegetated Bottom	Algal Beds/Macro
				Drift Algae
				Rooted Vascular
	Larvae	Water Column	Epipelagic Zone	Unknown
Redstripe rockfish (*Sebastes proriger*)	Adults	Benthos	Hard Bottom	Unknown
		Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Hard Bottom	Unknown
			Mixed Bottom	Sand/Rock

Table A-1. Species and lifestages belong to the Pacific coast groundfish management unit with EFH designated in the vicinity of Hood Canal and the Naval Base Kitsap Bangor (continued).

Species	Lifestage	Habitats Designated for Inland Seas (Puget Sound)		
		Level 2	Level 3	Level 4
Rockfish (continued)				
Redstripe rockfish (*Sebastes proriger*)	Juveniles	Water Column	Epipelagic Zone	Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Silvergray rockfish (*Sebastes brevispinis*)	Adults	Benthos	Hard Bottom	Bedrock
				Boulder
Splitnose rockfish (*Sebastes diploproa*)	Juveniles	Water Column	Epipelagic Zone	Drift Algae
				Macrophyte Canopy
				Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Tiger rockfish (*Sebastes nigrocinctus*)	Adults	Benthos	Hard Bottom	Bedrock
				Boulder
		Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Hard Bottom	Bedrock
		Water Column	Epipelagic Zone	Drift Algae
				Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Widow rockfish (*Sebastes entomelas*)	Adults	Benthos	Hard Bottom	Bedrock
			Mixed Bottom	Mud/Rock
		Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Hard Bottom	Bedrock
			Unconsolidated	Unknown
			Vegetated Bottom	Algal Beds/Macro
		Water Column	Epipelagic Zone	Macrophyte Canopy
				Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Yelloweye rockfish (*Sebastes ruberimus*)	Adults	Benthos	Hard Bottom	Bedrock
				Boulder
			Mixed Bottom	Mud/Boulders
	Juveniles	Benthos	Biogenic	Sponges
			Hard Bottom	Bedrock
	Larvae	Water Column	Epipelagic Zone	Unknown
Yellowtail rockfish (*Sebastes flavidus*)	Adults	Benthos	Hard Bottom	Bedrock
			Unconsolidated	Sand
			Vegetated Bottom	Algal Beds/Macro

Table A-1. Species and lifestages belong to the Pacific coast groundfish management unit with EFH designated in the vicinity of Hood Canal and the Naval Base Kitsap Bangor (continued).

Species	Lifestage	Habitats Designated for Inland Seas (Puget Sound)		
		Level 2	Level 3	Level 4
Rockfish (continued)				
Yellowtail rockfish (*Sebastes flavidus*)	Juveniles	Benthos	Hard Bottom	Bedrock
			Unconsolidated	Sand
			Vegetated Bottom	Algal Beds/Macro
		Water Column	Epipelagic Zone	Unknown
Flatfish				
Butter sole (*Isopsetta isolepis*)	Adults	Benthos	Unconsolidated	Mud
				Sand
	Eggs	Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Unconsolidated	Mud
				Sand
	Larvae	Water Column	Epipelagic Zone	Unknown
English sole (*Parophrys vetulus*)	Adults	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
	Eggs	Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
Flathead sole (*Hippoglossoides elassodon*)	Adults	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
	Juveniles	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
Pacific sanddab (*Citharichthys sordidus*)	Adults	Benthos	Mixed Bottom	Sand/Gravel
				Sand/Rock
			Unconsolidated	Mud
				Sand
	Eggs	Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Mixed Bottom	Silt/Sand
			Unconsolidated	Sand
	Larvae	Water Column	Epipelagic Zone	Unknown
Petrale sole (*Eopsetta jordani*)	Adults	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand

Table A-1. Species and lifestages belong to the Pacific coast groundfish management unit with EFH designated in the vicinity of Hood Canal and the Naval Base Kitsap Bangor (continued).

Species	Lifestage	Habitats Designated for Inland Seas (Puget Sound)		
		Level 2	Level 3	Level 4
Flatfish (continued)				
Petrale sole (*Eopsetta jordani*)	Juveniles	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
Rexsole (*Glyptocephalus zachirus*)	Adults	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
	Juveniles	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
Rock sole (*Lepidopsetta bilineata*)	Adults	Benthos	Unconsolidated	Gravel
				Mixed mud/sand
				Sand
	Eggs	Benthos	Unconsolidated	Sand
	Juveniles	Benthos	Mixed Bottom	Sand/Gravel
			Unconsolidated	Gravel
				Mixed mud/sand
				Sand
	Larvae	Water Column	Epipelagic Zone	Unknown
Sand sole (*Psettichthys melanostictus*)	Adults	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
	Eggs	Water Column	Epipelagic Zone	Unknown
	Juveniles	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
		Water Column	Epipelagic Zone	Unknown
	Larvae	Water Column	Epipelagic Zone	Unknown
Starry flounder (*Platichthys stellatus*)	Adults	Benthos	Unconsolidated	Gravel
				Mixed mud/sand
				Mud
				Sand
	Eggs	Water Column	Epipelagic Zone	Seawater surface
	Juveniles	Benthos	Unconsolidated	Mixed mud/sand
				Mud
				Sand
	Larvae	Water Column	Epipelagic Zone	Unknown

APPENDIX F

Endangered Species Act Consultation And Marine Mammal Protection Act Permit Application

This appendix contains the following letters:

1. Letter to National Marine Fisheries Service dated August 17, 2010
2. Letter to U.S. Fish and Wildlife Service dated August 17, 2010
3. Letter to National Marine Fisheries Service dated November 1, 2010
4. Letter from National Marine Fisheries Service dated April 28, 2011
5. Letter from U.S. Fish and Wildlife Service dated May 11, 2011

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DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00599
17 Aug 10

Mr. Steve Landino
National Marine Fisheries Service
510 Desmond Dr. SE, Suite 103
Lacey, WA 98503

Dear Mr. Landino:

SUBJECT: BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT FOR THE TEST PILE PROGRAM AT NAVAL BASE KITSAP BANGOR

The United States Department of the Navy (U.S. Navy) is proposing to conduct a Test Pile Program at the Naval Base Kitsap (NBK) Bangor waterfront. The Test Pile Program is designed to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for the proposed Explosive Handling Wharf #2 (EHW-2) and other future projects at the NBK Bangor waterfront. The Test Pile Program will require installing 29 test and reactionary piles ranging in size from 30 inches in diameter to 60 inches in diameter, to predetermined locations within the proposed footprint for EHW-2. Lateral load and tension load tests will be performed on some of the piles. The piles will be driven to their initial embedment depth with a vibratory hammer and then "proofed' with an impact hammer. The proposed action would occur over a 40 day period at which time all of the test and reactionary piles will be removed. The Test Pile Program is planned to occur after July 16, 2011.

This Biological Assessment (Enclosure 1) is submitted for your review.

We request your concurrence with our effect determination. You may direct any questions or concerns that you may have to the Navy point-of-contact Mr. Greg Leicht at (360) 476-6068 or greg.leicht@navy.mil.

Sincerely,

J. H. TRAVERS, CDR, USN

For

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

Enclosure: 1. Biological Assessment with an Essential Fish Habitat Assessment

DEPARTMENT OF THE NAVY
NAVAL BASE KITSAP
120 SOUTH DEWEY ST
BREMERTON, WA 98314-5020

5090
Ser PRB4/00600
17 Aug 10

Mr. Ken Berg
U.S. Fish and Wildlife Service
510 Desmond Dr. SE, Suite 102
Lacey, WA 98503

Dear Mr. Berg:

SUBJECT: BIOLOGICAL ASSESSMENT FOR THE TEST PILE PROGRAM AT NAVAL BASE KITSAP BANGOR

The United States Department of the Navy (U.S. Navy) is proposing to conduct a Test Pile Program at the Naval Base Kitsap (NBK) Bangor waterfront. The Test Pile Program is designed to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for the proposed Explosive Handling Wharf #2 (EHW-2) and other future projects at the NBK Bangor waterfront. The Test Pile Program will require installing 29 test and reactionary piles ranging in size from 30 inches in diameter to 60 inches in diameter, to predetermined locations within the proposed footprint for EHW-2. Lateral load and tension load tests will be performed on some of the piles. The piles will be driven to their initial embedment depth with a vibratory hammer and then "proofed' with an impact hammer. The proposed action would occur over a 40 day period at which time all of the test and reactionary piles will be removed. The Test Pile Program is planned to occur after July 16, 2011.

This Biological Assessment (Enclosure 1) is submitted for your review.

We request your concurrence with our effect determination. You may direct any questions or concerns that you may have to the Navy point-of-contact, Mr. Greg Leicht at (360) 476-6068 or greg.leicht@navy.mil.

Sincerely,

J. H. TRAVERS, CDR, USN
for

M. J. OLSON
Captain, U.S. Navy
Commanding Officer

Enclosure: 1. Biological Assessment

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

5090
Ser N454E/10U158297
01 NOV 2010

Mr. Jim Lecky
Office of Protected Resources National Marine Fisheries Service (NMFS)
National Oceanic and Atmospheric Administration
B-SSMC3 Room 13821
1315 East West Highway
Silver Spring, MD 20910-3282

SUBJECT: MARINE MAMMAL PROTECTION ACT (MMPA) INCIDENTAL HARASSMENT AUTHORIZATION (IHA) APPLICATION FOR NAVAL BASE KITSAP BANGOR, WA TEST PILE PROGRAM

Dear Mr. Lecky,

In accordance with the Marine Mammal Protection Act, as amended and 50 CFR Part 216.106, the U.S. Navy requests an Incidental Harassment Authorization (IHA) for the incidental take of marine mammals associated with the proposed Navy Test Pile Program conducted under Commander, U.S. Pacific Fleet at the Naval Base Kitsap Bangor, WA.

The proposed action may expose certain marine mammals and pinnipeds that may be present within the Hood Canal to sound from the installation and removal of test and reaction piles. Enclosure (1) focuses on the specific information required by the National Marine Fisheries Service for consideration of an incidental take request.

We appreciate your continued support in helping the Navy to meet its environmental responsibilities. My staff point of contact for this action is Mr. Ronald B. Carmichael at (703) 602-6844, or e-mail ronald.carmichael@navy.mil. Commander, U.S. Pacific Fleet's point of contact in this matter is Mr. Greg Leicht, (360)315-5411, gregory.leicht@navy.mil

Sincerely,

DR. ROBERT C GISINER
Head, Marine Science Branch
Chief of Naval Operations,
Energy & Environmental Readiness
Division (OPNAV N454)

Enclosure:

(1) Request for Incidental Harassment Authorization (IHA) for the Navy's Test Pile Program conducted at the Naval Base Kitsap Bangor, WA delivered via FedEx under separate cover on 01 NOV 2010

Copy to (w/o enclosure):
DASN (E)
OPNAV N43
CPF N01CE
COMNAVREG SE
NAVFACLANT (EV2)

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

Refer to NMFS No:
2010/04057

April 28, 2011

Captain M. J. Olson
Department of the Navy
Naval Base Kitsap
120 South Dewey Street
Bremerton, Washington 98314-5020

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Test Pile Program at Naval Base Kitsap Bangor, Kitsap County, Washington (5th field HUC: 17110018, Hood Canal)

Dear Captain Olson:

The enclosed document contains a biological opinion (opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of conducting the proposed test pile program for the Department of the Navy (Navy) at Naval Base Kitsap Bangor. In this opinion, NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of the Puget Sound (PS) Chinook salmon (*Oncorhynchus tshawytscha*), Hood Canal summer-run chum salmon (*O. keta*), PS steelhead (*O. mykiss*), and the PS/Georgia Basin distinct population segments of bocaccio (*Sebastes paucispinis*), canary rockfish (*S. pinniger*), and yelloweye rockfish (*S. ruberrimus*). In addition, NMFS concludes that the proposed action is not likely to adversely affect the Southern Resident killer whale (*Orcinus orca*), Steller sea lion (*Eumetopias jubatus*), and designated critical habitat for the PS Chinook salmon and Hood Canal summer-run chum salmon. Critical habitat has not been designated or proposed for PS steelhead or the ESA-listed rockfish, and Southern Resident killer whale and Steller sea lion do not have critical habitat in the action area.

As required by section 7 of the ESA, NMFS provided an incidental take statement with the opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Navy must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes three conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These recommendations include a subset of the ESA take statement's terms and conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendations, the Navy must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

If you have questions regarding this consultation, please contact Tami Black at the Washington State Habitat Office at (360) 753-6042, or electronic mail at Tami.Black@noaa.gov.

Sincerely,

Michael Tehan

for William W. Stelle, Jr.
Regional Administrator

cc: Gregory Leicht, Naval Base Kitsap
Steve Todd, Suquamish Tribe

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

MAY 11 2011

In Reply Refer To:
13410-2010-I-0531

Captain M. J. Olson
U. S. Navy Commanding Officer
Naval Base Kitsap
ATTN: Environmental Director (Leicht)
120 South Dewey St.
Bremerton, Washington 98314-5020

Dear Captain Olson:

Subject: Test Pile Program at Naval Base Kitsap Bangor Endangered Species Act Section 7 Consultation - Additional Clarification

We are providing you this letter as additional clarification to our April 19, 2011, concurrence letter for the above proposed action.

This letter is in response to your request for formal consultation for the Test Pile Program at Naval Base Kitsap Bangor (NBKB) located in Hood Canal in Kitsap County, Washington. You requested formal consultation from the U.S. Fish and Wildlife Service (Service) regarding anticipated adverse effects from the proposed action on the marbled murrelet (*Brachyramphus marmoratus*) and our concurrence with your "may affect, not likely to adversely affect" for the bull trout (*Salvelinus confluentus*). No marbled murrelet or bull trout critical habitat occurs within the affected area. Your letter and the Biological Assessment (BA), dated August 17, 2010, were received on August 19, 2010. We initiated formal consultation with the U.S. Navy (Navy) on October 14, 2010, for marbled murrelets.

We appreciate the willingness of the Navy to work with our staff to provide additional information and modifications to the proposed action to minimize effects to marbled murrelets. These modifications include, but are not limited to the inclusion of timing restrictions, limiting the duration of impact pile driving, and avoiding testing unattenuated piles in locations and by size to reduce the potential of exposure to marbled murrelets. Based on the modifications to the proposed action, the Service has determined that the Test Pile Program is not likely to result in adverse effects to marbled murrelets. Therefore, this letter transmits our concurrence on a "may affect, not likely to adversely affect" determination for both bull trout and marbled murrelets. This consultation has been conducted in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act). A complete record of this consultation is on file at the Washington Fish and Wildlife Office in Lacey, Washington.

Proposed Action

The Navy proposes to install and remove up to 29 steel piles ranging in size from 24 to 48 inches in diameter and 115 to 198 ft long will be installed (Figure 1, Tables 1 and 2), conduct testing on select piles, and measure in-water and in-air sound during pile installation. Piles will be installed using both a vibratory and impact hammer. The Navy is proposing this test pile program to collect geotechnical and sound data for a future new Explosives Handling Wharf (EHW-2) that will be constructed adjacent to the existing Explosives Handling Wharf (EHW-1). A separate consultation will be conducted on the new EHW-2. All piles associated with the proposed test pile action will be removed and are not part of the EHW-2.

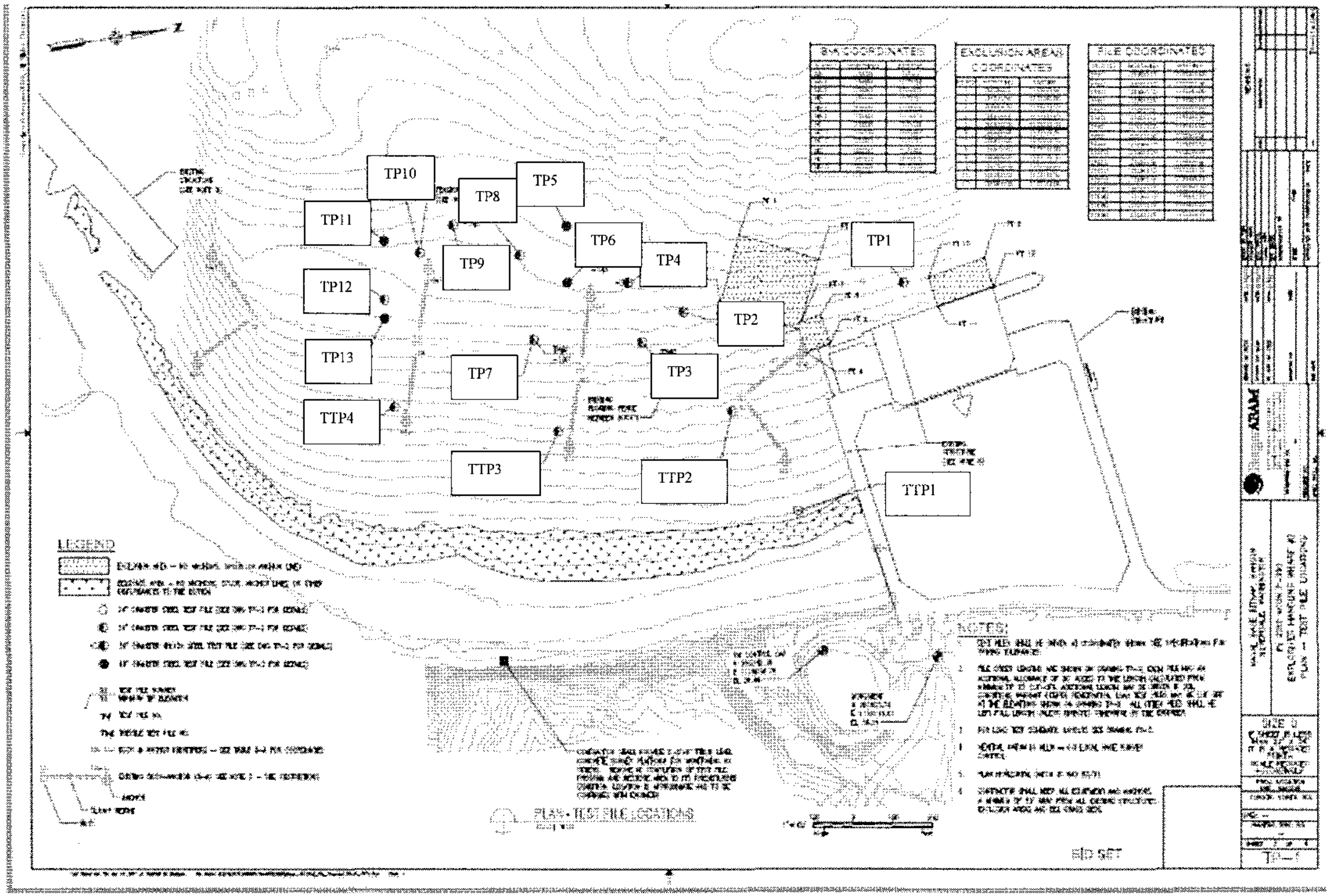

Figure 1. Test pile locations. Locations of tension load test piles are not shown in the figure, but will be approximately 30 ft from the test pile.

Table 1. Test pile specifications.

TEST PILE NO	PILE TYPE	DRIVING SHOES / END HARDENING	VIRBRATE & PROOF W/ IMPACT HAMMER	HAMMERS TO BE USED	TENSION LOAD TEST
TP #1[1]	36"Ø x 3/4"T x 175'L	CUTTING SHOE *1	X	APE 200-6 & APE D80[2]	
TP #2	36"Ø x 3/4"T x 180'L	NONE	X	APE 200-6 & APE D80[2]	
TP #3	36"Ø x 3/4"T x 170'L	WELDED END HARDENING *2	X	APE 200-6 & APE D80[2]	
TP #4	36"Ø x 3/4"T x 195'L	NONE	X	APE 200-6 & APE D80[2]	
TP #5	48"Ø x 1"T x 195'L	CUTTING SHOE *1	X	APE 400 & APE D100	
TP #6	48"Ø x 1"T x 185'L	WELDED END HARDENING *2	X	APE 200-6 & APE D80[2]	
TP #7	36"Ø x 3/4"T x 170'L	CUTTING SHOE *1	X	APE 200-6 & APE D80[2]	X
TP #8	36"Ø x 3/4"T x 185'L	WELDED END HARDENING *2	X	APE 200-6 & APE D80[2]	
TP #9	36"Ø x 3/4"T x 190'L	CUTTING SHOE *1	X	APE 400 & APE D100	
TP #10	36"Ø x 3/4"T x 180'L	CUTTING SHOE *1	X	APE 200-6 & APE D80[2]	X
TP #11	48"Ø x 1"T x 175'L	NONE	X	APE 200-6 & APE D80[2]	
TP #12	36"Ø x 3/4"T x 180'L	WELDED END HARDENING *2	X	APE 200-6 & APE D80[2]	
TP #13	48"Ø x 1"T x 175'L	NONE	X	APE 200-6 & APE D80[2]	
TTP #1	24"Ø x 5/8"T x 115'L	CUTTING SHOE *1	X	APE 200-6 & APE D80[2]	
TTP #2	36"Ø x 1"T x 150'L	NONE	X	APE 200-6 & APE D80[2]	
TTP #3	36"Ø x 1"T x 145'L	WELDED END HARDENING *2	X	APE 200-6 & APE D80[2]	
TTP #4	36"Ø x 1"T x 150'L	NONE	X	APE 200-6 & APE D80	

[1] Sound attenuation will be used at all times on this pile; bubble curtain efficiency will not be tested on this pile
[2] If piles do not reach design tip elevation the use of the APE 400 vibratory and APE D100 hammers will be implemented upon direction from the engineer

Table 2. Number of piles to be installed by pile diameter.

Pile Size (inches)	Number of Piles
24	1
36	12
48	16

The following is a more detailed description of the proposed action.

1. All test piles will be installed using a vibratory hammer. All 29 piles may need to be proofed with an impact pile driver. No impact pile driving will occur after October 14, 2011, for piles larger than 36 inches in diameter. All piles will be removed at the end of the test, but no later than October 31, 2011.

