PROPOSED PLAN

Management of Discarded Military Munitions
Jackson Park Housing Complex/
Naval Hospital Bremerton Superfund Site
Operable Unit 3 – Marine

Bremerton, Washington **October 2017**

INTRODUCTION

The U.S. Navy (Navy), as lead agency, invites the public to comment on its Proposed Plan (Plan) to clean up munitions and explosives of concern (MEC) (20-millimeter [mm] projectile or larger [by net explosive weight] containing high explosives [HE], including fuze components that may contain small quantities of explosives) within Operable Unit (OU) 3 – Marine (3M), a 10-acre subtidal area around the existing pier (Pier 2) on the west side of Ostrich Bay. No unexploded ordnance (UXO) has been found at OU 3M. MEC that will be cleaned at the site includes discarded military munitions (DMM) and material potentially presenting an explosive hazard (MPPEH, which is material that requires further processing to assess its explosive hazard).

OU 3M is part of the Jackson Park Housing Complex/Naval Hospital Bremerton (JPHC/NHB) Superfund Site (site) located in Kitsap County, Bremerton, Washington (Figure 1). This Plan has been prepared with oversight from the U.S. Environmental Protection Agency (EPA). The Washington State Department of Natural Resources and the Suquamish Tribe (the Tribe) also participated in development of the Plan