2. The duration of all in-water work (mobilization, initial pile installation, load testing, pile removal, demobilization) will be up to 40 days and will occur between July 16 and October 31. Duration of pile driving activities is listed in Table 3. More than one pile may be impact driven per day and up to four piles may be installed per day using a vibratory hammer. Proofing (impact driving) will not exceed 100 strikes per day and no more than 1,500 total strikes for the entire project.

Table 3. Duration of pile driving.

Activity	**Duration**	**Number of Piles**	**Total Number of Days**	**Total Cumulative Estimated Hrs**
Vibratory hammer installation	1 hr per pile	29	29	29 hrs
Vibratory extraction	30 minutes per pile	29	29	14.5 hrs
Impact hammer installation	15 minutes per pile not to exceed 100 pile strikes per day	29	29	7.25 hrs

3. Sound attenuation, including a regular bubble curtain, confined bubble curtain, temporary noise attenuation piles, or Gunderbooms, will be used during all impact pile driving. To test the effectiveness of the different sound attenuation methods, the following procedures will be followed:

    - Up to seven piles will be driven by impact hammer without sound attenuation for up to one minute each and no more than 50 strikes per day. It is not currently known which piles will be tested without attenuation. However, TP # 1 will not be tested without attenuation at all times. As the Navy has not identified which seven piles will be tested without sound attenuation, we assumed for our analysis that those piles that would result in the furthest sound pressures associated with unattenuated impact pile driving would be tested. These piles are TP 7, 8, 9, 10, 11, and 12. We also included TP #1 as it is the only 24 inch diameter steel pile that will be tested.

- After September 30, unattenuated impact pile driving will be restricted to the installation of the smallest pile (24-inch diameter).

4. Sound attenuation measures will be tested on vibratory pile driving for at least one pile of each size used for the test pile project.

5. A "soft start" procedure will be employed to minimize the effects of pile driving. The soft start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 1 minute waiting period. The procedure will be repeated two additional times. If an impact hammer is used, contractors will be required to provide an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 1 minute waiting period, then two subsequent three-strike sets.

6. Forage fish spawning surveys will be conducted in accordance with the Washington State Department of Fish and Wildlife (WDFW) guidelines. Surveys will be conducted weekly beginning September 30, 2011 and ending October 29, 2011, between the Marginal Wharf and the existing EHW-1. If forage fish eggs are detected on or after October 14, 2011, impact pile driving will be required to stop within 7 days. Prior to this, forage fish eggs will be noted, but impact pile driving would continue.

7. Up to four barges may be used for the proposed action. Barges are anticipated to be approximately 80-ft wide by 300-ft long. Barges will be present during the duration of the test pile program. Barges will be moved into position using a tug boat (up to 50 ft in length).

8. Existing upland disturbed areas will be used for staging and parking.

Proposed Minimization Measures

The Navy proposes to implement the following measures to minimize the effects of the proposed action on marbled murrelets, bull trout, and their prey species.

1. All impact pile driving will be performed between July 16 and October 31, 2011, to minimize impacts to marbled murrelets, bull trout, Pacific herring (*Clupea pallasi*), surf smelt (*Hypomesus pretiosus*), and Pacific sand lance (*Ammodytes hexapterus*) (sand lance). Densities of marbled murrelets and bull trout are lower in Hood Canal during this time period and effects to some of the forage fish would also be minimized because actions during the spawning period will be limited or avoided. All in-water work will be completed by October 31, 2011.

2. During the marbled murrelet breeding season (April 1 through September 15), in-water work will not begin until 2 hours after sunrise and will end 2 hours before sunset.

3. Sound attenuation methods will be implemented during all impact pile diving, except during the proposed effectiveness testing. TP # 1 will not be tested without attenuation at any time due to the limited ability to conduct adequate marbled murrelet surveys adjacent to EHW-1.

4. Monitoring of in-air and underwater sound pressures will occur during impact and vibratory pile driving. A copy of the monitoring protocol is included in Appendix 1.

5. Marbled murrelet surveys will be conducted prior to and during all impact pile driving. A copy of the at-sea marbled murrelet monitoring protocol is included in Appendix 2.

6. Impacts to eelgrass and kelp will be avoided. Impacts to other macroalgae will be monitored to determine the extent of effects. Because the proposed EHW-2 project activities overlap with the test pile program, compensatory mitigation for submerged aquatic vegetation will be provided as part of the EHW-2 proposal.

7. Existing upland vegetation will not be disturbed.

8. If needed, a Stormwater Pollution Prevention Plan will be developed and implemented.

9. Spill prevention control equipment will be available. Equipment will be clean and well maintained.

<u>Forage Fish Occurrence in the Affected Area</u>

Beach seine surveys were conducted from 2007 through 2008 along the shoreline of the NBKB. Table 4 includes only those results for the primary prey species of bull trout and marbled murrelets.

Table 4. Beach seine results from multiple collection sites along the shoreline of the NBKB (based on NAVFAC 2010, p. B-12 through B-28).

Beach Seine Results - Year	2005	2006	2007	2008
Pacific herring (*Clupea pallasi*)	7	59,288	10,611	12
Sand lance (*Ammodytes hexapterus*)	13	5,599	306	2,113
Surf smelt (*Hypomesus pretiosus*)	1,024	15,160	1,632	12,178

Much of the shoreline along the NBKB property is identified as suitable and/or potential spawning habitat for forage fish, and documented sand lance spawning occurs along the shoreline where the test pile program will be conducted. The WDFW has also documented sand lance spawning within the action area during surveys conducted on November 25, December 4, January 21, and February 6 (Lowry in litt. 2011). Although no forage fish surveys were conducted at NBKB during other months, survey data for other areas of Puget Sound indicates that sand lance spawning is most likely to occur from late October through late February.

Based on the information provided in the cover letter, BA, personal communications, and other documents, we have concluded that effects of the proposed action to the marbled murrelet and bull trout would be insignificant. Therefore, for the reasons identified below, we have determined that the proposed action "may affect, but is not likely to adversely affect" the marbled murrelet and concur with your "may affect, not likely to adversely affect" determination for the bull trout.

Effects of the Proposed Action

The proposed action may result in negative effects to marbled murrelets and bull trout during the installation and removal of piles. Marbled murrelets that are in the area during implementation of the test pile project may be affected as a result of a) exposure to elevated in-air and underwater sound pressure levels; b) exposure to contaminants; c) increased activity levels from watercraft used to transport staff to barges as well as those used for monitoring purposes; and d) reduced forage availability. Bull trout would also potentially be affected by elevated underwater sound pressure, exposure to increased turbidity and contaminants, and reduced prey availability.

Please note that our analysis is based on dual criteria of peak decibels (dB_{peak}) and sound exposure level (SEL) for assessing the potential of physical injury and dB root mean squared (dB_{rms}) for assessing the potential for behavioral effects to marbled murrelets and bull trout.

Effects to Marbled Murrelet

Potential of Exposure

Marbled murrelets have been observed in the nearshore areas of NBKB, including the project area, by the Navy and others (NAVFAC 2010, p.75). The most recent observations within the project area were recorded in 2007 and 2008 as part of marine bird surveys conducted at NBKB (Tables 5 and 6). Additionally, monitoring of marbled murrelets occurs during the summer months (May 15 to July 31 each year) within Hood Canal as part of the Northwest Forest Plan Marbled Murrelet Effectiveness Monitoring Program (Raphael et al. 2007) and in December of each year as part of the Puget Sound Ambient Monitoring Program conducted by the WDFW. Summer surveys are conducted across Hood Canal from NBKB. Winter aerial surveys are adjacent to the project area. Based on the survey results, we anticipate that marbled murrelets likely will be in the project area and may be exposed to the proposed action.

Table 5. Marbled murrelet observations along the NBKB waterfront March through August, 2007 (from Agness and Tannenbaum 2009, p. 12).

Date	Area	Number of Marbled Murrelets Observed	Behavior Observed	Approximate Distance from Shore (ft)
4/17/2007	Nearshore 6	2	Loafing	1,000
4/18/2007	Nearshore 2	2	Diving	150
4/18/2007	Nearshore 3	2	Loafing	500
4/30/2007	Nearshore 2	2	Diving	500
5/1/2007	Nearshore 2	2	Diving	200
5/1/2007	Nearshore 1	2	Loafing	500
5/14/2007	Nearshore 5	2	Loafing	1,500
5/25/2007	Nearshore 2	2	Diving	<50

Table 6. Marbled murrelet observed along the NBKB waterfront July to September, 2008 (Tannenbaum et al. 2009).

Date	Area	Number of Marbled Murrelets Observed	Behavior Observed	Location
9/4/2008	Pier 5	1 (juvenile)	Swimming under Pier 5	Within 100 ft of the EHW-1

Effects of Exposure

Effects from Underwater Sound Pressures

Although marbled murrelet monitoring will be conducted prior to and during impact pile driving, it is possible that a marbled murrelet within the area surveyed may go undetected. Based on similar methods evaluated by Evans Mack et al. (2002), we expect that the Navy's marbled murrelet monitoring effort (including the use of two observers per boat, maximum transect width of 100 m, boat speed equal to or less than 10 knots per hour, and two boats surveying in pattern designed to cover the entire area twice prior to initiating impact pile driving) has a 78 to 95 percent probability of detecting marbled murrelets in the monitoring area. Using the conservative estimate, we assume that 78 percent of the marbled murrelets that may be in the survey area would be detected and 22 percent will go undetected.

We modeled the probability of exposure of a marbled murrelet to underwater sound pressures that could result in physical injury (e.g., 206 dB_{peak} or higher and 183 dB SEL or higher). Using the available information on marbled murrelet densities during the time of year the project will be implemented, average dive times and foraging bouts, and incorporating the expected effectiveness of the monitoring effort, we determined that the probability of marbled murrelet exposure to injurious levels of underwater sound would be below 0.1. Therefore, we do not anticipate marbled murrelets to be exposed to underwater sound pressure levels that would result in injury. This approach has been used by the Service in previous analyses on underwater sound (U.S. Fish and Wildlife Service 2008, p. 99).

Vibratory hammers produce underwater peak pressures that are approximately 17 dB lower than those generated by impact hammers (Nedwell and Edwards 2002). Not only are these sounds different in intensity, but they also differ in frequency and impulse energy (total energy content of the pressure wave), which may account for the fact that no fish kills have been observed with use of vibratory hammers. Most of the sound energy of impact hammers is concentrated between 100 and 800 Hz, the frequencies thought to be most harmful to aquatic animals, while the sound energy from the vibratory hammer is concentrated around 20 to 30 Hz. Additionally, during the strike from an impact hammer, the sound pressure rises much more rapidly than during the use of a vibratory hammer (Nedwell and Edwards 2002) increasing the likelihood and severity of injury. Because we do not anticipate the pressure waves associated with vibratory pile driving to result in physical injury due to the slower rise time versus impact pile pressure waves, effects to marbled murrelets associated with vibratory pile driving are considered insignificant.

Marbled murrelets may be exposed to underwater sound levels that reach or exceed 150 dB_{rms}. Exposure to these sound levels may cause a behavioral response such as avoidance, interrupted resting or feeding. However, due to the inclusion of the in-water timing restriction during the breeding season to reduce the likelihood of delayed feeding attempts of young, the fact that pile driving is not continuous throughout the day, and that monitoring results show that marbled murrelets continue to forage in situations where they are exposed to sound levels at or above 150 dB_{rms}, we do not expect any measurable alterations in the normal behavior of marbled murrelets. Thus, effects to marbled murrelets from potential noise-related disturbance are considered insignificant.

Effect of In-Air Sound Pressure from Pile Installation and Removal

Backround in-air sound levels have not been recorded at NBKB, but the BA states that they are expected to be in the 70 dBA to 90 dBA range based on urbanized and industrial areas. The BA assumed that the in-air sound pressure levels will be 105 dBA re: 20μPa at 50 ft for impact pile driving and 95 dBA re: 20μPa at 50 ft for vibratory pile driving (NAVFAC 2010, p. 101). However, the 105 dBA was based on "a rule of thumb" (Greene in litt. 2002, no page) and the specific pile size is not provided.

Based on sound measurements taken by the WSDOT during impact installation of 36 inch diameter piles (Laughlin 2007, pg. 44), in-air sound pressures were 96.7 dBA at 300 ft from the pile for impact pile driving. Using the spherical spreading loss calculator (reduction of 6 dB per doubling distance for open sites), 96.7 dBA at 300 ft will attenuate to 92 dBA at 515 ft). Although the WSDOT data are for piles of smaller sizes than the maximum 48 inch diameter that will be used for the test pile program, it represents a more conservative value than that used by the Navy in their analysis. Data are also available from the WSDOT (in litt. 2010) indicate that in air sound pressures from vibratory pile driving of 30-inch diameter steel piles ranges from approximately 85 dBA to 96 dBA standardized to 50 ft. We have elected to use the more conservative value of 96 dBA for in air sound associated with vibratory pile driving, with sound pressure attenuating to 92 dBA at 24 m (79 ft).

Marbled murrelets may be exposed to elevated in-air sound pressures for a total of 43.5 hrs associated with vibratory pile installation and removal and 7.25 hrs for impact pile driving over a total of 29 days during the proposed in-water work period of July 16 through October 31, 2011. These estimates are based on the following assumptions, as stated in the BA (Table 7).

Table 7. Duration of pile installation and removal (NAVFAC 2010, p. 17).

Activity	Duration	No. of Piles	Total No. of Days	Total Cumulative Estimated Hours
Vibratory Hammer Installation	1 hr per pile	29	29	29
Vibratory Extraction	30 minutes per pile	29	29	14.5
Impact Hammer Installation	15 minutes per pile	29	29	7.25
			Total	50.75

The Navy anticipates that up to four piles may be installed using a vibratory pile driver per day. We have assumed up to two piles may be impact driven per day due to the limit on the number of pile strikes permitted per day. The number of piles that may be removed per day is unknown, but we assume that it may be at least four piles. Therefore, on a daily basis, marbled murrelets may be exposed to up to 6.5 hrs of in-air sound pressure associated with a vibratory and impact pile driver over 29 days.

Based on research studies and available data for sound-related disturbance in the terrestrial environment, sound levels at or above 92 dBA elicit flushing or startle responses in birds. For projects in the marine environment, we assume that marbled murrelet response to above-ambient sounds on the water could result behavioral responses such as diving, flushing or avoidance of the area.

Recent anecdotal information collected during monitoring of seabird response to pile driving for bridge and ferry terminal projects in Washington, described mixed behavioral responses to pile driving. There is some evidence that marbled murrelets and other seabirds may ignore or become habituated to elevated sound levels associated with pile driving. For example, during construction of the Hood Canal Bridge project, it was observed that marbled murrelets continued to forage even when pile driving was occurring (Entranco and Hamer Environmental 2005). Observers also noted that at the beginning of the pile driving work, the majority of seabirds in the vicinity responded by flushing, but that this response lessened over time, indicating that there was some habituation to elevated noise levels over the course of construction (Entranco and Hamer Environmental 2005, p. 22).

Based on the available information, we expect marbled murrelets to ignore or habituate to elevated sound levels. Although marbled murrelets may respond by diving or flying initially, they are likely to resume foraging. Therefore, we anticipate that the effects of the proposed action will not measurably affect normal marbled murrelet behavior, and the effect to this species due to in-air disturbance is considered insignificant.

Effects from Exposure to Contaminants

The proposed action may result in an increased risk of contaminants due to fuel and oil leaks from the use of boats and barges. Additionally, if contaminants are present in the sediments where the piles are installed and removed, these may be released and become available to marbled murrelets directly through contact or ingestion or indirectly through their prey. Stormwater runoff may also enter the surface waters from parking and staging areas.

Although there is a risk of fuel and oil leaks from the surface water vessels, we do not anticipate that there is a high likelihood of an oil or fuel spill during the proposed work. Because the test pile program will be conducted in deeper water (greater than 40 ft for most piles), we do not anticipate measurable levels of elevated turbidity and exposure to suspended sediments during pile installation and removal. No contaminants are known to occur within the project area in concentrations that may result in measureable effects to marbled murrelets or their prey species if there was exposure. Furthermore, existing parking areas will be used and no additional contaminants from these areas are anticipated.

Therefore, the risk of marbled murrelet exposure to contaminants (ingestion or contact) at concentrations that would measurably affect this species is considered insignificant.

Surface Vessels and Personnel

The proposed action may result in disturbance to marbled murrelets associated with human activities, barge and vessel traffic, and other construction-related activities. Additionally, observer boats will also be in in the action area during the marbled murrelet and other monitoring surveys.

Agness et al. (2008) investigated the potential effects of vessels on the near shore density and behavior of Kittlitz's murrelets (*Brachyramphus brevirostris*) in one summer (breeding) season at Glacier Bay, Alaska, with particular emphasis on the behavioral (response) differences between breeding and non-breeding adults and forage group size at three time scales: instantaneous, 30-minutes, and daily. In general, Kittlitz's murrelets were immediately displaced by vessel traffic, resulting in a 40 percent decrease in the nearshore density for up to 30 minutes. Kittlitz's murrelet density returned to or exceeded the pre-exposure density within the same day. The authors also noted that group size did not change at the 30-minute or daily time scales and inferred that group dynamics (possibly of importance to foraging success) was unaffected on days with high vessel traffic (Agness et al. 2008, p. 352).

Overall, however, the authors noted a three-fold increase in dive behavior on days with higher vessel traffic. However, this did not appear to be a direct response to an approaching vessel as no change in dive behavior was detected at the instantaneous and 30 minute time scales (Agness et al. 2008, p. 352). Rather, the increase in dive behavior (presumably foraging) was probably in response to the 30 percent increase in flight behavior that placed an increased energetic demand on individuals and led to the observed higher frequency in diving and foraging behavior.

Non-breeding Kittlitz's murrelets were much more likely to flush in response to vessel traffic, and breeding Kittlitz's murrelets (holding a fish for delivery to inland nestlings) were more likely to dive. Breeding adults seldom flew while holding a fish, probably because the combination of the added weight and effort of holding a fish made diving energetically more preferable (Agness et al. 2008, p. 352). Dive behavior of marbled murrelets with fish was also observed by (Speckman et al. 2004, p. 33) in response to research boats attempting to approach the birds. Fish-holding Kittlitz's murrelets will sometimes fly when the vessels are slow and approaching at greater distances (Agness et al. 2008, p. 351).

Bellefuer et al. (2009) studied the behavior of marbled murrelets in response to small vessels (4.9 m to 7.3 m in length) in the marine waters of the Pacific Rim National Park Reserve, Vancouver Island, British Columbia, Canada. They found that juveniles flushed more than adults (70.1 percent versus 51.7 percent), but flushed when boats were closer. Also, boats with speeds greater than 29 kph resulted in a greater proportion of the birds flushing and to greater distances versus speeds less than 12 kph, Based on a regression analysis, marbled murrelets tended to fly completely out of feeding areas at the approach of boats travelling more than 28.8 kph and later in the season (July and August) (Bellefuer et al. 2009, p. 1).

We assume the response of marbled murrelets to vessels will be similar to the closely related Kittlitz's murrelet, as described above. The visual stimuli associated with the vessels may induce either diving or flying behavior in affected marbled murrelets. We expect this will not affect the foraging success of marbled murrelets.

We expect that current Navy activities at NBKB expose marbled murrelets to Navy surface vessels, submarines, and personnel as the Navy performs routine training, security, and maintenance activities in the area. Marbled murrelets may avoid or be physically displaced from exposure to vessels currently using the project area. Responses to existing and proposed vessel operation by marbled murrelets could include diving, swimming away from a vessel, or abandoning a foraging area. However, our assumption is that marbled murrelets that use this area are accustomed to the daily activity levels that occur there. The effects associated with the surface vessels and personnel that marbled murrelets may be exposed to as a result of this proposed action are not anticipated to be measurable over existing conditions due to the current active use of the facilities by the Navy. Therefore, we anticipate that the effects to marbled murrelets associated with the presence of humans and surface vessels will not measurably affect normal marbled murrelet behaviors, such as loafing, breeding, and foraging.

Effects to Marbled Murrelet Prey Resources

Indirect effects to marbled murrelets may occur due to impacts to forage fish and forage fish spawning habitat that occurs within the action area. Pacific herring, surf smelt, and sand lance occur within the area. Although eelgrass beds occur on-site and may be used by Pacific herring for spawning, no spawning by Pacific herring has been documented in the project site. The Navy proposes to minimize effects to forage fish and forage fish spawning habitat by minimizing tugboat scour and anchors within eelgrass beds. Surf smelt spawning has not been documented at the project site; however, this species has been documented in the area. Sand lance spawning occurs within the project area, and adult, juvenile, and larval individuals are anticipated to be present at all times of the year (NAVFAC 2010, p. 43). Spawning surveys have been conducted by the WDFW within the action area, but none since 1997 (Lowry in litt. 2011). The forage fish spawning surveys were conducted during late November through the beginning of February. They did not occur during the same time of year that the proposed action will be implemented (July through October). However, based on surveys in other parts of Puget Sound, sand lance generally spawn from late October through late February (Lowry in litt. 2011). Therefore, we anticipate that there is a likelihood that spawning sand lance may be exposed to pile driving associated with the proposed action during October.

Beach surveys will be conducted along the NBKB waterfront beginning September 30 to determine if surf smelt or sand lance eggs are present. If forage fish eggs are detected on or after October 14, 2011, impact pile driving will be required to stop within 7 days. Prior to this, forage fish eggs will be noted, but impact pile driving would continue. This will reduce, but not eliminate effects to spawning forage fish.

Additionally, some forage fish may be injured or killed during impact pile driving (both attenuated and unattenuated) if they are within the area where sound pressures are expected to result in levels known to injure fish.

Impact pile driving will be restricted to July 16 to October 31. This will reduce, but not eliminate, negative effects to marbled murrelet prey. However, due to the timing of the proposed action to minimize injury to forage fish, the proposed sound attenuation during the majority of pile driving to limit the extent of potential injury, and the limited duration (7 minutes) of unattenuated pile driving proposed, we do not anticipate that effects to forage fish will be of such a magnitude to measurably affect marbled murrelet. Therefore, we anticipate that the effects to marbled murrelet via their prey will be insignificant.

Effects to Bull Trout

The proposed action may result in increased turbidity and contaminants during pile installation and removal. Additionally, impact pile driving of steel piles may result in sound pressure levels that are known to injure fish. Furthermore, although a bubble curtain or other sound attenuation device is proposed, sound pressures may still reach injurious levels to bull trout, especially during the sound attenuation effectiveness testing when the bubble curtain is turned off.

Potential for Exposure

The closest known population of bull trout is in the Skokomish River, approximately 35 miles south of the project area. Based on recent tagging information, bull trout in the South Fork Skykomish River appear to be fluvial (there is currently no documentation of anadromy based on tagged fish). Cushman Dam currently blocks all upstream access and most downstream access to the marine environment for bull trout in the North Fork Skokomish River. There are no records of bull trout in the Hood Canal marine environment or freshwater systems on the Kitsap Peninsula. As it is extremely unlikely that bull trout occur within the action area and the project will be conducted at a time of year when few bull trout are in the marine environment (July 16 to October 31), we consider the direct effects of the proposed action (e.g., exposure to turbidity, contaminants, increased sound pressures) to bull trout to be discountable.

Effects to Bull Trout Prey

Indirect effects to bull trout may occur due to impacts to forage fish and forage fish spawning habitat that occurs within the action area. Pacific herring, surf smelt, and sand lance occur within the area. Although eelgrass beds occur on-site and may be used by Pacific herring for spawning, no known spawning by Pacific herring is known from the project site. The Navy proposes to minimize effects to forage fish and forage fish spawning habitat by minimizing tugboat scour and anchors within eelgrass beds. Surf smelt spawning has not been documented at the project site; however, individuals are known to use the area. Sand lance spawning occurs within the affected area, and adult, juvenile, and larval individuals are anticipated to be present at all times of the year (NAVFAC 2010, p. 43). Spawning surveys have been conducted by the WDFW within the action area, but none since 1997 (Lowry in litt. 2011). The forage fish spawning surveys were conducted during late November through the beginning of February. They did not occur during the time frame of the proposed action (July through October). However, based on surveys in other parts of Puget Sound, sand lance generally spawn from late October through late February (Lowry in litt. 2011). Therefore, we anticipate that there is a likelihood that spawning sand lance may be exposed to pile driving associated with the proposed action during October.

Beach surveys will be conducted along the NBKB waterfront beginning September 30 to determine if surf smelt or sand lance eggs are present. If forage fish eggs are detected on or after October 14, 2011, impact pile driving will be required to stop within 7 days. Prior to this, forage fish eggs will be noted, but impact pile driving would continue. This will reduce, but not eliminate effects to spawning forage fish.

Additionally, some forage fish may be injured or killed during impact pile driving (both attenuated and unattenuated) if they are within the area where sound pressures are expected to result in levels known to injure fish during non-spawning periods.

Impact pile driving will be restricted to July 16 to October 31. This will reduce, but will not eliminate negative effects to bull trout prey. However, due to the timing of the proposed action to minimize injury to forage fish, the proposed sound attenuation during the majority of pile driving to limit the extent of potential injury, and the limited duration (7 minutes) of unattenuated pile driving proposed, we do not anticipate that effects to forage fish will be of such a magnitude to measurably affect bull trout. Therefore, we anticipate that the effects to bull trout via their prey will be insignificant.

Conservation Recommendation

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Navy should perform marbled murrelet marine surveys to determine their specific occurrence and timing of their use within the areas affected by Navy actions anticipated in the future. These surveys should be conducted during the in-water work window and result in statistically valid data. We recommend that you coordinate survey methodology with our office and/or other marbled murrelet researchers. These surveys would provide more site-specific information for this species and for developing minimization measures associated with further Navy actions.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

If you have any comments or questions regarding this concurrence or our joint responsibilities under the Endangered Species Act, please contact Nancy Brennan-Dubbs at (360) 753-5835 or Martha Jensen at (360) 753-9000 of this office.

Sincerely,

Martha L. Jensen

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

Enclosures:
Marbled Murrelet Monitoring Plan
USN Acoustic Monitoring Plan

cc:
NMFS, Lacey, WA (T. Black)

LITERATURE CITED

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APPENDIX G

Public Comments

This appendix contains the following letters:

1. Letter dated May 16, 2011
2. Letter dated May 17, 2011
3. Letter dated May 21, 2011
4. Letter dated May 22, 2011
5. Letter dated May 24, 2011
6. Letter dated May 27, 2011
7. Letter dated May 27, 2011
8. Letter dated May 28, 2011
9. Letter dated May 28, 2011
10. Letter dated May 31, 2011
11. Letter dated May 31, 2011
12. Letter dated May 31, 2011
13. Letter dated June 2, 2011
14. Letter dated June 6, 2011
15. Letter dated June 7, 2011
16. Letter dated June 8, 2011
17. Letter dated June 8, 2011
18. Letter dated June 8, 2011
19. Letter dated June 8, 2011

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A letter was received on May 16, 2011 during the Trident Support facilities Explosives Handling Wharf (EHW-2) Draft Environmental Impact Statement. A portion of the letter commented on the Test Pile Program. The portion of the letter that pertains to the Test Pile Program has been included in this appendix.

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On April 28, 2011, I received a Freedom of Information Act (FOIA) response from Strategic Systems Programs of the Navy in response to a FOIA request I made on July 16, 2009 for records indicating the "current cost value" for the proposed second EHW at Bangor. A heavily redacted update on the project, titled *"Status Update to Mr. Andy DeMott"*, dated August 11, 2009, indicated the proposed second wharf could not be operational until 2015.[1]

The Navy first announced the EIS for the second Explosives Handling Wharf on June 10, 2008. The Navy later withdrew the announced review on June 30, 2008 in order to *"perform a thorough Business Case Analysis on this project."*[2]

The Navy had years to prepare its Draft EIS for the second EHW. The Navy has never asserted there is an immediate need for the second EHW. The Navy still has time for a proper EIS review. The Navy cancelled its first announcement of the project while knowing it could take up to six years to conduct an EIS, construct the second EHW, and to bring the EHW to operational status.

The Navy must provide a revised Draft EIS and a new scoping period for the proposed second EHW at Bangor. It is the only remedy at this point for the numerous errors in this EIS process.

I will first address procedural errors in the Draft EIS that may result in a negative environmental impact in Hood Canal.

I have separated my statement into sections. Please consider each issue presented.

Test Pile Program and the second EHW are connected projects and should be under the same review

The Navy's Test Pile Program, as currently being reviewed by the National Marine Fisheries Service for an Incidental Harassment Authorization (IHA), is a connected action and should be included in the Draft EIS for the proposed second Explosives Handling Wharf.

The Navy identified Alternative 1 as the preferred plan for the second EHW in the March 2011 Draft EIS.[3] However, piles for the Test Pile Program, intended to support the design for the future construction of the EHW, appear to be in areas that are not necessary for Alternative 1.

The January 25, 2011 notice in the Federal Register, regarding the proposed Test Pile Program, contained the following statements:

> *The Navy proposes a test pile program* ***to support the design of the future construction of EHW-2.***[4]

[1] FOIA response dated April 21, 2011 from K.R. Brenton, Strategic Systems Programs, to Glen Milner, *"Status Update to Mr. Andy DeMott"*, dated August 11, 2009. According to the Navy Region Northwest record, the projected cost for the EHW was *"in range of $700M-$800M."*
[2] Federal Register: June 30, 2008, Volume 73, Number 126, page 36847.
[3] *Trident Support Facilities Explosives Handling Wharf (EHW-2)*, Draft EIS, March 2011, Chapter 2, page 10.
[4] Federal Register: January 25, 2011, Volume 76, Number 16, pages 4300-4322. See http://edocket.access.gpo.gov/2011/2011-1528.htm, page 4301.

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> *The test pile program will involve driving eighteen steel pipe piles,* ***at pre-determined locations within the proposed footprint of EHW-2.***[5]

However, the diagram in the *Essential Fish Habitat Assessment for the Test Pile Program,* dated July 2010, shows locations for some of the 18 piles outside of the structure of the proposed second EHW shown in Alternative 1.[6] It appears one pile is outside of the area for the second EHW and seven piles are between structural parts of the second EHW. If the Test Pile Program and the second EHW had been reviewed together, as required by CEQ Regulations, the Navy might have better coordinated these two connected projects. Some piles might be eliminated.

In addition, according to the *Test Pile Program, Naval Base Kitsap Bangor Waterfront, PreFinal Environmental Assessment*:

> *All test piles will be removed with a vibratory hammer as part of the project and reused as part of the EHW-2 project if structurally intact...*[7]

The Navy never explained why some of the 18 piles could not be left in place. The Navy mentioned conducting load tests on the piles but never explained whether testing would prevent leaving the piles in place for use for the second EHW. A less aggressive form of testing might render the piles usable after testing, eliminating the need for removing these piles and installing them a second time.

There may be other ways that combining the two projects could lessen the environmental impact in Hood Canal. However, unless the connected projects are reviewed together, it is difficult to discuss other ways to mitigate impacts. The Navy plans to begin the Test Pile Program after July 16, 2011.[8]

I attempted to submit comments concerning the relationship between the two projects after the publication of the Draft EIS for the second EHW. Mr. Ben Laws, of the National Marine Fisheries Service, told me:

> *Please note that the comment period for the proposed Incidental Harassment Authorization for the Navy's Test Pile Program closed on February 24, 2011. Your additional comment is outside of the 30-day comment period and is therefore not accepted.*

On April 4, 2011, Mr. Laws told me:

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[5] Ibid, page 4301.
[6] See http://www.nmfs.noaa.gov/pr/permits/incidental.htm. Which came first, the location of the piles for the Test Pile Program or the location of the piles for the proposed EHW? Page 5 of the *Essential Fish Habitat Assessment* gives coordinate locations for the piles but I could not find similar coordinates in the Draft EIS for the EHW. It also appears different coordinates are given in the *Test Pile Program, Naval Base Kitsap Bangor Waterfront, PreFinal Environmental Assessment* in Figure 2-2. For a comparison of the two projects, I copied Figure 2-2 of the PreFinal EA at 113 percent on a transparency film and laid it over the diagram on page 2-11 of the Draft EIS.
[7] *Test Pile Program, Naval Base Kitsap Bangor Waterfront, PreFinal Environmental Assessment*, Chapter 2, page 6.
[8] Ibid, cover page.

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NMFS intends to either issue or deny the Navy's requested authorization under the MMPA ***by May 1, 2011*** *Although this is longer than the 45 days stipulated in the MMPA, that timeframe may be adjusted in agreement with the applicant, as is the case here. The Navy will not issue an additional PreFinal Environmental Assessment; the Navy's next step is to issue a final Environmental Assessment. NMFS did receive a number of public comments, many of which expressed concern over the Navy's NEPA process for both the Test Pile project and for the proposed construction of a second Explosives Handling Wharf (EHW).* ***Under NEPA, there is no requirement to allow for public comment on an Environmental Assessment - unlike for the more rigorous Environmental Impact Statement.*** *Additionally, the Navy would not properly respond to public comment received on NMFS' proposed issuance of an Incidental Harassment Authorization, as those comments should be directed towards NMFS and should pertain solely to that proposed authorization. For this reason, many of the comments NMFS received from the public regarding the proposed authorization were not relevant to NMFS, as they either would have properly been directed towards the Navy or were relevant to the EHW. These comments expressed concern over the Navy's NEPA process - something NMFS has no control over - or expressed opposition to the proposed EHW, a separate action that NMFS was not soliciting public comment on.* ***NMFS does not control the Navy's decision to treat these projects separately,*** *but is required to analyze the impacts of actions as requested by applicants, making determinations as appropriate. NMFS will address public comments in its public notice of either issuance or denial of the Navy's request.*[9]

According to Mr. Laws' response, the National Marine Fisheries Service will not be determining whether the two projects are connected. This is a question left to the review of the Draft EIS.

Cost-benefit Analysis, withheld appendices, and missing information

I will not again belabor the fact that the Cost-benefit Analysis and other records have been withheld. The information is required under CEQ Regulations and was addressed in my April 18, 2011 statement. The Navy never stated in the Draft EIS that it had conducted a Cost-Benefit Analysis or explained why it was withheld from the Draft EIS.

I attended the scoping meetings on April 19 and April 21, 2011. Every public comment, with the exception of a comment by a Kitsap County Commissioner, was opposed to building the second EHW. Many spoke with a good understanding of issues involved and stated that the project is unnecessary. More information should be available regarding the Navy's need and purpose, safety, and alternatives for the project. Appendices A, B, and C should be released in their entirety.

Obviously, if the second EHW is found to be unnecessary, and not built, there would be no further impacts in Hood Canal from the project.

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[9] April 4, 2011 e-mail from Ben Laws, ITP.Laws [ITP.Laws@noaa.gov], to Glen Milner. Bold type added to Mr. Laws' statement.

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A letter was received on May 17, 2011 during the Trident Support facilities Explosives Handling Wharf (EHW-2) Draft Environmental Impact Statement. A portion of the letter commented on the Test Pile Program. The portion of the letter that pertains to the Test Pile Program has been included in this appendix.

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out of Puget Sound, although some are still found in nearshore areas through October" (Fresh 2006).

Juvenile Chinook, coho, and chum, as well as surf smelt, sand lance, and Pacific herring, are documented in nearshore beach seine surveys adjacent to Kitsap County shorelines during the proposed work window months of July – November (Paul Dorn, Suquamish Tribe, personal communication).

Therefore, it is expected that if pile driving is occurring in mid-July through the summer months, particularly in deeper nearshore or offshore areas of the proposed EHW2, juvenile out-migrant salmonids and forage fish species would likely be exposed to pile driving and experience behavioral changes, injury, or death.

Another proposed mitigation measure, the "soft start" approach to vibratory and hammer pile driving designed to induce marine animals, fish, and birds to move out of the area, would potentially alter the behavior of these animals that presumably have been displaced from preferred habitats for feeding, resting, rearing, or spawning. Another effect not considered by the Navy is that when fish become disoriented, injured, or killed from noise levels generated by pile driving, this will likely attract predatory birds, mammals, or other fish to the construction area making these animals more vulnerable to behavioral impacts, injury, or death from pile driving noise generation.

In sum, Suquamish finds the mitigation measures proposed in the DEIS for pile driving (i.e., proposed work window, noise attenuators, "soft start" approach, and monitoring) inadequate for avoiding and minimizing impacts to fish, mammals, and birds. Unavoidable impacts are likely yet the Navy offers no mitigation beyond standard BMPs for consideration in the DEIS.

g. *Test Pile Study*

In addition to the pile driving activities associated with construction of the EHW2, Suquamish has concerns with the proposed Test Pile Study proposed to start on July 16, 2011 and the likely harm to fish, birds, and mammals from underwater noise. Though the purpose of the study is to monitor noise generated by the pile driving and its biological effects and to identify more effective means for mitigating these effects, the Suquamish prefer that answers to these questions be addressed through an investigation of the literature, and by monitoring potential effects of pile driving (vibratory and hammer) activity occurring at the existing adjacent explosives handling wharf. In addition, data exists on noise generation from similar pile size, type, and likely substrate conditions from the Bangor Carderock Pier not far south from the proposed EHW2 project (as described in Section 3.4.2.1.1 and in Table 3.4-1).

The Navy provides considerable information on sound pressure levels using hammer, vibratory, and noise attenuating devices on hollow steel pile of similar diameters being proposed for EHW2. From comments made by the Navy, the study's findings will not likely be completed

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in time for incorporation into the FEIS, which seems to defeat one of the study's main intentions. After all, the floating wharf alternative would significantly minimize noise related impacts and the primary purpose of an EIS is to analyze and compare the impacts of multiple alternatives prior to reaching a final decision. Given the untimely nature of the Test Pile Study, the Suquamish request that its findings be shared with affected tribes and the Navy needs to reach concurrence with affected tribes, USACE, and NMFS/USFWS prior to incorporation into a FEIS.

h. Marine Vegetation

On Table 3.5-2 (page 196), the area of eelgrass and other marine vegetation types displaced by piles has not been determined and would need to be completed for the development of compensatory mitigation (Mitigation Action Plan). Also, in Section 3.5.2.1.1, the DEIS states that "construction activities for Alternative 1 would result in impacts to 0.37 acres of eelgrass …", however, this does not take into account impacts or displacement of eelgrass and other marine vegetation from piling.

In Section 3.5.2.1.2 (page 201), in addition to shading being a long-term/operational impact to marine vegetation, the Navy needs to consider potential impacts from scouring (particularly around piling) that could detach vegetation and the deposition of fines associated with a reduction in wave energy that could smother existing marine vegetation.

The areal distribution of eelgrass beds can vary interannually in Hood Canal (Gaeckle et al. 2011). To account for this variability the Navy may need to mitigate for the coverage and impact of areas that are suitable for eelgrass (based on elevation, substrate, and other habitat variables) but where no eelgrass currently exists.

i. Benthic Communities including Shellfish

As mentioned in Section 3.7.1.2 (page 230), geoduck, *Panopea spp.*, appear to be present at the proposed site of EHW2, and the depths of the proposed wharf are appropriate for this economically important shellfish species. Commercial geoduck harvest occurs at depths from -18 to -70 MLLW; geoduck also live below these depths and contribute to natural recruitment. According to bathymetry shown in Figure ES-2 (which pertains to the Preferred Alternative and Alternative 2) in the DEIS, it appears that approximately half the trestle length and half the wharf area would intersect these depths. The Navy needs to assess the potential impacts of EHW2 construction and long-term operation on geoduck and other shellfish habitat and resources as well as the loss of access to the harvest of geoduck, crab, and other shellfish species. The Navy must also consider how it will mitigate for these impacts in its Mitigation Action Plan (See section above on 'Tribal-Treaty Fishery Impacts').

As the Navy acknowledges in Section 3.7.2.1.1.2 (page 235), few studies have examined the effects of underwater noise on invertebrates such as crabs, clams, and shrimp. This is of concern considering that these animals are typically less mobile than fish, mammals, and birds,

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and less able to vacate and avoid the construction area. Geoduck spawning in Hood Canal occurs in April – July, and larval settlement occurs from April – August (Strathmann 1987, pages 339-340), which overlaps with the proposed work window. Suquamish requests that, if conducted, the Test Pile Study include studies of behavioral and biological impacts to invertebrates, including shrimp, crab, and clams.

j. Marine Fish

With respect to construction-related impacts to marine fish, Suquamish disagrees with this conclusion in the DEIS, Section 3.8 (page 246): "The underwater noise levels would not rise to the level that would preclude migration or force juveniles into deeper water where predation is more likely." First, this seems to contradict a statement in Section 3.8.2 that "pile driving would exceed the underwater noise thresholds for fish, established for both behavior and injury, and result in the greatest potential for adverse impacts to marine fish." Second, the proposed "soft start" mitigation measure for pile driving, if effective, would displace fish, mammals, and birds outside of the construction area, in effect driving juvenile salmonids into deeper water or dispersing them into habitats where they are potentially more vulnerable to predation and less productive to foraging behavior.

On pages 276 and 282 of the DEIS, the Navy asserts that based on several referenced NBK Bangor fish surveys in the 1970s, and from 2005 to 2008, that greater than 95% of the juvenile salmonids in the area of Hood Canal near the proposed EHW2 are present outside of the in-water work window, and would therefore not be impacted by pile driving. There is no mention in the DEIS from what depths these fish surveys were conducted. This is important because much of the pile driving activity would occur in relatively deep water where larger juvenile salmonids and other marine fish are present in summer months and may not be detected by the fish survey techniques used in the referenced studies (See above comments in 'Underwater Noise').

In Section 3.2.1.6 of the Mitigation Action Plan (Appendix F), it is unclear whether monitoring of juvenile salmonids, forage fish adults, eggs, or larval fish will take place during construction activity, and whether contingencies (e.g., work stoppage) are in place if these species and life stages are present.

According to the DEIS, it appears that the last surf smelt spawn surveys were from May 1996 through June 1997, and no spawning was documented. It appears that sand lance spawning has been documented to the immediate north and south of the EHW2 site and during a time when the proposed work window would likely be in effect, from early November through mid-February. In addition, the proposed concrete abutment along the shoreline would result in some fill of the upper intertidal zone and potential alterations in substrate conditions over time that could affect spawning substrate for both sand lance and surf smelt. In addition to the upper intertidal spawning habitats characteristic of sand lance and surf smelt, adult fish of both species will occupy lower intertidal and other nearshore habitats (Penttila 2007). Therefore, adult and juvenile sand lance and surf smelt are likely present in the nearshore waters of the proposed

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[redacted]

From: [redacted]
Sent: Saturday, May 21, 2011 1:40 PM
To: Dildine, Thomas CIV NAVFAC NW, EV1
Subject: New Wharf Pilings

Sirs:
Consider helical piers for the new wharf.
Regards,
Dave Nelson
Keyport

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[redacted]

From: [redacted]
Sent: Sunday, May 22, 2011 10:32 AM
To: Dildine, Thomas CIV NAVFAC NW, EV1
Subject: Comments on a possible pile driving FONSI in Hood Canal

Comments on the environmental effects of test Pile Driving in Hood Canal in Preparation for Wharf Building; Richard Stoll.

1. It appears if the Navy has presupposed that the EIS Record of Decision for the proposed wharf will allow one of the several very similar proposed alternatives to go forward. If data is needed on the nature of pile driving in that immediate area, how is it possible to have published a DEIS without this data? The Navy appears to have come up with a FONSI in order to fill a serious gap in DEIS analyses.

2. The Navy already has data on pile driving data from previous years and knows the nature of substrates and aquifers in this area is relatively well known.

3. With regard to the proposed wharf that this action precedes, in this time of national economic stress, and the questionable importance of sustained robust nuclear deterrent in a very changed national defense climate, how can the Navy justify the expense of construction of a new nuclear weapons handling wharf, including preparations for that construction? This questions the very thin Purpose and Need section of the DEIS.

4. The environmental effects of pile driving justify a full EIS not a FONSI issued by the Navy, the lead agency, as apparently the Navy has unilaterally chosen to do.

5. Following are some general comments on the nature and effects of sound in water:

Sound, which is caused by pressure waves, is a very significant environmental factor in aquatic environments. The underwater soundscape is diverse, sometimes intense, and can be pervasive. This is especially true in inner sounds and bays where there is a lot of human caused noise such as boats, sonar, and pile driving.
Sound travels much faster, further, and at much higher sustained intensities in water than in air. Under standard temperature and pressure conditions sound travels approximately 1,100 feet per second in air, but approximately 4,750 feet per second in saltwater.
Fish have roughly the equivalent of the human inner ear. Like in humans, the ear functions in both hearing and balance. Research indicates that fish including salmonids, and by inference other fish and animal biota, mostly perceive sound in the lower frequencies as compared to human hearing. Where the human sound perception is about 20 to 20,000 Hz, salmonids appear to perceive sound in

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the 10 to 750 Hz range. They appear to hear sounds best at levels less than 150 Hz. These are sub-woofer type frequencies.

Fish perceive the low frequency pressure waves (100Hz to less than1 Hz) through their Lateral lines. Lateral lines are unique in that they combine functional aspects of touch, hearing and seeing. Lateral lines function very much like an inner ear. Like ears lateral lines are located on each side of a fish. Therefore, fish can tell the direction from which these low frequency waves are coming. Fish can use this sense to a very sophisticated degree. They can detect both large and minute water disturbances as well as differentiate between different disturbances occurring at the same time. The bottom line is that fish are very much more sensitive to sound than humans and other terrestrial animals.

Fish can not only perceive small changes in water movements, but the direction from which they come. Many species of fish, especially including salmonids, can directionally sense prey fish movements to a highly sophisticated degree. They do this to some degree during all feeding periods, but especially in dark conditions and at greater depths where the light is low. As a feeding response mechanism, the lateral line may often be far more important than sight. Intensive sound can not only temporarily disable this fish feeding mechanism, but may permanently damage the lateral line that allow them to effectively feed just as intensive sound can damage human hearing organs.

Also important is the lateral line assists in low-light navigation around obstructions by detecting water refraction from these obstructions, detect potential predators, and may even may assist salmon in finding their way back from deep oceans to their natal streams. Damage of the lateral line senses may also seriously affect these.

The inner-ear and lateral lines in fish form a sensory system that conveys environmental information to the brain of a fish. This includes locating of prey among other things. Where lateral-line organs respond to changes in water pressure and displacement, the inner ear responds to sound and gravity. The inner-ear and the lateral lines work both separately and in coordination. The lateral line system which may be damaged by intensive sound is a collection of small mechanoreceptive patches or neuromasts located superficially on the skin or just under the skin in fluid-filled canals on the head and body of all fishes. The mechanoreceptive component of the neuromast is the hair cell. This is similar to the sensory cells found in all vertebrate ears, including the human ear. These cells transduce mechanical energy into electrical energy when their apical hairs or "cilia" are displaced. The nerves contacting these receptors enter the brain in close association with the auditory processing areas of the fish nervous system. Although auditory and lateral line pathways in the central nervous system are separate, they are largely parallel and share many of the same organizational features, suggesting that the two systems have developed and evolved in close association with each other and may share many of the same attributes.

One of the issues with sound that has not been adequately resolved is the effect of human caused sound pollution on a variety of marine animals, including salmon. As is becoming more evident from scientific investigations anthropomorphic changes in the ocean soundscape are interfering with normal function of natural saltwater ecosystems. Anthropomorphic noise comes from sources like ship propellers, sonar from a variety of sources and including military sonar, pile driving, submarines, and a variety of other sources. Very low frequency sound can travel many miles, at some lower frequencies and intensities possibly hundreds of miles, and far faster than sound travels in air. Noise is becoming increasingly recognized by scientists as one of the major environmental stimuli to saltwater biota.

While there have been a few studies on salmon avoidance of sound, most of these only address avoidance thresholds, ie: sound barriers. However, sound intensities and frequencies at sub-barrier levels could deleteriously affect salmon in a number of ways as alluded to above. These include interfering with feeding behaviors or even impeding the ability of salmon to effectively feed. There could also be corollary effects on the bait fish salmon feed on and other marine biota.

5. There is much we do not know about the real effects of excessive sound on marine organisms. But all too often decisions are made based on what people (or agencies, as the case may be) want to act in terms of what they think they know (in this case augmented by what they think is a superseding agency priority) rather than on what they do not know. Having worked for the Navy as both an environmental engineer and natural resources lead in past years I know all too well that perceived mission often appears to take precedence over other important issues.

6. In my opinion a determination of 'Finding of no Significant Impact' is absolutely not justified for the proposed action; pile driving.

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[redacted]

From: [redacted]
Sent: Tuesday, May 24, 2011 1:55 AM
To: Dildine, Thomas CIV NAVFAC NW, EV1
Subject: 2nd wharf

I am opposed to the second explosives handling wharf at Bangor subase. Its construction will impact the pristine ecology of upper Hood Canal. If there is any kind of spill or accident at the site the damage will be nasty.
Any explosion while handling warheads would be a disaster; maps of the affected zone extend all the way across the canal and down south to near my neighbors. The second wharf is expensive and threatens the unspoiled nature of Hood Canal, which is important for locals and for the area's economy.
But the 2nd wharf is the start of much more. This is the first step in a multi-year project to replace the existing Trident weapons system with a brand new one. This program will cost nearly a trillion dollars, sends the wrong message to nations who may want to reduce or scrap their nuclear weapons programs,and encourages those who see the US military as a force for global domination instead promoting a safe global order.
I love my country, and the folks in the Navy are my friends, students, and neighbors,but this wharf and the nuclear expansion underlying it are wrong.

Mack Johnson
[redacted]

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6

[redacted]

From: [redacted]
Sent: Friday, May 27, 2011 11:48 AM
To: Dildine, Thomas CIV NAVFAC NW, EV1
Subject: wharf for Navy

I am outraged at the Navy putting in another dock in the Hood Canal and pushing this through while the Seabeck Marina is stalled on all levels for years. The Seabeck Marina is just replacing an existing marina site where your project is a new environmental impact on our very fragile Hood Canal. How can this move forward when our tax dollars are spent trying to find out the source to oxygen depletion in the canal, etc. Could it be all of the naval exercises and interaction with the environment such as the huge wave that caused years worth of damage to the shellfish that community citizens attempted to restore.

When it comes to dollars going towards a project that creates job and tourist activities I want my money on the Seabeck Marina where all can enjoy the treasure of the Hood Canal not another military complex project that is unwarranted and unneeded. Please reconsider and think of the long term implications of your actions before the Hood Canal looks like a Norfolk shipyard. Our children and grandchildren deserve better.

I appreciate you time and consideration.

A very concerned citizen,

Carma Foley
[redacted]

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[redacted]

From: [redacted]
Sent: Friday, May 27, 2011 3:30 PM
To: Dildine, Thomas CIV NAVFAC NW, EV1
Subject: proposed test pile program

As a taxpaying US citizen, US Army veteran and former resident of the Puget Sound area while stationed as Chief Psychologist at Madigan General Hospital during the Vietnam War, I strongly oppose any extension of the Trident nuclear weapons facility, a wholly unnecessary concentration of WMDs enough to destroy life on earth that should be reduced, not expanded in its scope or reach. And I fondly remember the Hood Canal and its oyster beds, a precious and fragile marine ecosystem that human arrogance has no right to disturb.

Jack Dresser, Ph.D.

[redacted]

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[redacted]

From: [redacted]
Sent: Saturday, May 28, 2011 12:23 PM
To: Dildine, Thomas CIV NAVFAC NW, EV1
Subject: To the Commanding Officer

Dear Sir,
At this time when we are having to cut the federal budget and prioritize everything, as one of your neighbors I wish to let you know that the environmental impact of a second explosives Handling Wharf, should the Navy Build it, will be very difficult to accept for some of your neighbors, namely some of us who live here on Bainbridge Island.

We have watched our neighbors on Hood Canal lose time and time again some of its attraction and advantage as they need to spend major time, money and emphasis on keeping our environment not only beautiful but healthy! Please do not at this time build a second explosives Handling Wharf.

Sincerely yours, Judith R. Brown, [redacted]

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[redacted]

From: [redacted]
Sent: Saturday, May 28, 2011 7:14 PM
To: Dildine, Thomas CIV NAVFAC NW, EV1
Subject: Test Pile Program for second Explosives Handling Wharf-NBK-Bangor

Dear Sir,

I believe that the Navy has failed to follow required procedures in the following respects:
1. Conduct a review of the Test Pile Program and the second EHW as one project. They are connected projects.
2. File a notice in the Federal Register for the Test Pile Program (the information in the newspaper is listed above as an additional notice, not as a substitute for a notice in the Federal Register.) 3. Contact interested persons. The Navy has the contact information for people who commented on the second EHW. The Navy should contact these people regarding the Test Pile Program.
4. Make information available to the public regarding the Test Pile Program. The information could have been added to the Navy's existing website for the EIS for the second EHW. A better location for the Navy would be the www.regulations.gov <http://www.regulations.gov/> website. Seehttp://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR;rpp=10;po=0;D=USN-2008-0049 <http://www.regulations.gov/#!docketDetail;dct=FR+PR+N+O+SR;rpp=10;po=0;D=USN-2008-0049>
5. Hold a public hearing for the Test Pile Program.

The 28 February 2011 Marine Mammal Commission's letter referenced below http://mmc.gov/letters/pdf/2011/navy_kitsap_iha_022811.pdf identifies several recommendation to implement before further work is done on the proposed wharf.

I believe the $782 million expenditure is unjustified. There is no conceivable, logical use for such an excessive quantity of nuclear weapons, and the project should be stopped now.

Sincerely,
George N. Keefe

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May 31, 2011

Commanding Officer
1101 Tautog Circle
Silverdale, WA. 98383

RE: PILE TESTING

This letter is in response to a request for public comment with the new work slated for Naval Base Kitsap – Bangor that was in the Kitsap Sun on May 20, 2011.

As a concerned resident located at King Spit just south of Naval Base Kitsap-Bangor I do not agree with the new work that is proposed at the base. I have an existing erosion problem that has not yet been addressed with either a response or a resolution by the Navy.

I do not believe that putting more obstructions into the canal is such a good idea until you know exactly what the impact will be to the neighboring property. King Spit was just fine until you started placing current obstructing obstacles such as the security fencing, piling and piers at Carlson Spit.

Thank you,

Mark Sherbesman
[redacted]

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David C. Hall, MD [redacted]

May 31, 2011

ATTN: Mr. Thomas Dildine - NEPA Project Manager
Commanding Officer
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

RE: Test pile program for Bangor 2nd Explosive Handling Wharf

Dear Commander Dildine:

Thank you for the opportunity to restate my opposition to the building of the 2nd Explosive Handling Wharf at Bangor in Hood Canal. The test pile program is one leading edge of the US Navy's plan to rebuild the entire Trident nuclear weapons system over the next 30 years. The fundamental issue is not about eel grass or endangered murrelets, it is about the deployment of weapons of mass destruction and the continuation of Cold War levels of Trident warship missions around the globe.

The Navy has not justified to need for 400 working days per year to maintain the Trident warship fleet's missile loads. The claim that a second wharf is needed is based on the continuation of missile handling at or above current levels, when ongoing international negotiations to reduce the numbers of both missiles and warheads continue to reduce both.

The need for the 2nd EHW reflects the momentum of Cold War plans to modernize and rebuild the entire Trident nuclear weapons system, including replacement of all fourteen of the current D-5 armed warships beginning in 2029.

The plan to rebuild the Trident fleet needs public review in light of the changing realities of current international relations and treaty agreements. Trident currently focuses primarily on the Pacific Ocean where the principal adversary is China, which also holds over $1 trillion of US national debt (more than any other nation) and produces perhaps half our US consumer goods. What role does threatening China's very existence with W-88 warheads have in a sane world today?

We have the capacity to find common ground with potential adversaries who would respond to the threats of Mutual Assured Destruction, because they have an interest in survival as well. Our gravest threats come from suicidal actors for whom survival has no political relevance. This is where we need worldwide cooperative security efforts to restrict access to fissile materials, share intelligence about planned violations of neutrality, and share responsibility for intervening where plots against sovereignty are uncovered. Deterrence cannot succeed indefinitely. We must find ways to meet our neighbors in other countries and cultures at the negotiating table, as we are with Russia.

Meanwhile, we depend on Navy professionals to deploy these weapons of mass destruction without accident or unauthorized use until through the political and diplomatic processes we eliminate them altogether. Their military value lies in their ability to prevent their own use. If they are ever used, the whole system has failed.

You might be interested to know that General Lee Butler, who was once the Pentagon expert on

Soviet Russia, had never met a live Russian military leader before 1988, even though he studied the Russian language and monitored the intelligence on Soviet military activities. When he finally met his Soviet counterparts, he recognized common humanity and common interests, and during his tenure as Strategic Air Commander under President Clinton reduced the number of nuclear weapon targets in the Soviet Union from roughly 35,000 to 13,000.

We need our military leaders to do the same with China, Iran, North Korea, and Pakistan, as well as Great Britain, France, India and Israel.

Thank you for the care and diligence with which you serve our country and our common human future.

Sincerely, David C. Hall MD

David C. Hall, MD

Physicians for Social responsibility

Ground Zero Center for Nonviolent Action

Copies to:

Senator Patty Murray

Senator Maria Cantwell

Congressman Norm Dicks

Congressman Jay Inslee

Congressman Jim McDermott

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[redacted]

Commanding Officer
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

ATTN: Mr. Thomas Dildine - NEPA Project Manager

Dear Sir:

Please enter this letter containing my comments on the USN proposal to conduct Test Piles in Hood Canal as described in the Kitsap Sun newspaper as follows: *"Test Pile Program proposed in Hood Canal beginning this summer. The Test Pile program would involve the installation and removal of 29 open ended, hollow steel test and reaction piles ranging in size from 30 inches in diameter to 60 inches in diameter in Hood Canal over a forty day work period between 16 July and 30 October 2011.*

The purpose of the Test Pile Program is to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for the proposed EHW-2 and future projects at the Bangor waterfront at Naval Base Kitsap (NBK).

I absolutely oppose every aspect of this plan because it is connected to a USN proposal that I commented on previously, the Second Explosive Handling Wharf. My statement of opposition was sent to the USN, but I am now informed that this Test Pile Program has just been announced with comments due in a short 5 weeks. I have some familiarity with DEIS, EIS, and NEPA, and am dismayed that so many separate, sudden comment periods are being announced for this USN project. I am also familiar with the hourly cost of consultants who manage these mandated processes, and prefer that my taxpayer money not be spent to create killing machine facilities. America needs healing services and projects to improve opportunities for education, health care, and housing.

Because I wrote in opposition to the Second Explosives Handling Wharf, all I need to say about test piles is that when the citizen opposition to the wharf prevails, any test pile work done by the USN will be recognized as needless destruction and disturbance of the already fragile Hood Canal environment.

Sincerely, Jean P. Sundborg
Jean Penrose Sundborg

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June 2, 2011

Commanding Officer
1101 Tautog Circle
Silverdale WA 98315-1101

I oppose the Test Pile Program for the EHW-2. It is the first step. It creates momentum for continuing in a mistaken direction.

I cannot see any way to engineer the explosive handling operation at Bangor to prevent catastrophic accidents involving nuclear and missile fuel explosives in the event of a major earthquake +/or tsunami. An event like Japan's earthquake, tsunami, and environmental disaster is likely here. Removing Trident is the wise course of action.

"Japan -- Killer Quake" (PBS.org) is a documentary that shows how far inland and how uncontrollable Japan's 9.0 quake and tsunami were. If a submarine with nuclear weapons had been in those places, it would not have had a chance. We can proactively prevent devastating harm to our region — its people, animals and environment -- if we learn from Japan. The Fukushima melt-down is still not under control after ten weeks. We have a chance to do better.

Thank you for your consideration.

Sincerely,
Mary Hanson

[redacted]

[redacted] -2 Test Pile Program

[redacted] Handling Wharf (EHW-2)
[redacted] EIS)

[redacted] Draft EIS. If your comment refers to a specific page or section of [redacted] it your comments in any of the following ways:

[redacted] during the open house session or public hearing.

[redacted] orthwest
[redacted] S Project Manager

[redacted] project website at www.nbkeis.com/EHW

All written comments must be postmarked or received by May 2, 2011, to ensure they become part of the official record. All comments will be addressed in the Final EIS.

Name: Mary Hanson Date: 05-02-11

Organization/Affiliation (if applicable):

Address:* [redacted]

City, State, Zip Code:* [redacted]

Comments: I spoke at the April 21, 2011 hearing in Seattle. My main point is that the handling of nuclear bombs and missile fuel in a location as seismicly dangerous as this area could result in catastrophic damage to the region even greater than the current situation at Fukushima, Japan. Please amend my testimony with these documents:

① Scientific American, May 2011, page 22
"The Cascadian subduction zone is arguably the biggest seismic hazard in the U.S. ...(it) has a 10 to 15 percent chance of suffering a magnitude 8.0 or greater quake in the next 50 years." -- Sid Perkins

② Scenario for a Magnitude 6.7 Earthquake on the Seattle Fault, June 2005, Earthquake Engineering Research Institute and the Washington Military Department, Emergency Mgmt. Division. http://earthquake.usgs.gov Search for Seattle Fault Zone

Visit **www.nbkeis.com/EHW** for project information.

*Provide your mailing address to receive future notices about the TRIDENT Support Facilities Explosives Handling Wharf (EHW-2) EIS.

(over)

This report's maps (p-28) clearly show the Seattle Fault zone extending into the Kitsap County area south of the Bangor base. Chapter 1 (copied and included) is a good summary of the 3 kinds of earthquakes this region experiences. The entire report is 170 pages long.

"Before the late 1980's, the earthquake hazard assessment did not consider the threat of events on shallow crustal faults even though scientists had defined several faults; they also did not believe the huge offshore Cascadia Subduction Zone was active. The understanding of the region's earthquake threat began changing dramatically in 1987... By early summer of 2004, field evidence showed six major crustal fault systems caused surface faulting of several feet or more during the past 12,000 years. The recent discoveries clearly demonstrate that large magnitude crustal earthquakes pose a significant hazard in the Puget Sound Region."

(3) uses maps of the Seattle Fault Zone

(4) Video (DV) Cascadia: the hidden fire / Global Net productions, co-produced and directed by Michael Lienau and Lisa Knorr, 2004 Seattle Public library DVD 551.22097 C265 2004

(5) PBS video "On Shaky Ground: Earthquakes in the Pacific Northwest" http//video.KCTS9.org /video/1737194182

Thank you for considering this information in the EHW-2 Draft EIS. and other related activity regarding basing and handling nuclear weapons.

Sincerely,

Mary Hanson [redacted]

ADVANCES

GEOLOGY

Bracing for the Big One

A series of major earthquakes have struck below the Pacific Ocean in less than a year and a half. Could the West Coast be next?

Several devastating earthquakes have rumbled beneath the Pacific in the past 15 months. In February 2010 a magnitude 8.8 temblor slammed central Chile; last September a 7.0 quake walloped Christchurch, New Zealand, leading to a 6.3 aftershock in February. The magnitude 9.0 mega quake that flattened Japan in March is tied for fourth largest in the past 110 years.

These events have led many people to wonder if they are somehow linked. Most likely, scientists say, their near coincidence is merely a statistical fluke. That doesn't mean, however, that it is necessarily safe to come out from under the bed. The best gauge of quake risk is the geologic record. And new data on that record tell a disturbing story, especially in the northeastern Pacific.

Although most people may consider southern California to be the most earthquake-prone region in the nation, the Cascadia subduction zone is arguably the biggest seismic hazard in the U.S. It parallels the coast and poses a seismic threat to cities such as Vancouver, B.C., Seattle, and Portland, Ore. At that subduction zone, the tiny Juan de Fuca plate slides eastward underneath North America between 30 and 40 millimeters a year—but this interface has apparently been locked for centuries. "This subduction zone stands out as the big elephant in the corner," says Chris Goldfinger, a marine geologist at Oregon State University. "It sits quiet for hundreds of years and then goes off all at once."

New data suggest that the northern portion of the subduction zone, from the middle of Vancouver Island to the Washington-Oregon border, has a 10 to 15 percent chance of suffering a magnitude 8.0 or greater quake in the next 50 years. The southern portion, stretching from the Washington-Oregon border to California's Cape Mendocino, has a 37 percent chance of the same-size quake over that same interval. Goldfinger and his colleagues expect to publish the data in an upcoming USGS report. The next big one, he says, "is going to happen. It's just a matter of narrowing down the timeline."

—Sid Perkins

EXPLAINER

How do scientists measure the speed of tectonic plates?

The best way to measure how quickly two tectonic plates converge is to use the Global Positioning System. By repeatedly checking the distances between specific points on two different plates, researchers can assess long-term rates of convergence and measure sudden movements, such as Japan's 2.4-meter (eight-foot) leap eastward during the March 11 quake. Before the advent of GPS, scientists relied on rocks in the ocean floor, which, when they cooled, record the direction of the earth's magnetic field. Knowing when and how often the field has flipped in the past enables researchers to calculate the rate at which new ocean crust forms at mid-ocean ridges. Another technique is to sample and map rock formations on both sides of a tectonic interface—especially formations that have a distinctive composition or an unusual assemblage of fossils. —S.P.

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ATTN: Mr. Thomas Dildine - NEPA Project Manager
Commanding Officer
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

re: Navy Test Pile Program June 6, 2011

Thank you for your invitation to comment on the Navy "Test Pile Program for Second Explosives Handling Wharf."

First, when I attended a gathering in Seattle, April 21, to review the Environmental Impact of the 2nd Wharf, it was very clear that every one of the 25 people present from the public opposed the building of a second wharf. Has the issue of the need for a second wharf ever been a subject of any public hearing? Why do this Test Pile Program if the $715 million dollar wharf is scratched?

While the need issue was presented that evening, the purpose of the meeting focused on environment from a 968 page statement that few of the public the ability or time to wade through.

At that meeting, my question was and still is, what assessment of use of energy, gas, electricity, been done as part of both the 400 day plan for wharf, and proposed Test Pile Program? In an age of climate change and search for alternatives, every use of energy must be questioned.

The chief environmental provider at that meeting was a contract person. As you are well aware, the military contract services are undergoing sever public criticism due to cost overruns and sometimes apparent fraud. What standards are being used to weigh the objectivity and costs of outsourcing these reports? When 25% of the DOD expenditures are not accounted for by the military's own accountants, public crticism of DOD growing costs are in question.

The Marine Mammal Commission had number of critical statements regarding the Navy's earlier application before the National marine fisheries Service for the Test Pile Program. Have these been answered?

As you can read, my concerns about this issue have to do with cost and need.

Sincerely,

Tom Shea

Tom Shea, [redacted]

15

[redacted]

From: [redacted]
Sent: Tuesday, June 07, 2011 12:09 PM
To: thomas.dildine@navy.mil
Cc: [redacted]
Subject: Comments on test pile proposal
Attachments: ATT1700725.htm

My name is Mary Gleysteen. I moved to Kitsap County with my family in 1959. Growing up in Bremerton I swam, boated and fished in Hood Canal. I now live in Kingston and continue to enjoy the waters and beaches of the canal and am anxious to protect them and to see their health and viability restored and enhanced.

Over the years I have participated in EIS hearings and scoping meetings relating to waterfront development at the canal, and in particular those relating to construction at the Explosives Handling Wharf at the Trident Submarine Base at Bangor. I attended community meetings in Poulsbo and in Port Ludlow and commented in opposition to the plans for a Second Explosives Handling Wharf at Bangor. I felt so strongly about the issue that I wrote a guest editorial in the Kitsap Sun urging others to express their concerns as well.(see attached)

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I am therefore disturbed to hear that the Navy is now proposing the environmentally damaging Test Pile Program for the Wharf, prior to completion of the Environmental Impact Statement.

This seems a blatant attempt to circumvent the letter and intention of controlling environmental laws and policies and makes a mockery of the efforts of concerned citizens to take part in a process designed to ensure public participation.

Many of the same issues involving the hazards to the health of the water and marine life of Hood Canal posed by construction of a new wharf are also raised by the "test" pile driving program for that project. It is my understanding that there are already ongoing studies of the effects of noise due to pile driving on fish and marine mammals and these should be taken into consideration before approval of the Test Pile Program.

No decision has yet been made concerning the related and connected construction of a second explosives handling wharf at Bangor, and there are compelling reasons that it should not go ahead. In addition to environmental hazards, there are significant budget, policy and international treaty issues that militate against construction of a second wharf. It makes no sense to conduct testing in advance of a decision on the merits of the connected and underlying project, the proposed second Explosives Handling Wharf.

A recent Kitsap Sun article(5/31/11) indicates that replacement of piles on the existing explosives handling wharf will be completed by October 2012. Certainly there will be environmental impacts from this activity. Will the impacts of the test pile project be cumulative with pile replacement and the possible
construction of a second wharf?

It would make more sense to me to complete the EIS project on the proposed second wharf. If it is approved and the ongoing studies of the effects of drilling are inadequate, then the proposed test pile program would be appropriate.

If the second wharf is not approved, then repairs to the existing wharf could incorporate any necessary design elements from the second wharf, after any necessary and appropriate tests are made.

It seems as though the Navy is employing a shotgun approach to the wharf issue. In an era of budget crisis, we cannot afford the economic and environmental effects of multiple and duplicative projects in this environmentally sensitive area.

Thank you for this opportunity to comment and please keep me informed of your deliberations and decisions in this matter.

[redacted]

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[redacted]
June 8, 2011

Reference 1 Letter to P. Michael Payne, Permits dated 22 February 2011
Reference 2 - Federal Register Document Citation: 76 FR 4300 for EHW-2
RIN: 0648-XA07 Document Number: 2011-1528

Mr. Thomas Dildine - NEPA Project Manager
Commanding Officer
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

Dear Mr. Dildine,

This letter is nearly identical to my earlier letter to Michael Payne (Reference 1). I apologize if any comments have been answered in the documents in the intervening 4 months. I am not sure why this has taken years (I first commented on this a couple of years ago) and why the two projects are not being considered as one due to the important aspect of cumulative impact. In addition the public is not able to read one appendix which is supposed to justify both fixing up the present wharf and adding a new one. A project that will eventually require one billion dollars cannot be rubber stamped in these times of national deficit, nor justified with reduction in nuclear weapons via Staert II. I hope the Secretary of Defense, Robert Gates, who has been critical of some pentagon spending, has been informed about this project.

1. PROCESS

1a. Notice. **Has Washington's Fish and Wildlife Department or the US Fish and Wildlife responded to the Navy's requests?** Based on shoreline applications required for city projects here on Bainbridge Island, it would appear that a **Hydraulic Project Approval (HPA now called a JARPA) would be required**. It would also seem it is important to evaluate the effects on endangered salmon and other aquatic life in the area. This test pile program is proposed to occur between July 16, 2011 and October 31, 2011. During spawning season, adult Chinook salmon enter Hood Canal waters from August to October to begin spawning in their natal streams in September with peak spawning occurring in October. The taking of salmon was an important issue in the state of California when pilings were driven there and payment was made to their Fish and Wildlife Department. In addition, Hood Canal has been under stress the past few years for unknown reasons, and this proposal should definitely be coordinated with the State, not just the federal government.
1b. Alternatives. As required by NEPA, all reasonable alternatives must be considered. The stated reason for the proposal is: "The test pile program has been designed to collect adequate geotechnical and sound propagation data." The EA does state "The number of piles proposed in the Test Pile Program has been reduced to the minimum number required to gather accurate data to support the proposed EHW-2 project," but followed with no justification. Based on my experience as an acoustical engineer the sound levels could be estimated by installing much less than 18 pilings. Why was it all 18 or nothing? It will be interesting to see if the acoustic data varies among the 18 pile drivings; if this variability was expected, then a data spread analysis should have been presented. Also I am not a geologist, **but it would seem that simple bore drillings could establish the sediment/rock makeup of the 18 sites, saving cost and time of experimenting with each pile.**

Letter to Naval Facilities Engineering Command Northwest Page 1

1c. Financial Considerations. I know that EISs can include economic data so that cost-benefits can be weighed in the final decisions. As the U.S. Congress faces its own decisions on how to reduce the budget, including the DOD budget, this **financial information has to be presented to inform the public to show our leaders what the cost-benefit will be.**
1d. Cumulative Effects. As mentioned above, it is becoming more evident that we cannot consider the effects on the environment by analyzing each application one-by-one. **The effects from EHW1 Pile Replacement for 138 steel and concrete pilings must be evaluated simultaneously with this request for EHW2.**

2. INCONSISTENCES
I noted some lines in the report which seemed to imply different plans: "All piles will be removed at or before the completion of the test pile program because they could pose a potential navigation risk if left in place." and "The proposed action for this IHA request is to install and remove up to 29 test and reaction piles, conduct loading tests on select piles, and measure in-water sound propagation parameters (e.g., transmission loss) during pile installation and removal." versus a line "The Navy expects that some of the initial eighteen test piles will be removed and re-driven as part of lateral load and tension tests." I assume the latter line means that the re-driven pilings will be removed, but **it would help to clarify of the plan for the 29 pilings that no pilings will remain.**

3. ACOUSTIC CALCULATIONS
I worked for Honeywell Marine Systems located in Seattle and Poulsbo for 24 years. During that time I taught classes in underwater acoustics at Keyport, Washington and carried out many acoustic tests in the Puget Sound area as well in other areas of the world. After leaving Honeywell I have been involved in all aspects of acoustics, including planning meetings in acoustics where the subject of effects of noise on marine mammals and fish is analyzed by experts in the field. These matters have become of increasing interest over the past few years based on the effects on fish and marine mammals. This has only increased due to the recent surge in interest in locating wind farms in shallow water. The study of the effects of masking on finding prey and being prey has increased. Many tentative conclusions have been presented as to these effects, but probably the most prevalent is that there are presently no strongly held conclusions effects on effects to fish and marine mammals. The announcement references some reports but I note more recent work has been done, with one example being a Conference on Noise Effects on Fish in Ireland last year.

The Federal Register report (Reference 2) is very long and I feel requires clearer calculations augmented by graphs which would lead to a better understanding of their acoustic conclusions. What is the pulse rate? What is the spectrum of pulse transmissions? The frequency ranges are defined for many marine mammals in the report, but I could only find qualitative with regard to the sounds produced by the vibratory and hammering installation (e.g. "low frequency"). Considering only the total energy may be important for damage and TTS, but frequency content is important for masking as pointed out in the report. In addition other assumptions should be clearly stated. For instance the propagation loss refers to "practical spreading loss" for underwater transmission loss (Reference 1). This is not a common term, but suggested by Fish and Wildlife as a compromise between spherical and cylindrical spreading. Also it appears the modeler assumed no transmission via the bottom which often can offer a better path than water for low frequencies of interest, especially for piles driven into the bottom. Pile driving metal tubes into the ground will be an obvious source for ground wave propagation. Will there be anomalies due to surface reflections? Will there be a measurement problem for the close hydrophone in the near field at the very low frequencies?

The report noted that "Thorson and Reyff (2004) determined that a properly designed bubble curtain could provide a reduction of 5 to 20 dB." I did not find the report (or even a bibliography at the site). But one report I found (Chapter 4 from the *Final Data Report: Noise and Vibration Measurements Associated with the Pile Installation Demonstration Project for the San Francisco-Oakland Bay Bridge East Span*, May 21, 2001, prepared by Illingworth & Rodkin, Inc: http://www.dot.ca.gov/dist4/documents/appendix_d_8901.pdf) showed that the bubble screen only being effective at higher frequencies. This is due to the size and mass of the bubbles. The bubble screen in the above cited paper did not attenuate frequencies very much, and a graph showed around 0 to10 dB attenuation at the lower frequencies which were used in Table 1 of Reference 1. There seemed to be some sort of measurement problem encountered in the Illingworth and Rodkin report regarding the Gunderboom installation so benefits were not clear. This report is still interesting as it includes illustrations of pulses generated by the pile driving operations and their spectra.

But in the end it will be the measurements, if done properly, which will confirm the acoustic predictions. "The Navy will conduct acoustic monitoring for impact driving of steel piles in order to determine the actual distances to the 190-, 180-, and 160-dB (re 1 µPa rms) isopleths and to determine the relative effectiveness of the bubble curtain system at attenuating noise underwater." Will acoustical measurements be done for each of the 18 pile drivings? Will the effectiveness of the Gunderboom be measured? I didn't note it, but if it wasn't included, I suggest taking baseline ambient levels before the project even starts to understand not just the noise levels, but the rise in noise levels.

4. EFFECT ON FISH

A recent study (Effects of Pile Driving Noise on the Behavior of Marine Fish, Mueller-Blenkoe et al, March 2010) also has some interesting results. See

http://www.offshorewindfarms.co.uk/Assets/COWRIE%20FISH%2006-08_Technical%20report_Cefas_31-03-10.pdf

Although there were, as often found in these studies qualifiers, the authors stated: "There was a significant movement response to the pile-driving stimulus in both species at relatively low received sound pressure levels (sole: 144 – 156 dB re 1µPa Peak; cod: 140 – 161 dB re 1 µPa Peak, particle motion between 6.51x10-3 and 8.62x10-4 m/s2 peak)." They concluded. that: "First, the concerns raised about the potential effects of pile-driving noise on fish were well founded."

The Navy's conclusion needs professional review of their statement: "Given the short daily duration of noise associated with individual pile driving and removal, the short duration of the entire test pile program (forty work days), and the relatively small areas being affected, pile driving activities associated with the proposed action are not likely to have a permanent, adverse effect on any essential fish habitat, or populations of fish species. Therefore, pile driving and removal is not likely to have a permanent, adverse effect on marine mammal foraging habitat at the project area." A benthic and fish sampling baseline before and after should be carried out to confirm this assertion.

CONCLUSIONS

1. The cumulative effect of repairing the current dock with constructing a new dock should be included in making a decision. This is done here in our City, and I don't know why it should not be part of two large projects.

2. A number of assumptions are made for predicting acoustic propagation loss which should have been addressed. The acoustic measurements must be made public to verify the conclusions for takings based on the acoustic model and animal biological data were correct. Also the spectra of the noise should be modeled and measured.
3. The attenuation by bubbles is optimistic for the frequencies stated.
4. More work needs to be done to determine the effect of pile driving noise on fish and mammals. As the report states "To date, no studies have been conducted that examine impacts to marine mammals from pile driving sounds from which empirical noise thresholds have been established." Is this true? If so, it seems difficult to make a determination for takings.
5. Before the announcements in April, I have emailed the Navy twice last year since I could find nothing on the web pertaining to an EIS, and have not received any answers or notification of its status. Although the recent announcements have been broadcast, no information seemed to be available in the interim which would have allowed more time to study the situation.
6. The economic aspects of this project has to included in the EIS.
7. Finally I feel it is a conflict of interest for the Navy to carry out their NEPA review of its own product. An independent study team, with a knowledgeable background and a clearance to allow them to read the appendix, should be established to make recommendations for acceptance or denial of this project. Such a committee could be established througn the National Academy of Sciences.

Thank you for reading my concerns.

In closing I would like to note that these comments are strictly my own and do not represent those of any organization.

Charles Schmid

Charles Schmid, Ph.D.

17

Gabriel Lavalle
[redacted]

June 7, 2011

Commanding Officer
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

ATTN: Mr. Thomas Dildine - NEPA Project Manager
RE: Test Pile Program, Naval Base Kitsap-Bangor

Dear Mr. Dildine,

I am submitting comments on the Navy's Environmental Assessment (EA) for the proposed Test Pile Program in Hood Canal as announced in the legal notice in the Kitsap Sun on May 25, 2011.

I am a 4th generation Puget Sound native and have many cousins, siblings, nieces and nephews that call this place home. I work as a horticulturist and am very involved in doing all I can to protect Puget Sound's (aka The Salish Sea) wonderful ecosystem. I as so many other residents as of the area enjoy hiking, boating, beach combing, and bird watching, in the area as well as in the Strait of Juan de Fuca and Washington coastal areas. This area as you know is a huge draw for tourist's as well. I am also a Landscape Manager and Certified Arborist with the International Society of Arboriculture. My great-great grandfather served in the Civil War, and my father who retired as a G-13 from the Census Bureau, served during WWII for the army, and worked for the government in both Korea and Vietnam. So I do have much respect for those who serve in the military and for the United States Government. That being said, I must state my reasons for my complete disapproval of the Test Pile Program in Hood Canal.

First, there are many procedural issues that were not followed in properly alerting the public of this project. It is my opinion that it should have been included in the EIS along with the proposed Second Explosive's Handling Wharf as it is directly related to this project. I feel that I and my fellow citizens have been repeatedly left out of a process that is going to impact myself and future generations. The only reason I even found out about the notice that appeared only in the Kitsap Sun was because of the diligence of my friend Glen Milner.

Having just read Glen Milner's rough draft of the letter he will be sending you, I must say that I am astonished and disgusted by the actions of the U.S. Navy in regards to following procedures for the protocol required of them for the proposed EHW. It is my opinion that the Navy should be much more forthcoming in communicating with the surrounding community and that it should not be the responsibility of citizen's to uncover what it is you are doing over there.

From what I understand there is no need for the second Explosive's Handling Wharf. Thus there is no need to go forward with the Test Pile Project at this time. The Hood Canal ecosystem is already suffering and to further disrupt it with this project is deplorable. Glen Milner's point regarding the toxic spill that occurred in February 2000 seems reason enough alone to cease and desist with any plans to continue this inane project. It is hazardous to the environment, our community and a complete waste of tax payer's money.

I must reiterate that I fully back Glen Milner's statement regarding this project and am disgusted that he has to spend so much time bringing to light what you try to keep hidden from the good people of Washington State.

I hope you will consider my comments and think of the detrimental impact this Test Pile Project will have on our community.

Sincerely,

Gabriel Lavalle

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Glen Milner
[redacted]

June 7, 2011

Commanding Officer
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

ATTN: Mr. Thomas Dildine - NEPA Project Manager
RE: Test Pile Program, Naval Base Kitsap-Bangor

Dear Mr. Dildine

I am submitting comments on the Navy's Environmental Assessment (EA) for the proposed Test Pile Program in Hood Canal as announced in the legal notice in the Kitsap Sun on May 25, 2011.

I have lived in the Puget Sound area since 1951. I have been closely connected with the Puget Sound environment, enjoying fishing, clamming, and boating for years in the area as well as in the Strait of Juan de Fuca and Washington coastal areas. I am also a long-time researcher and writer about military and environmental issues in the Puget Sound region.

I have separated my statement into sections. Please consider each issue presented.

Comment period for the EA for the Test Pile Program

In the legal notice in the Kitsap Sun, the Navy stated, "A Finding of No Significant Impact (FONSI) addressing this action will be based on an EA dated June 2011, which will evaluate the potential environmental effects of constructing the Test Pile Program."

According to the legal notice, the Navy has already decided that there are no significant impacts associated with the Test Pile Program before announcing its request for comments. According to the legal notice, the Final EA will be released less than three weeks after a public comment period for the project. The project will begin on July 16, about five weeks after the close of the public comment period.

If the Navy is now "accepting written comments on the Test Pile Program Environmental Assessment," then the Navy has opened a public comment period pursuant to CEQ Regulations. Accordingly, the Navy must now follow CEQ Regulations for this comment period.

The Test Pile Program should have been reviewed under the same EIS as the proposed second Explosives Handling Wharf (EHW) because they are connected projects. At the very least, the public should have been given notification, a 45-day public comment period, and scoping process as an EIS.

As in the case of the Draft EIS for the proposed second EHW, the Navy announced the comment period after the period was scheduled to begin.[1] In the case of the Test Pile Program, the announcement for the scheduled comment period, from May 24 to June 8, was not published until May 25.[2] What would have been a 16-day period became a 14-day comment period because the announcement was published two days late.

On May 25, 2011, the Navy's legal notice also announced the availability of its 425-page environmental assessment, *PreFinal EA Version 2*, dated May 2011, on a Navy website.

The comment period for the Test Pile Program was never listed in the Federal Register as required for notice. Publishing a legal notice in one local newspaper does not satisfy notification for the Test Pile Program, especially when the Navy failed to notify citizens who had previously commented on the Draft EIS for the proposed second Explosives Handling Wharf in three different geographical areas.[3]

Purpose and Need

Section 1502.13, *Purpose and need,* 40 C.F.R. Part 1500, of the CEQ Regulations, states that the agency *"shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action."*

The Navy has failed to recognize historic changes, both in new military planning for a reduced nuclear arsenal and in new international treaties, since filing its proposal and Environmental Impact Statement for a second EHW at Bangor in May 2009. The Navy's Test Pile Program is a connected, cumulative, and similar action to the proposed second EHW at Bangor.

The Navy is preparing a Final EA for the Test Pile Program to support another project, the proposed second EHW that likely will not move forward. There is no legitimate need for either the Test Pile Program or the Navy's proposed second EHW at Naval Base Kitsap-Bangor. Both projects would cause significant disruption in environmentally-sensitive Hood Canal.

During the scoping process in 2009, many individuals, including retired Navy officers, questioned the necessity of the second wharf due to a reduced number of submarines based at Bangor than initially planned.

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[1] The public comment period for the Draft EIS for the proposed second EHW was announced in the Federal Register on March 21, 2011, three days after the comment period was scheduled to begin.

[2] An article was published in the Kitsap Sun on May 20, 2011, and another article on May 30, 2011, which stated public comments were being accepted for the Test Pile Program. The May 20 article did not announce how to obtain the EA. The May 30 article provided only an address on the submarine base for obtaining the EA, although no explanation was given on how someone could obtain a copy, read it, and submit a comment by the June 2 deadline mentioned in the article for public comments.

[3] Scoping meetings for the proposed second EHW had been held in April 2011 in Poulsbo, Chimacum, and Seattle. The Kitsap Sun print edition is not available in Seattle.

2

In the Draft EIS, the Navy stated, *"...the original TRIDENT Facilities EIS identified the need for three EHWs..."* However, the Navy failed to state that this original EIS also addressed the possibility of 20 Trident submarines at the base instead of the eight submarines at Bangor at this time. The 1974 Draft EIS for the base stated, *"The Preliminary Master Plans, waterfront alternatives, engineering studies, and the technical studies all address the possible expansion of the Support Site to support a twenty-ship fleet."*[4]

The Navy's own records show that Bangor was never intended to have two wharves until 10 ballistic missile submarines are based in Puget Sound.

A Navy document dated June 8, 1993, titled, *Explosives Safety Siting, Bangor, Washington*, released through the Freedom of Information Act, stated that a second wharf at Bangor was *"deferred pending reaching full squadron support,"* at 10 submarines. There are only eight submarines stationed at Bangor and 14 Trident ballistic missile submarines in the entire U.S. fleet.[5]

Since May 2009, a number of assessments and treaties have mandated a reduction in nuclear weapons and delivery systems, such as the Department of Defense 2010 Quadrennial Defense Review; the 2010 Nuclear Posture Review; the Nuclear Nonproliferation (NPT) Treaty Review Conference in May 2010; and the passage on the New START Treaty in December 2010. The 2010 Nuclear Posture Review stated the Trident submarine force could be reduced from 14 to 12 Trident submarines by the end of the decade.[6] The passage of the New START Treaty in December 2010 created a binding treaty obligation with Russia to substantially reduce nuclear arsenals and delivery systems.

The Navy announced in September 2010 that it would likely render as unusable up to 4 of the 24 launch tubes on each of the 14 Trident submarines in the force, accordingly reducing the number of missiles per Trident submarine to comply with the New START Treaty.[7] This type of reduction was presented in a recent CRS report, *"The New START Treaty: Central Limits and Key Provision,"* dated February 7, 2011, which listed "potential New START forces" with 20 missiles instead of the present 24 missiles per Trident submarine.[8]

On May 4, 2011, James Miller, Principal Deputy Undersecretary of Defense for Policy, testified before Congress about changes in weapons programs and the New START Treaty. Miller said that the current fleet of 14 Ohio-class ballistic missile submarines will carry "no more than 240 Trident II D5 at any time."[9] With 12 submarines deployed at a time, this would allow for "no more" than an average of 20 missiles instead of the present 24 missiles per Trident submarine.

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[4] *Proposed Action*, March 1974 *Trident Support Site* Draft EIS, page 6. The Navy is currently planning to reduce the number of SSBN submarines at Bangor from eight to seven (not twenty) submarines.
[5] One of the eight submarines at Bangor is in overhaul at any given time. See http://www.navy.mil/navydata/fact_display.asp?cid=4100&tid=200&ct=4 and http://gsn.nti.org/gsn/nw_20100930_1061.php.
[6] See http://gsn.nti.org/gsn/nw_20100810_2253.php.
[7] See http://gsn.nti.org/gsn/nw_20100930_1061.php.
[8] CRS Report, *"The New START Treaty: Central Limits and Key Provision"* by Amy F. Woolf, dated February 7, 2011, see Table 2. *U.S. Strategic Nuclear Forces under New START* on page 20.
[9] Air Force Times, May 9, 2011, *Non-nuclear use seen for B-52H bombers.*

3

The Navy announced in December 2010 that the replacement submarine for the Trident would likely consist of a fleet of 12 (two fewer than at present) with each new submarine carrying only 16 missiles instead of the present 24 missiles per Trident submarine.[10]

A March 10, 2011 CRS Report suggested a smaller number of submarines is being considered for the replacement for the present Trident submarine. The CRS Report stated:[11]

> *Some observers over the years have advocated or presented options for an SSBN force of fewer than 12 SSBNs. The Congressional Budget Office (CBO), for example, has at times in the past presented options for reducing the SSBN force to 10 boats as a cost-reduction measure. A June 2010 report by a group known as the Sustainable Defense Task Force recommends reducing the SSBN force to seven boats; a September 2010 report from the Cato Institute recommends reducing the SSBN force to six boats.*

The New START Treaty was never mentioned in the Navy's 945-page Draft EIS.

In a recent article, naval expert Norman Polmar stated his belief that the Navy needs less than half the Trident missiles than it presently deploys. Polmar stated, *"There's no rationale at this stage for more missiles than 144"* across the fleet, compared to the 288 Trident missiles currently deployed by the Navy.[12] This type of practical reduction in SLBM missiles would eliminate the need for the second EHW.

The present wharf has handled the larger Trident D-5 missiles since 2002 and has gone through numerous maintenance projects over the years.[13] The next maintenance and repair project for the existing wharf is described on the Federal Register at http://edocket.access.gpo.gov/2011/pdf/2011-2530.pdf. With a second EHW, the Navy would have an additional wharf in Hood Canal that would require frequent repairs and ongoing maintenance. There is no need, however, for a second wharf.

Purpose and Need, explosives handling restrictions

The existing EHW at Bangor and the proposed second EHW at Bangor are too close to conduct simultaneous missile handling operations between the two wharves. This greatly reduces the usefulness of a second EHW and was not mentioned in the Draft EIS.

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[10] See http://www.globalsecuritynewswire.org/gsn/nw_20101221_5014.php.

[11] CRS Report, dated March 10, 2011, *Navy SSBN(X) Ballistic Missile Submarine Program: Background and Issues for Congress.*

[12] 288 missiles are on 12 submarines, with two submarines in refit. If the Navy followed Norman Polmar's advice, and the submarine force was equally divided between the East and West coast Trident bases, there would only be 72 missiles at Bangor. If the number of missiles was reduced by four for each submarine presently stationed at Bangor, as suggested by the Navy, there would still be only 140 missiles deployed at Bangor at one time. See http://gsn.nti.org/gsn/nw_20110204_4436.php.

[13] December 20, 2005 FOIA response from Naval Facilities Engineering Service Center to Glen Milner: July 2003 *Underwater Facilities Inspections and Assessments at Explosives Handling Wharf Submarine Base Bangor, Washington, Report CR-6285-OCN*, Blaylock Engineering Group, stated, *"Repairs to damaged piles at Bents 24 and 25 have been completed..."* Repairs to Bent 16 were extensive and successfully completed.

Explosives siting records for the Bangor submarine base indicate that when submarines are berthed within a "cluster" on the waterfront area, missile handling operations are allowed for only one submarine at a time. The hatches of adjacent submarines must be closed.[14]

Mark Roberts, of Strategic Systems Programs, confirmed that loading operations could not take place at both EHWs at the same time at the April 21, 2011 Draft EIS scoping meeting in Poulsbo, Washington. Mr. Roberts stated that a second wharf would still be useful to allow the docking and preparation for handling missiles at one EHW while missile handling was being conducted at the other EHW. However, Department of Defense Explosives Safety Board regulations also prohibit personnel within certain distances of explosives handling if their activity is not directly or indirectly supporting that particular explosives operation.[15] Work on one submarine could not be considered related to missile handling operations on another submarine.

No need for second EHW: then no need for the Test Pile Program

The Navy does not need a second Explosives Handling Wharf at Bangor for future operations.

The present wharf has handled the larger Trident D-5 missiles since 2002 and has gone through numerous maintenance projects over the years.

In addition, the U.S. defense budget is being scrutinized for any wasteful spending. If the Navy does not have to show a need for the project in an environmental review, it may still have to convince the U.S. Congress. The latest published estimate for the project is $780 million.

The evidence is overwhelming that the Navy does not need a second EHW at Bangor. If the Navy needed the wharf in May 2009, it does not now, with recent Department of Defense assessments and the passage of the New START Treaty.

Test Pile Program and the second EHW are connected projects and should be under the same review

Section 1508.25, *Scope*, 40 C.F.R. Part 1500, of the Council on Environmental Quality Regulations, addresses the range of actions, alternatives, and impacts to be considered in an environmental impact statement.

In addition, when analyzing the proposal and alternatives, agencies must consider actions that are interdependent or result as a direct or indirect consequence — that is, connected, similar, and cumulative actions. These actions should be incorporated into the description of the proposal and alternatives if relevant.

[14] This appears in numerous Navy records such as SSP OD 61119.
[15] Explosives handling at Bangor is addressed in detail in SSP OD 61119, *Explosives Safety Siting, Bangor, Washington*, dated July 2, 1993. On page 3-16, restrictions on the waterfront are discussed: "Upon arrival of SSBNs carrying D-5 missiles, refit operations at the Marginal Wharf must be terminated." Likewise, nonessential work at an adjacent EHW during explosives operations at the adjacent EHW should also be terminated.

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Connected actions are closely related and therefore should be discussed in the same impact statement. Actions are connected if they: (1) Automatically trigger other actions which may require environmental impact statements; (2) Cannot or will not proceed unless other actions are taken previously or simultaneously; or (3) Are interdependent parts of a larger action and depend on the larger action for their justification.

Similar actions, which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography. An agency should analyze actions together when the best way to assess adequately the combined impacts of similar actions is to treat them in a single impact statement.

Cumulative actions, which when viewed with other proposed actions, have cumulatively significant impacts and should therefore be discussed in the same impact statement.

The Navy's Test Pile Program is a connected action and should be included in the Draft EIS for the proposed second Explosives Handling Wharf.

The Navy identified Alternative 1 as the preferred plan for the second EHW in the March 2011 Draft EIS.[16] However, piles for the Test Pile Program, intended to support the design for the future construction of the EHW, appear to be in areas that are not necessary for Alternative 1.

The January 25, 2011 notice in the Federal Register, regarding the proposed Test Pile Program, contained the following statements:

> *The Navy proposes a test pile program* ***to support the design of the future construction of EHW-2.***[17]
>
> *The test pile program will involve driving eighteen steel pipe piles,* ***at pre-determined locations within the proposed footprint of EHW-2.***[18]

However, the diagram in the *Essential Fish Habitat Assessment for the Test Pile Program,* dated July 2010, shows locations for some of the 18 piles outside the structure of the proposed second EHW shown in Alternative 1.[19] It appears one pile is outside the area for the second EHW and seven piles are between structural parts of the second EHW. If the Test Pile Program and the second EHW had been reviewed together, as required by CEQ Regulations, the Navy might have better coordinated these two connected projects. Some piles might be eliminated.

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[16] *Trident Support Facilities Explosives Handling Wharf (EHW-2)*, Draft EIS, March 2011, Chapter 2, page 10.
[17] Federal Register: January 25, 2011, Volume 76, Number 16, pages 4300-4322. See http://edocket.access.gpo.gov/2011/2011-1528.htm, page 4301.
[18] Ibid, page 4301.
[19] See http://www.nmfs.noaa.gov/pr/permits/incidental.htm. Which came first, the location of the piles for the Test Pile Program or the location of the piles for the proposed EHW? Page 5 of the *Essential Fish Habitat Assessment* gives coordinate locations for the piles but I could not find similar coordinates in the Draft EIS for the EHW. It also appears different coordinates are given in the *Test Pile Program, Naval Base Kitsap Bangor Waterfront, PreFinal Environmental Assessment* in Figure 2-2. For a comparison of the two projects, I copied Figure 2-2 of the PreFinal EA at 113 percent on a transparency film and laid it over the diagram on page 2-11 of the Draft EIS.

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In addition, according to the *Test Pile Program, Naval Base Kitsap Bangor Waterfront, PreFinal Environmental Assessment*:

> *All test piles will be removed with a vibratory hammer as part of the project and reused as part of the EHW-2 project if structurally intact...*[20]

The Navy never explained why some of the 18 piles could not be left in place. The Navy mentioned conducting load tests on the piles but never explained whether testing would prevent leaving the piles in place for use for the second EHW. A less aggressive form of testing might render the piles usable after testing, eliminating the need for removing these piles and installing them a second time.

There may be other ways that combining the two projects could lessen the environmental impact in Hood Canal. However, unless the connected projects are reviewed together, it is difficult to discuss other ways to mitigate impacts. The Navy plans to begin the Test Pile Program after July 16, 2011.[21]

Test Pile Program and the second Explosives Handling Wharf at Bangor

The Test Pile Program at Naval Base Kitsap-Bangor is a connected and similar action to the proposed second EHW at Bangor. The Test Pile Program should be considered with the larger second EHW currently under NEPA review. The Navy filed its intent to conduct an Environmental Impact Statement for the proposed second EHW in May 2009.

The January 25, 2011 announcement in the Federal Register, at http://edocket.access.gpo.gov/2011/2011-1528.htm, shows how the Test Pile Program and the proposed second EHW are connected and related.[22]

The projects are connected because, as the Navy openly states, the Test Pile Program is for the proposed second EHW at Bangor. Section 1508.25(a)(1)(iii) states that actions are connected if they *"are interdependent parts of a larger action and depend on the larger action for their justification."*

The projects are similar because they are in the same location. The Navy stated that it "*proposes to install the test piles in the location planned **for the future EHW-2**.*" Section 1508.25(a)(3) states that projects are similar if "*when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography. An agency may wish to analyze these actions in the same impact statement. It should do so when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement.*"

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[20] *Test Pile Program, Naval Base Kitsap Bangor Waterfront, PreFinal Environmental Assessment*, Chapter 2, page 6.
[21] Ibid, cover page.
[22] Federal Register: January 25, 2011, Volume 76, Number 16, pages 4300-4322.

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The projects are cumulative because they have cumulative significant impacts and should be considered together. Section 1508.25(a)(2) states that projects are cumulative if *"when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement."*

The January 25, 2011 notice in the Federal Register contained the following statements:

> *The Navy proposes to install up to 29 test and reaction piles at NBKB to gather geotechnical and noise data to validate the design concept* ***for the building of a new Explosive Handling Wharf (EHW-2)****, as well as for future projects at the NBKB waterfront.*[23]
>
> *The test pile program will involve driving eighteen steel pipe piles,* ***at pre-determined locations within the proposed footprint of EHW-2.***[24]
>
> *The Navy proposes a test pile program to support the design of the future construction of EHW-2.*[25]
>
> *Geotechnical and sound propagation data collected during pile installation and removal will be integrated into the design, construction, and environmental planning* ***for the Navy's proposed EHW-2****. Future construction projects at the NBKB waterfront may also benefit from the geotechnical data gathered for use in their environmental planning documentation. The Navy proposes to install the test piles in the location* ***planned for the future EHW-2****, which will be adjacent to the existing Explosive Handling Wharf (EHW-1) at NBKB.*[26]

The PreFinal Version 2 EA also shows the connection between the Test Pile Program and the proposed second EHW. The EA stated:

> *The need for the proposed action is to obtain the most accurate geotechnical information* ***to validate the design for the proposed second Explosive Handling Wharf (EHW-2)*** *and to obtain sound propagation data to identify possible effects on the species and habitat within the project area.*[27]

The Navy's claim in the PreFinal Version 2 EA that this may benefit "other future construction projects at the Bangor waterfront at NBK"[28] is not valid. If the Test Pile Program would somehow benefit some other future project then it should also be true that the Pile Replacement Program, also scheduled this summer at the existing EHW, should be useful for future projects. Testing and measurements taken during the installation of replacement pilings at the existing

[23] Ibid, page 4301.
[24] Ibid, page 4301.
[25] Ibid, page 4301.
[26] Ibid, pages 4301 and 4302.
[27] *PreFinal Version 2 Environmental Assessment, Test Pile Program*, dated May 2011, page i.
[28] Ibid, abstract (front page).

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wharf should make the Test Pile Program unnecessary and a duplication of efforts. Please see the notice for the Pile Replacement Program for the existing EHW at http://edocket.access.gpo.gov/2011/pdf/2011-2530.pdf.[29]

The Draft EIS for the proposed second EHW also shows how that project and the Test Pile Program are connected, similar, and cumulative actions.

On page 185, Section 3.4.2.7, *Mitigation Measures and Regulatory Compliance*, of the Draft EIS for the proposed second EHW, the Navy mentions the "test pile program for the project." The Navy, in the Draft EIS, stated:

> *For the first 30 days of pile driving, the Navy would conduct underwater acoustic monitoring for impact driving of steel piles to confirm that noise levels are comparable to those measured during the* ***test pile program for the project.***

On page 678, Section 6.2, *Literature Cited*, of the Draft EIS for the proposed second EHW, the Navy listed the Test Pile Program as a supporting record for the wharf. The Navy, in the Draft EIS, referenced:

> *Navy. 2010a.* ***Test Pile Program*** *NBK Bangor Waterfront, Draft Essential Fish Habitat Assessment. Prepared by NAVFAC Naval Base Kitsap Bangor, Silverdale, Kitsap County, Washington. July.*

On page 805, Section 4.2.1.1, *Acoustic Measurements*, of the Draft EIS for the proposed second EHW, the Navy stated it is monitoring impact driving of the piles to confirm noise levels are comparable to those measured during the Test Pile Program. The Navy, in the Draft EIS, stated:

> *For the first 30 days of pile driving, the Navy will conduct underwater acoustic monitoring for impact driving of steel piles to confirm that noise levels are comparable to those measured during the* ***Test Pile Program.*** *All measurements will be made with the noise attenuation measures discussed above in place. As with the* ***Test Pile Program,*** *these noise measurements will determine the actual distances to the following isopleths: 190 dB re 1μPa RMS, 180 dB re 1μPa RMS, 180 dB PEAK re 1μPa, 160 dB re 1μPa RMS, and 150 dB re 1μPa RMS; and to determine the relative effectiveness of the bubble curtain or other noise attenuating device at attenuating underwater noise.*

It is also important to note that the Navy is the lead agency for both the Test Pile Program and the proposed second Explosives Handling Wharf at Bangor.

In addition, the Navy had planned for the Test Pile Program at least since June 2010, and possibly since the announcement for the EIS for the proposed second Explosives Handling Wharf in May 2009. The Navy stated in its PreFinal Environmental Assessment that it had a government-to-government meeting with the Chairman of the Suquamish Tribe on June 18, 2010.[30] The Navy should have included this project with the EIS for the proposed second

[29] Federal Register: February 4, 2011, Volume 76, No. 24, pages 6406-6430.
[30] *PreFinal Environmental Assessment, Test Pile Program*, February 2011, page iv.

Explosives Handling Wharf.[31] The Navy should have posted the announcement on its website for the proposed second Explosives Handling Wharf.

EIS for proposed second Explosives Handling Wharf

On May 15, 2009, the Navy announced its intent to conduct an Environmental Impact Statement for the proposed second wharf at Bangor.[32] The Navy announced "*its intent to prepare an Environmental Impact Statement (EIS)* ***to evaluate the potential environmental impacts associated with the construction and operation of a proposed new Explosives Handling Wharf*** *(EHW) located adjacent to, but separate from, the existing EHW on Hood Canal, NBK-Bangor, WA, to support TRIDENT submarines.*"[33]

Three options are being considered for the proposed second Explosives Handling Wharf at Bangor. One of the three options is No Action.[34]

The announcement also stated:

> *No decision will be made to implement any alternative until the EIS process is complete, with the release of the Record of Decision. Phased construction of the project would be completed in four years.*
>
> *The impacts to be evaluated include, but will not be limited to, impacts on fish and marine mammals, essential fish habitat, effects on endangered and threatened species, impacts relating to underwater sound and underwater habitat, impacts to the migratory and transient movement of fish along the shore, impacts on cultural resources, reduction in water quality, impacts on wetlands, terrestrial impacts, effects on Tribal resources, and human health and public safety.*
>
> ***The analysis will include an evaluation of direct, indirect, short term, and long term impacts from the construction and operation of the new EHW and will account for cumulative impacts from other Navy and non-Navy activities in the project area.***[35]

The Test Pile Program has impacts related to the construction of the proposed second Explosives Handling Wharf and should have been included in the Environmental Impact Statement.

Public Participation: Proposed second Explosives Handling Wharf and the Test Pile Program

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[31] The Draft EIS for the proposed second Explosives Handling Wharf was originally scheduled for November 2010. The initial announcement for the EIS for the proposed second Explosives Handling Wharf was published in June 2008.
[32] Federal Register: May 15, 2009, Volume 74, No. 93, pages 22900-22901.
[33] Ibid, page 22900.
[34] Ibid, page 22901.
[35] Ibid.

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In 2009, I received scoping meeting comments for the proposed second Explosives Handling Wharf (EHW) from the Navy with a Freedom of Information Act response dated October 30, 2009.[36]

Over 130 individuals and organizations commented on the proposed second Explosives Handling Wharf during the scoping period.[37] Approximately 12 comments were generally in favor to strongly in favor of the proposed Explosives Handling Wharf. Approximately 121 comments were generally opposed to strongly opposed to the proposed Explosives Handling Wharf. Approximately three comments were generally neutral, asking questions and making comments.

Of the scoping comments for the proposed second Explosives Handling Wharf, there was approximately a ten to one ratio against the proposed project. I believe that none of the individuals or organizations who commented on the proposed Explosives Handling Wharf were contacted about the related Test Pile Program.

In addition, there were problems with the scoping process for the proposed second Explosives Handling Wharf. Three locations were chosen: Poulsbo, Port Ludlow, and Seattle. The location of the Seattle scoping meeting was changed on the day of the event. The Navy attempted to intercept individuals at the announced location of the Seattle event and direct them to the new location. However, it seems likely that some people missed the meeting because of the change. Fred Felleman, commenting for Friends of the Earth, stated, "... *it was unfortunate that the venue for the hearing had to be changed at the last minute. I am certain that the change reduced the public turn out.*"[38]

I had requested an extension for comments for this scoping comment period, but was denied by the Navy. It is very difficult to engage lawmakers and other members of the community in the time allowed for comments.[39]

The Draft EIS for the proposed second Explosives Handling Wharf was scheduled to be published in November 2010. This was postponed until February 2011. The Draft EIS was finally announced in the Federal Register on March 21, 2011.

The Navy claims it seeks public involvement in the Test Pile Program while ignoring the comments of over 100 individuals opposed to the proposed second Explosives Handling Wharf at Bangor and proceeding with "*a test pile program to support the design of the future construction of EHW-2.*"

Comments submitted for the EIS for the proposed second Explosives Handling Wharf should be considered in the EA for the Test Pile Program because the comments are for connected actions.

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[36] FOIA request dated September 1, 2009, Glen Milner to Strategic Systems Programs, U.S. Navy.
[37] The Navy's Scoping Comment Summary Report, published on the website for the proposed second wharf, at https://www.nbkeis.com/ehw, stated there were "*156 comments from individuals and groups.*" Note that this is about 20 more comments than I received but it may have considered verbal statements and comments from governmental agencies.
[38] Scoping comment, Friends of the Earth, Fred Felleman, dated July 14, 2009.
[39] Comment period for the proposed Explosives Handling Wharf was from May 15, 2009 through July 17, 2009, longer than is required by the NEPA.

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Test Pile Program and EHW-1 Pile Replacement Project have cumulative impacts

The EA for the Test Pile Program stated:

> *The Test Pile Program and the EHW-1 Pile Replacement Project could be occurring during the same timeframe. The Test Pile Program, EHW-1 Pile Replacement Project and the proposed TRIDENT Support Facilities Explosives Handling Wharf project would employ the use of pile driving.*[40]

The Navy must analyze the cumulative impacts of the two projects. They are occurring during the same time period.

The EA also stated that the EHW-1 Pile Replacement Project is being analyzed in the EIS for the second EHW. The cumulative impacts of the various colocated projects need to be studied in the EA due to the fact that the Test Pile Program and the Pile Replacement Project precede the EIS for the second EHW. The EA for the Test Pile Program stated:

> *Projects such as the EHW-1 Pile Replacement Project and the TRIDENT Support Facilities Explosives Handling Wharf, the potential impacts of which are currently being analyzed in an Environmental Impact Statement (EIS), are geographically colocated.*

5,000 pounds of toxic waste near area of the Test Pile Program

On February 10, 2000, an accident occurred near the area of the proposed Test Pile Program in which a contractor for the Navy dropped approximately 6,000 pounds of toxic material at the southwest corner of the existing EHW. The toxic material fell approximately 70 feet before landing in Hood Canal. A final report on February 23, 2000 stated that only about 905 pounds of the material were recovered.

Approximately 5,000 pounds of toxic waste dispersed into areas adjacent to the existing EHW in Hood Canal and into areas affected by construction of the second EHW. It is likely that this material is still in the area.

The Navy should describe the locations of this toxic material and either completely remove the material or show how the construction of the second EHW will not cause further contamination of Hood Canal.

I received information regarding this accident from a Freedom of Information Act request that I filed with the Navy on February 15, 2001.[41] I received records with a FOIA response dated March 20, 2001 from Naval Submarine Base, Bangor.

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[40] *PreFinal Environmental Assessment, Test Pile Program*, February 2011, page vi.

[41] The Navy's Engineering Field Activity Northwest initially told me in March 2001 it would cost $1,000 to process this FOIA request and that they would begin processing it after receiving a check for $500.

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I also submitted a Freedom of Information Act request dated February 27, 2001 to the U.S. EPA, Region 10 in Seattle regarding this accident. The response, dated April 4, 2001, shows that the accident was reported by telephone on February 10, 2000. The notice from the Navy was noted by CIV PENDLETON of the EPA and stated that only one ton, instead of three tons, of Grip Blast fell into the water.[42]

I submitted a FOIA request, dated February 24, 2001, to the National Oceanic and Atmospheric Administration about the accident. NOAA, according to a March 15, 2001 FOIA response, could find no responsive records for the accident at Bangor in February 2000.[43]

In response to another Public Records Act request, the Northwest Regional Office of the Department of Ecology stated that 1,000 pounds, instead of the actual 6,000 pounds of toxic material, had been reported as dropped into Hood Canal.[44]

The Navy has been less than honest about the accident at the EHW in 2000. It is likely the toxic material is still in Hood Canal in the vicinity of the proposed second EHW.

The EA for the proposed Test Pile Program should address toxic waste that the Navy has dropped into Hood Canal.

Please see the attached summary of communication regarding the accident in Hood Canal. It would be difficult for the Navy to contest the fact that 5,000 pounds of toxic waste remain in Hood Canal.

Deadline for the Test Pile Program—30-day review period for FNSI "before any action is taken"

The Navy must publish its Finding of No Significant Impact (FNSI) by June 16, 2011 in order to begin the project on July 16, 2011. In this case, a 30-day review period is required for the FNSI before the project may begin.

The Navy's own stipulated time period for the Test Pile Program is between July 16, 2011 and October 31, 2011.[45] The Navy stated, "Implementation would occur over 40 work days between July 16 and October 14, 2011 for impact pile driving and until October 31, 2011 for vibratory pile driving and other in-water work."

If the Test Pile Program begins at a later date, the Navy must at least explain how the project will be completed in a shorter than planned timeframe.

Section 640.4(e), Responsibilities and procedures for preparation of an environmental impact statement, of 45 C.F.R. Part 640, states:

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[42] April 4, 2001 response from Chris Field, Unit Manager, Emergency Response Unit, EPA.
[43] March 15, 2001 response from Margaret Davidson, Acting Assistant Administrator, NOAA.
[44] Incident ID: N509212, February 27, 2001.
[45] *PreFinal Environmental Assessment, Test Pile Program*, February 2011, page i.

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> *If, on the basis of an environmental assessment, it is determined that an EIS is not required, a Finding of No Significant Impact (FNSI) as described in 40 CFR 1508.13 will be prepared. The FNSI shall include the environmental assessment or a summary of it and be available to the public from the Committee. If the proposed action is one that normally requires an EIS, is closely similar to an action normally requiring an EIS, or is without precedent, the* ***FNSI shall be made available for a 30 day public review period before any action is taken.***

Time is available for a sufficient EA

The Navy has never stated when a second EHW needs to be operational in order to meet the needs of the Life Extension Program. If the project proceeds as planned, the second EHW will be operational in 2015.[46] However, according to Mr. Benedict, Director of Strategic Systems Programs, the refurbishment of the Trident missile and warheads will *"reach Initial Operation Capability in the SLBM Fleet in 2018."*[47] This means that initial operational capability, likely for one submarine, would be deployed with the rebuilt D-5 missiles in 2018. This is several years after the present planned completion of the second EHW.

The Test Pile Program can wait at least another year to allow the Navy time for an adequate notice and consideration of all environmental issues concerning this project.

Please contact me if you have any questions about the statements I have presented. Thank you for your consideration of these issues.

Sincerely

Glen Milner

encl: Kitsap Sun, April 15, 2011, *"Public needs to know about Navy operations."*
Kitsap Sun, April 20, 2011, *"Speakers say second explosives handling wharf at Bangor isn't needed."*
Accident at Explosives Handling Wharf, Naval Base Kitsap-Bangor, summary of FOIA responses received by Glen Milner.

[46] FOIA response dated April 21, 2011 from K.R. Brenton, Strategic Systems Programs, to Glen Milner, *"Status Update to Mr. Andy DeMott"*, dated August 11, 2009.

[47] April 5, 2011, House Armed Services Subcommittee on Strategic Forces Hearing; *Department of Energy Atomic Energy Defense Activities and Department of Defense Nuclear Programs Budget Request*; Testimony by Terry Benedict, USN, Director, Strategic Systems Programs, U.S. Navy, Congressional Documents and Publications. See http://www.militaryaerospace.com/index/display/wire-news-display/1393815873.html.

[redacted]

MY TURN | Public needs to know about Navy operations

Staff Reports

Friday, April 15, 2011

Public needs to know about Navy operations

What value is an open government if information is denied when the public needs it the most? Or when information becomes secret that is embarrassing to an agency or may bring an unfavorable public response to a governmental action?

The Navy is currently conducting an environmental review for a massive new wharf in Hood Canal, to be used to load Trident nuclear missiles onto submarines. The current estimate for the proposed four-year project is $782 million. The Navy acknowledges that it has loaded Trident submarines at the Bangor submarine base for nearly 30 years with just one wharf. Now, with already reduced numbers of ballistic missile submarines, and much greater reductions in missiles and nuclear warheads in the near future, the Navy wants a second wharf.

The Navy claims it needs the wharf for the so-called Life Extension Program for the Trident D-5 missile. The Navy has stated that in the future, it will need twice the number of "operational days" to handle its 130,000-pound missiles as it does now.

In its environmental assessment, the Navy stated the 1,250 to 1,500 pilings for the wharf and overwater structure will cause "insignificant" cumulative impacts to Hood Canal. The Navy notes that some endangered species such as the Puget Sound orca, are occasionally seen in Hood Canal. The Navy adds that they have not dropped a missile, causing a catastrophic accident in Hood Canal in the past 30 years.

According to the Navy, that is all the public needs to know. They want the wharf and the rest is just a formality.

For the past two years, the Navy has denied my Freedom of Information Act requests for records explaining the need for the wharf, such as the Navy's Business Case Analysis and related records. Making records unavailable for public discussion, the Navy claims to have lost some records after gathering them for processing, and has withheld official determinations by the Navy's General Counsel.

I feel the Navy does not want the public to know that its proposed $782 million wharf is unnecessary while crucial social services in education, health care, and transportation are being cut for lack of funds.

The Navy also apparently does not want the public to know about the explosives hazards involving missiles at the wharf. One Trident SSBN submarine contains enough rocket propellant to equal 3.7 million pounds of TNT. The 24 missiles on a submarine now each carry about four nuclear warheads. Although the risk of a catastrophic accident is small at the base, the risk of an accident increases the more often the missiles are handled.

The Draft Environmental Impact Statement is located at https://www.nbkeis.com/ehw. Some appendices to the Draft EIS, which would normally provide meaningful information, are completely withheld, such as Appendix A, Purpose and Need; Appendix B, Alternatives Considered; and Appendix C, Explosives Safety Arcs "

I first learned to file FOIA requests in 1986 when I discovered that a derailed train near Shelton contained large amounts of high explosives, despite denials from Navy officials. I have learned that FOIA suits against the Navy are difficult and time-consuming. The case recently decided 8-1 in my favor by the United States Supreme Court, Milner v. Navy, has taken over seven years. Although the Navy lost, I still do not have the records.

The Navy should tell citizens in the Puget Sound region the truth about its operations instead of hiding behind a veil of secrecy.

The Navy is conducting a public comment session for the proposed wharf at Bangor on April 19 in Poulsbo, April 20 in Chimacum and April 21 in Seattle. Each session is from 6 to 9 p.m. Come and bring some questions and see for yourself.

Glen Milner lives in Seattle and is a member of Ground Zero Center for Nonviolent Action in Poulsbo, Washington; www.gzcenter.org.

[redacted]

Speakers say second explosives handling wharf at Bangor isn't needed

By Ed Friedrich

Wednesday, April 20, 2011

POULSBO — Nuclear weapons are a Cold War relic and continuing to invest in them is a waste, three of four speakers testified during a public hearing for a second explosives handling wharf at Naval Base Kitsap-Bangor.

The other speaker, Kitsap County Commissioner Rob Gelder, wanted to make sure the county is involved in choosing Hood Canal mitigation efforts that spin off the $715 million project.

The existing explosives handling wharf, where ballistic missiles are loaded and unloaded from eight Trident submarines, is 30 years old and needs repairs, according to a Draft Environmental Impact Statement upon which people were asked to comment Tuesday night at the North Kitsap High School Commons. It will be available only 300 days a year even after it's renovated, and it can't support the Trident program alone, according to the report.

The wharf was built to accommodate C4 missiles. They've been replaced by bigger, more complex D5 missiles that require more time for handling. The program needs 400 days of wharf access a year, the Navy says. The two wharves combined would provide 500 to 600.

Construction would begin in 2012 and be completed in about four years.

Charles Schmid of Bainbridge Island said a second wharf isn't necessary because the threat that spawned nuclear weapons is gone.

"The Cold War is over," he said. "The world has changed. There are not that many Russian subs out there."

The wharf will probably wind up costing a billion dollars. Is that what the country should be spending it's money on?" he asked.

"The threats have changed, and I'm hoping that the country starts adapting to the new threats that are out there," he said.

Brian Watson of Bremerton said the Navy's numbers don't add up. The switch from C4 to D5 missiles began 10 years ago, and the base has handled them fine — even when Bangor had one more Trident submarine than it does now. He quoted old Navy documents that said a second wharf wouldn't be needed until there were 10 submarines at Bangor.

The Navy has no plans to base another Trident sub at Bangor.

The proposal to build a second wharf "is as if we're still in 1975 or 1985, as if there still was a USSR," Watson said. "... Maybe if I saw a Purpose and Need appendix, the numbers would add up. The existing wharf can handle D5 missiles as it has the last 10 years."

The Navy didn't release the Purpose and Need appendix, Alternatives Considered appendix and the Explosives Safety Arcs appendix to the public because of their sensitive nature.

Mark Roberts of the Navy's Strategic Systems Programs said the documents were withheld because they mention specific operations.Tom Rogers, a retired submarine officer from Poulsbo, said the time to end the country's reliance on nuclear weapons is long overdue. The Soviet Union collapsed in 1990.

"Trident is a Cold War relic. It needs to be phased out," he said. "It's extremely expensive to operate, it's dangerous, barbaric and against international law."

This is an opportunity to show leadership in nuclear disarmament, he said, adding that adversaries like Russia and China are watching the United States and will see it's not ready to give up nuclear weapons.

"It's a horrible waste of taxpayer money," he said. "Decommission some of those Trident submarines and the existing EHW will be adequate."

The Navy will use an in-lieu-fee program to mitigate environmental damage from the project, in which funds are given to a sponsor to perform the work. The Navy will choose a sponsor, most likely the Hood Canal Coordinating Council, Puget Sound Partnership or some combination, said Lynn Wall of the Naval Facilities Engineering Command. The dollar cost of the project's environmental damage will be assessed, and that money will be used for improvements on Hood Canal. Restoring the 27-acre Big Beef Creek estuary, including replacing a bridge that strangles it, has been mentioned as one option. Another is buying Pope Resources waterfront property on Port Gamble Bay and conserving it.

A panel of three received Tuesday's comments: Capt. Pete Dawson, Naval Base Kitsap commander; Roberts of Strategic Weapons Program; and Christine Stevenson, the EIS project manager. Fifty-three people attended, along with more than 20 Navy subject-matter experts and public information officers.

Additional public hearings are planned in Chimacum and Seattle. Comments can be made until May 2, in writing or by visiting the website www.nbkeis.com/EHW. A final EIS will be released in the fall, with a record of decision coming in late fall.

Attachment

Accident at Explosives Handling Wharf, Naval Base Kitsap-Bangor

In February 2000, a containment system that was built on the Explosives Handling Wharf to keep toxic paint chips out of Hood Canal collapsed and fell 70 feet into Hood Canal. Of the 6,000 pounds of toxic waste--905 pounds were recovered. Over 5,000 pounds were "dispersed" into endangered salmon habitat in Hood Canal.

--An initial report is apparently dated February 11, 2000, 2 am. FLAGWORD/NAVYBLUE. The report reads:

1. THE EXPLOSIVE HANDLING WHARF (EHW) IS A COVERED STRUCTURE USED FOR WEAPONS HANDLING OF CONVENTIONAL AND C-4 TRIDENT MISSILES FOR OHIO CLASS SUBMARINES. A PAINTING CONTRACT WITH LONG PAINTING FROM SEATTLE, WA BEGAN IN OCTOBER 1999 TO SAND BLAST AND REPAINT THE EHW. DURING THE SANDBLASTING OPERATIONS OF THE SOUTH OVERHEAD CRANE, A GRIT RECOVERY SYSTEM MADE OF HERCULITE AND FOUR SIPHON TUBES WAS USED TO RECOVER THE SANDBLAST MATERIAL AND PAINT CHIPS. THE 40 FT X 40 FT SECTION OF HERCULITE CONTAINING SANDBLASTING MATERIAL AND PAINT CHIPS BROKE FREE AND FELL APPROXIMATELY 70 FT. AN ESTIMATED 1000-2000 POUNDS OF POTENTIALLY HAZARDOUS MATERIAL FELL INTO THE WATERS OF HOOD CANAL (IN 60-80 FT OF WATER).

TIDE CONDITIONS AT THE TIME OF SPILL: EBB TIDE APPROXIMATELY ONE HOUR FROM SLACK WATER. NO EXPLOSIVES WERE PRESENT. NO INJURED PERSONNEL. NO DAMAGE TO EQUIPMENT. SANDBLASTING OPERATIONS WERE IMMEDIATELY SECURED AND THE SUBASE HAZARDOUS MATERIAL AND WASTE MANAGEMENT TEAM HAS ARRIVED AND IS EVALUATING THE SCENE.

2. US NAVY DIVERS HAVE MADE AN INITIAL SURVEY OF THE SEA BED BELOW THE EHW. THERE IS AN 8 FT BY 2 FT BY 2 FT AREA WHERE THE HERCULITE AND MOST OF THE SANDBLASTING MATERIAL AND PAINT CHIPS ARE CONTAINED. SAMPLES OF MATERIAL WERE TAKEN FOR ANALYSIS BY SUBASE BANGOR. DIVERS HAVE TIED OFF SECTIONS OF THE HERCULITE TO PREVENT FUTURE DISPERSION CAUSED BY TIDAL CHANGES. THERE IS A PLUME OF MATERIAL AROUND THE HERCULITE APPROXIMATELY 30 FT BY 30 FT UP TO 1 INCH THICK.

3. CONTRACTORS (LONG PAINTING) DIVERS WILL EVALUATE AND RECOVER MATERIAL COMMENCING 11 FEBRUARY 2000 AT 4 PM. ADDITIONAL ENVIRONMENTAL REPORTING WILL BE ACCOMPLISHED BY SUBASE BANGOR.

4. PRESS INTEREST IS ANTICIPATED.

5. UPDATE MESSAGE TO FOLLOW.

--Another report dated February 11, 2000, 3 pm, stated:

ESTIMATED AMOUNT RELEASED: ESTIMATE APPROX. 3 TONS. DIVERS SECURED AS MUCH MATERIAL AS POSSIBLE IN THE TORN CONTAINMENT BAG. RECOVERY OPERATION IN PLANNING. FINAL REPORT WILL BE SUBMITTED AFTER RECOVER PHASE ESTIMATED 3-7 DAYS.

--Another report on the spill, dated February 18, 2000, 7 pm, stated:

7. FIELD TESTINGS: BASED ON LAN ANALYSIS OF GRIT AND PAINTCHIPS THE SPILLED MATERIAL HAS BEEN DESIGNATED AS A STATE DANGEROUS WASTE (D007, WT02) BECAUSE OF TOTAL HEXAVALENT CHROMIUM (49PPM).

8. ESTIMATED AMOUNT RELEASED: CALCULATED TO BE 3 TONS OF GRIT WITH PAINT CHIPS AND 3 TARPS.

9. CAUSE FOR RELEASE: STRUCTURAL CABLES FOR CONTAINMENT SYSTEM FAILED.

10. RELEASE SCENE DESCRIPTION: HOOD CANAL.

11. NOTIFICATIONS MADE AND ASSISTANCE REQUESTED: YES NUMBER 519416/NONE

12. DESCRIBE CONTROL AND CONTAINMENT ACTIONS TAKEN/PLANNED: DIVERS SECURED AS MUCH MATERIAL AS POSSIBLE IN THE TORN CONTAINMENT BAG.

13. DESCRIBE CLEAN-UP ACTIONS TAKEN/PLANNED: ON 14 FEB 2000 DIVERS AND MOBILE CRANES RECOVERED 905 POUNDS OF BLAST GRIT AND 3 CONTAINMENT TARPS.

--A report dated February 23, 2000, 11 pm, is the HAZARDOUS SUBSTANCE RELEASE FINAL REPORT:

1. RESULTS OF CONTRACTOR DIVER EVALUATION AND RECOVERY EFFORTS AT THE EXPLOSIVE HANDLING WHARF INCLUDED THE RECOVERY OF 905 POUNDS OF BLAST GRIT AND 3 CONTAINMENT TARPS. HAZARDOUS SUBSTANCE TESTING REVEALED THE BLAST GRIT AND PAINT CHIPS TO BE CONSIDERED DANGEROUS WASTE DUE TO CHROMIUM CONTENT (49PPM). THE REMAINING MATERIAL HAS DISPERSED. LONG PAINTING COMPANY HAS REVIEWED ITS CONTAINMENT SYSTEM AND IMPLEMENTED ADDITIONAL MEASURES TO PRECLUDE ADDITIONAL SPILLS.

2. PRESS INTEREST NO LONGER ANTICIPATED.

3. FINAL REPORT THIS INCIDENT.

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Karol Milner
[redacted]

June 8, 2011

Commanding Officer
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

ATTN: Mr. Thomas Dildine - NEPA Project Manager
RE: Test Pile Program, Naval Base Kitsap-Bangor

Dear Mr. Dildine

I attended the recent scoping meetings for the second Explosives Handling Wharf at Bangor in Poulsbo and Seattle. I believe the Test Pile Program should have also been discussed as part of the same EIS for the second Explosives Handling Wharf.

The comments I made at the scoping meeting in Seattle regarding the second Explosives Handling Wharf apply to the Test Pile Program.

I do not think we should be spending our $782 million dollars on a second Explosives Handling Wharf. There are too many people suffering today due to lack of funding for important programs. Our children are being robbed of their futures. Our schools do not have the proper funding to operate effectively. Family budgets are being stretched to the breaking point over high medical costs from lack of insurance. Even people who have insurance have higher co-payments for their services. Senior services are being cut or eliminated altogether. The thought of Social Security not being available in the future is a concern for many. College graduates have incurred huge student loan debt and are forced into low income jobs with no benefits or possible advancement. As you know, this list could fill many pages.

The Trident system and other military funding has robbed from all of us in the past and now plans to rob from us in the future. What would this country look like if this money were spent differently?

You do not have to be a marine biologist to know that when you cover 6 acres of water the life below will not thrive. Any proposed mitigation plan is a fraud and only provides the Navy a permit to damage Hood Canal.

In working with children all my life, I have learned what they need. Children need schools, quality health care, healthy food, parks and open space, clean air and water, and a future to look toward. Children, nowhere on the planet, need weapons of mass destruction. You cannot separate the $782 million dollars from what this project is and does.

The second Explosives Handling Wharf should not be built for the protection of Hood Canal, our world, and all life on our planet.

Accordingly, the Test Pile Program should not be conducted because it is for an unnecessary and wasteful project.

Sincerely

Karol Milner

Karol Milner

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT

Letter Number	Response
1 (Glen Milner)	**Test Pile Program and the second Explosives Handling Wharf (EHW) are connected projects and should be under the same review** Test Pile and the proposed second Explosives Handling Wharf (EHW-2) are not "connected actions" as defined in the CEQ regulations, 40 C.F.R. § 1508.25. "Connected actions" are those which: (i) Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) Are interdependent parts of a larger action and depend on the larger action for their justification. Test Pile does not automatically trigger EHW-2, nor does EHW-2 trigger Test Pile. EHW-2 would proceed regardless of whether Test Pile was completed; Test Pile is more of a "risk management" project to more clearly ascertain the geologic and biologic conditions present where EHW-2 is currently proposed to be built, thus reducing the extrapolations necessary in any planning scenario and leading ultimately to less disruption, quicker construction, and minimum impacts to the affected environment. Moreover, the Navy has several waterfront projects in the planning stages for NBK at Bangor, and Test Pile will provide important biological monitoring data and a more complete geological picture for all those projects, not just EHW-2. In short, Test Pile may have been undertaken whether EHW-2 proceeded or not. The effects of the Test Pile Program on the human environment have been analyzed in this Environmental Assessment under the National Environmental Policy Act (NEPA). The Navy is performing the Test Pile Program to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for the proposed EHW-2 and future projects at the Bangor waterfront at Naval Base Kitsap (NBK). The location of the individual test piles have been chosen so that information obtained from driving the pile can serve any of the alternatives addressed in the Environmental Impact Statement (EIS). It is not possible to layout out a Test Pile Program so that all driven piles would be of proper location, diameter, and embedment depth to serve all alternatives. The piles would be removed using a vibratory hammer at or before the completion of the Test Pile Program because they could pose a potential navigation risk if left in place. The test piles would not be incorporated into the proposed EHW-2 construction because exact pile locations for the proposed structure have not been determined.

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
2 (Suquamish)	**Test Pile Study** The Navy has analyzed the impacts to fish (Section 3.8 of the Environmental Assessment [EA]), mammals (Section 3.9 of the EA) and birds (Section 3.10 of the EA) including the affects of underwater noise on these species. Additionally, the Navy has consulted with the appropriate regulatory agencies for federally threatened and endangered species, Magnuson-Stevens Fishery Conservation and Management Act, and for the Marine Mammal protection Act. The purpose of the Test Pile Program is to acquire accurate geotechnical and sound propagation data to validate design concepts, construction methods, and environmental analyses for the proposed EHW-2 and future projects at the Bangor waterfront at NBK. This EA did consider data from other projects such as the Bangor Carderock Pier. The Bangor Carderock Pier did acquire sound data, which was considered in the EA analysis, but this project did not obtain geotechnical data. The EHW-1 Pile Replacement Project is permitted for impact pile driving; however, impact pile driving is not anticipated for this project. As a result, more accurate data of the Bangor waterfront at NBK is necessary for use in future projects. The Navy will incorporate findings and results from the Test Pile Program into future NEPA documents as appropriate. The Navy will continue to comply with regulatory requirements. **Benthic Communities including shellfish** The Navy has analyzed the impacts to benthic invertebrates in Section 3.7 of the EA. The Navy determined the Test Pile Program will have no significant impacts to benthic invertebrates. Therefore, studies on the behavioral and biological impacts of pile driving are not a part of the Test Pile Program.
3 (David Nelson)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf.
4 (Richard Stoll)	**Comment 1.** The location of the individual test piles have been chosen so that information obtained from driving the piles can serve any of the alternatives addressed in the Trident Support Services EHW-2 EIS. **Comment 2.** The Test Pile Program will aid in establishing the ability to advance piles to design tip by using a

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
4 (Richard Stoll, continued)	vibratory hammer, thereby limiting the number of strikes with an impact hammer to that of "proofing" the pile, resulting in both environmental and cost benefits. The Navy does not possess data on pile driving in the immediate location of the proposed project. The substrates in the project area are glacially overridden soils with significant potential for variations in physical characteristics. The Test Pile Program will serve to verify assumption derived from existing geotechnical information. **Comment 3.** Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf. **Comment 4.** Based on the analysis presented in the EA and coordination with the United States Fish and Wildlife Department (USFWS), National Marine Fisheries Department (NMFS), Washington State Historic Preservation Office (SHPO), Washington Department of Ecology, and five Tribes, the Navy finds that implementation of the Proposed Action will not significantly impact the quality of the human or natural environment. **Comment 5.** The Navy appreciates your comment. **Comment 6.** The Navy appreciates your comment.
5 (Lisa Johnson)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf.
6 (Carma Foley)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf.
7 (Jack Dresser)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf.

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
8 (Judy Brown)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf.
9 (George Keefe)	**Comment 1.** Test Pile and EHW-2 are not "connected actions" as defined in the CEQ regulations, 40 C.F.R. § 1508.25. "Connected actions" are those which: (i) Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) Are interdependent parts of a larger action and depend on the larger action for their justification. Test Pile does not automatically trigger EHW-2, nor does EHW-2 trigger Test Pile. EHW-2 would proceed regardless of whether Test Pile was completed; Test Pile is more of a "risk management" project to more clearly ascertain the geologic and biologic conditions present where EHW-2 is currently proposed to be built, thus reducing the extrapolations necessary in any planning scenario and leading ultimately to less disruption, quicker construction, and minimum impacts to the affected environment. Moreover, the Navy has several waterfront projects in the planning stages for NBK at Bangor, and Test Pile will provide important biological monitoring data and a more complete geological picture for all those projects, not just EHW-2. In short, Test Pile may have been undertaken whether EHW-2 proceeded or not. The effects of the Test Pile Program on the human environment have been analyzed in this Environmental Assessment under the National Environmental Policy Act (NEPA). **Comment 2 and 3.** An EIS follows a different procedure for public notice than does an EA, but ultimately, the proponent agency determines what procedures are appropriate. The NEPA analysis for the Test Pile Program is an EA, not an EIS; and the commenting requirements are not the same as for an EIS. The notice provided for the Test Pile Program EA meets the required public comment standard for EAs. The fact that numerous comments were received from several sources indicates that the notice was adequate. **Comment 4.** The Navy provided the EA on an existing Navy website which was published in the Kitsap Sun. https://portal.navfac.navy.mil/portal/page/portal/navfac/navfac_ww_pp/navfac_efanw_pp **Comment 5.** The Navy appreciates your comment.

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
10 (Mark Sherbesman)	All of the piles will be removed at the end of the project; there will be no permanent in-water structures. The Navy's analysis has determined that there would be no long-term permanent impacts from the Test Pile Program.
11 (David Hall)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf.
12 (Jean Sundborg)	The Navy appreciates your comment.
13 (Mary Hanson)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf.
14 (Tom Shea)	The purpose and need for the Test Pile Program is described in Section 1.4 of the EA. This program will benefit other future projects at the Bangor waterfront at NBK, not just the proposed EHW-2. Section 5.4 of the Test Pile Program EA addresses irretrievable or irreversible commitment of resources. Section 5.3.4.1.1 addresses climate change. Comments by the Marine Mammal Commission were submitted to NMFS for the Test Pile Program Incidental Harassment Authorization. These comments will be responded to by NMFS through the Incidental Harassment Authorization process.
15 (Mary Gleysteen)	The purpose and need for the Test Pile Program is described in Section 1.4 of the EA. The Test Pile Program EA analyzes the impacts of pile driving on fish (Section 3.8 of the EA), mammals (Section 3.9 of the EA) and birds (Section 3.10 of the EA) and well as a number of other resource areas. Chapter 5 of the Test Pile Program EA discusses the cumulative impacts of the Test Pile Program and other Navy and Non-Navy projects.
16 (Charles Schmid)	**Processes** **1a.** The Navy has consulted with the USFWS and NMFS for federally threatened and endangered species and for the Marine Mammal Protection Act. The Navy is not required to obtain a Hydraulic Project approval; however; the Navy

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
16 (Charles Schmid, continued)	has submitted a permit application to the United States Army Corps of Engineers under Section 10 of the Rivers and Harbors Act and has consulted with the appropriate state agencies. **1b.** Section 2.3.2 of the EA discusses the reason for using 18 piles for the Test Pile Program. **1c.** Though some data exists from previous studies in the area and that data has been considered, the Test Pile Program will aid in establishing the ability to advance piles to design tip by using a vibratory hammer, thereby limiting the number of strikes with an impact hammer that are necessary for “proofing” a pile, resulting in both environmental and cost benefits. The Navy does not possess data on pile driving in the immediate location of the proposed project. The substrates in the project area are glacially overridden soils with significant potential for variations in physical characteristics. The Test Pile Program will serve to verify assumptions derived from existing geotechnical information. **Inconsistencies** All 29 piles will be removed at the completion of the Test Pile Program. **Acoustic Calculations** a. The Navy provided relevant information regarding pile driving impulse that was necessary to determine the acoustic impacts of the project. The exact pulse rate that will be used is unknown and will be dependent upon site conditions. b. The frequency spectrum of pile driving sounds is highly dependent on bathymetric and substrate conditions; pile material composition and size, and the hammer type and capacity. As a result, the Navy provided an overview of the frequency band in which the majority of pile driving sounds fall within. c. The Navy provided additional information in Section 3.9.2.2.1.4 regarding the practical spreading loss model. The model assumptions are provided in Sections 3.9.2.2.1.4 and 3.9.2.2.1.6. d. Acoustic data at the project site from which to estimate the contribution of sound transmitted through the

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
16 (Charles Schmid, continued)	substrate and into the water column was unavailable. Precise data to estimate the linear loss from scattering and absorption was also unavailable. Therefore, in order to be conservative, the Navy only took into consideration the effect of logarithmic spreading loss in the acoustic analyses. The Navy is currently working with researchers at the University of Washington to develop a more robust model for characterizing the behavior of pile driving sounds and anticipates using such a model in future analyses, as appropriate. e. The Navy will be making underwater and airborne acoustic measurements during the Test Pile Program to determine the types of transmission loss that occur at the project site. The Navy will be recording underwater sound from multiple receiver locations. The Navy does not anticipate a problem with recording low frequencies at the near-field hydrophone, since the 10 meter reference location is a standard recording distance in other studies which have examined pile driving sound. f. The Navy provided additional information in Section 2.2.2 regarding the types of sound attenuation devices that the Navy may employ as part of the Test Pile Program and empirical data regarding the level of sound reduction that these types of systems are capable of achieving. g. All mitigation associated with the Test Pile Program is provided in Chapter 4 of the EA. The Navy will be making underwater and airborne acoustic measurements during the Test Pile Program for each pile. The effectiveness of sound attenuation devices will be measured during the proposed action. Baseline ambient conditions will be recorded during the Test Pile Program. **Fish** a. The Navy considered existing data sources that were applicable to the proposed action regarding the effects of underwater noise on fish; these sources are cited in Section 3.8. The Navy consulted with the appropriate regulatory agencies (NMFS and USFWS) regarding the effect of the proposed action on ESA-listed fish. The Navy received a biological opinion from NMFS and a letter of concurrence from USFWS in agreement with the Navy's analysis and determinations of affect on fish.

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
16 (Charles Schmid, continued)	**Conclusions** **Comment 1.** Chapter 5 of the Test Pile Program EA discusses the cumulative impacts of the Test Pile Program and other Navy and Non-Navy projects. **Comment 2.** The Navy provided additional information in Section 3.9.2.2.1.4 regarding the use of the practical spreading loss model. Other assumptions regarding the acoustic modeling analysis are primarily contained in Sections 3.9.2.2.1.4 and 3.9.2.2.1.6. Acoustic measurements will be recorded both underwater and in-air during pile installation and removal activities during the Test Pile Program. Additionally, visual monitoring of marine species (marine mammals and marbled murrelets) will occur as part of the proposed action. The results of the Navy's visual and acoustic monitoring will be reported to the appropriate regulatory agencies in accordance with the permits received and consultations conducted for the Test Pile Program. **Comment 3.** Additional information regarding sound attenuation devices that the Navy proposes to use during the Test Pile Program and empirical data regarding the level of sound reduction that these types of systems are capable of achieving has been provided in Section 2.2.2. Based on these results from similar pile driving actions, the Navy assumed a 10 dB reduction in the initial sound pressure levels from the use of a sound attenuation device. The regulatory agencies concurred with the use of this level of sound attenuation in the underwater acoustic analyses. **Comment 4.** The statement the commenter is referring to is in regard to the development of acoustic criteria which are established by the regulatory agency, which in the case of marine mammals is NMFS. The existing criteria were not developed from studies which specifically examined the impact of pile driving sounds on marine mammals. However, data from similar sound types (i.e. impulsive sources) were utilized by NMFS. As a result, the statement is accurate in that there are no empirical studies of the impacts of pile driving on marine mammals. However, there is evidence of the effects of impulsive sound sources which the regulatory agency has determined are reasonable proxies from which to assess impacts from pile driving. The Navy utilized these sources in evaluating the acoustic impact of the proposed action to marine mammals and submitted an application for the incidental harassment of marine mammals species based on this analysis. Any determination of allowable take under the Marine Mammal Protection Act is made by NMFS.

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
16 (Charles Schmid, continued)	**Comment 5.** The Navy responded to the commenter by email on March 15, 2011 with the dates of the second Explosives Handling Wharf public hearings and various ways in which the public could participate in the NEPA process for the EIS. **Comment 6.** Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA. A separate public comment period was held from March 18 to May 17, 2011 for the Draft EIS for the proposed second Explosives Handling Wharf. **Comment 7.** In the National Environmental Policy Act, Congress directed the individual Federal agencies to review their proposed actions in order to ensure that each agency considers the impacts that any given action might have on the environment. The Navy undertakes that responsibility by conducting environmental impact analyses on its proposals, to include seeking the necessary permits and undertaking the appropriate consultations with other agencies. Section 1.5 of the EA outlines this requirement in further detail.
17 (Gabriel Lavalle)	An EIS follows a different procedure for public notice than does an EA, but ultimately, the proponent agency determines what procedures are appropriate. The NEPA Analysis for the Test Pile Program is an EA, not an EIS; and the commenting requirements are not the same as for an EIS. The notice provided here for the Test Pile Program EA meets the required public comment standard for EAs. The fact that numerous comments were received from several sources indicates that the notice was adequate. Test Pile and the proposed second Explosives Handling Wharf (EHW-2) are not "connected actions" as defined in the CEQ regulations, 40 C.F.R. § 1508.25. "Connected actions" are those which: (i) Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) Are interdependent parts of a larger action and depend on the larger action for their justification. Test Pile does not automatically trigger EHW-2, nor does EHW-2 trigger Test Pile. EHW-2 would proceed regardless of whether Test Pile was completed; Test Pile is more of a "risk management" project to more clearly ascertain the geologic and biologic conditions present where EHW-2 is currently proposed to be built, thus reducing the extrapolations necessary in any planning scenario and leading ultimately to less disruption, quicker construction, and

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
17 (Gabriel Lavalle, continued)	minimum impacts to the affected environment. Moreover, the Navy has several waterfront projects in the planning stages for NBK at Bangor, and Test Pile will provide important biological monitoring data and a more complete geological picture for all those projects, not just EHW-2. In short, Test Pile may have been undertaken whether EHW-2 proceeded or not. The effects of the Test Pile Program on the human environment have been analyzed in this Environmental Assessment under the National Environmental Policy Act (NEPA).
18 (Glen Milner)	**Comment period for the EA for the Test Pile Program** An EIS follows a different procedure for public notice than does an EA, but ultimately, the proponent agency determines what procedures are appropriate. The NEPA analysis for the Test Pile Program is an EA, not an EIS; and the commenting requirements are not the same as for an EIS. The notice provided for the Test Pile Program EA meets the required public comment standard for EAs. The fact that numerous comments were received from several sources indicates that the notice was adequate. **Purpose and Need** The Navy appreciates your comment. **Purpose and Need, explosives handling restrictions** Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this Environmental Assessment. **No need for second EHW: then no need for the Test Pile Program** The Navy appreciates your comment. **Test Pile Program and the second EHW are connected projects and should be under the same review** Test Pile and the proposed second Explosives Handling Wharf (EHW-2) are not “connected actions” as defined in the CEQ regulations, 40 C.F.R. § 1508.25. “Connected actions” are those which: (i) Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) Are interdependent parts of a larger action and depend on the larger action for their justification.

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
18 (Glen Milner, continued)	Test Pile does not automatically trigger EHW-2, nor does EHW-2 trigger Test Pile. EHW-2 would proceed regardless of whether Test Pile was completed; Test Pile is more of a “risk management” project to more clearly ascertain the geologic and biologic conditions present where EHW-2 is currently proposed to be built, thus reducing the extrapolations necessary in any planning scenario and leading ultimately to less disruption, quicker construction, and minimum impacts to the affected environment. Moreover, the Navy has several waterfront projects in the planning stages for NBK at Bangor, and Test Pile will provide important biological monitoring data and a more complete geological picture for all those projects, not just EHW-2. In short, Test Pile may have been undertaken whether EHW-2 proceeded or not. The effects of the Test Pile Program on the human environment have been analyzed in this Environmental Assessment under the National Environmental Policy Act (NEPA). Chapter 5 of the Test Pile Program EA discusses the cumulative impacts of the Test Pile Program and other Navy and Non-Navy projects. The piles would be removed using a vibratory hammer at or before the completion of the Test Pile Program because they could pose a potential navigation risk if left in place (page 2-8 of the EA). The test piles would not be incorporated into the proposed EHW-2 construction because exact pile locations for the proposed structure have not been determined. Section 2.3 of the EA discusses the reason for eliminating other alternatives from the Test Pile Program. **Test Pile Program and the second Explosives Handling Wharf at Bangor** Test Pile and the proposed second Explosives Handling Wharf (EHW-2) are not “connected actions” as defined in the CEQ regulations, 40 C.F.R. § 1508.25. “Connected actions” are those which: (i) Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) Are interdependent parts of a larger action and depend on the larger action for their justification. Test Pile does not automatically trigger EHW-2, nor does EHW-2 trigger Test Pile. EHW-2 would proceed regardless of whether Test Pile was completed; Test Pile is more of a “risk management” project to more clearly ascertain the geologic and biologic conditions present where EHW-2 is currently proposed to be built, thus reducing the

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
18 (Glen Milner, continued)	extrapolations necessary in any planning scenario and leading ultimately to less disruption, quicker construction, and minimum impacts to the affected environment. Moreover, the Navy has several waterfront projects in the planning stages for NBK at Bangor, and Test Pile will provide important biological monitoring data and a more complete geological picture for all those projects, not just EHW-2. In short, Test Pile may have been undertaken whether EHW-2 proceeded or not. The effects of the Test Pile Program on the human environment have been analyzed in this Environmental Assessment under the National Environmental Policy Act (NEPA). Although other pile driving has occurred at Bangor (Carderock and EHW-1) the Navy does not have accurate geotechnical data for deepwater environments along the Bangor waterfront at NBK. The Test Pile Program will collect data in a range of water depths and collect information on the variations in substrate and the technologies required to drive piles within deep water and shallow water environments that contain variation in substrate composition. This information will be used for future projects along the Bangor waterfront at NBK. **EIS for proposed second Explosives Handling Wharf** The ROD for EHW-2 is projected for November 2011. The Secretary of the Navy is scheduled to make a final decision on EHW-2 in November 2011. Test Pile and the proposed second Explosives Handling Wharf (EHW-2) are not “connected actions” as defined in the CEQ regulations, 40 C.F.R. § 1508.25. “Connected actions” are those which: (i) Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) Are interdependent parts of a larger action and depend on the larger action for their justification. Test Pile does not automatically trigger EHW-2, nor does EHW-2 trigger Test Pile. EHW-2 would proceed regardless of whether Test Pile was completed; Test Pile is more of a “risk management” project to more clearly ascertain the geologic and biologic conditions present where EHW-2 is currently proposed to be built, thus reducing the extrapolations necessary in any planning scenario and leading ultimately to less disruption, quicker construction, and minimum impacts to the affected environment. Moreover, the Navy has several waterfront projects in the planning stages for NBK at Bangor, and Test Pile will provide important biological monitoring data and a more complete

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
18 (Glen Milner, continued)	geological picture for all those projects, not just EHW-2. In short, Test Pile may have been undertaken whether EHW-2 proceeded or not. The effects of the Test Pile Program on the human environment have been analyzed in this Environmental Assessment under the National Environmental Policy Act (NEPA). **Public Participation: Proposed second Explosives Handling Wharf and the Test Pile Program** An EIS follows a different procedure for public notice than does an EA, but ultimately, the proponent agency determines what procedures are appropriate. The NEPA analysis for the Test Pile Program is an EA, not an EIS; and the commenting requirements are not the same as for an EIS. The notice provided here for the Test Pile Program EA meets the required public comment standard for EAs. The fact that numerous comments were received from several sources indicates that the notice was adequate. **Test Pile Program and EHW-1 Pile Replacement Project have cumulative impacts** Chapter 5 of the Test Pile Program EA discusses the cumulative impacts of the Test Pile Program and other Navy and Non-Navy projects. In February 2000, a contractor was grit blasting the structural steel of the bridge crane of EHW-1 in preparation for painting the crane. The contractor had erected an enclosure that contained all blast material and then funneled it into a barrel. The funnel clogged, and before the clog was noticed, the containment system collapsed into the water. The incident was reported as a release, as the commenter noted. The amount of blast grit released into Hood Canal was estimated to be 5,000 pounds. Divers were able to retrieve 900 pounds of grit from the sea bottom. A sample of the grit was tested for toxicity using Toxicity Characteristic Leaching Procedure (TCLP) for 8 metals. The only material detected in the grit was chromium, which was found in a concentration of 2.5 parts per million. Since this was below the dangerous waste criteria level for chrome, the waste did not qualify as dangerous waste and no further action was taken. The Washington Department of Ecology publishes marine Sediment Quality Standards (WAC 172-204-320) determining potential impacts to marine life due to chemical contamination. Ecology's "no effects" level for chromium is 260 ppm. Sediment sampling at 13 locations completed for the EHW-2 project found chromium

TABLE G.1 PUBLIC COMMENT RESPONSE FOR THE TEST PILE PROGRAM ENVIRONMENTALASSESSMENT (continued)

Letter Number	Response
18 (Glen Milner, continued)	concentrations of 13.4 ppm to 16.6ppm, well below the 260 ppm "no effects" level specified in the Sediment Quality Standards and comparable to background levels for Puget Sound. Section 3.2 of the EA has more information on sediment quality. **Deadline for the Test Pile program – 30-day review period for FONSI "before any action is taken"** The comment refers to the National Science Foundation regulations, which are not Navy regulations. Navy regulation is OPNAVINST 5090.1C sections 5-5.2 f. and g. The Navy will comply with the publication and availability requirements in OPNAVINST 5090.1C. **Time is available for sufficient EA** The Test Pile Program must occur as scheduled to ensure the data collected will be utilized to validate the design and to realize efficiencies and cost savings for the construction contract for EHW-2.
19 (Karol Milner)	Issues regarding the proposed second Explosives Handling Wharf are not within the scope of this EA.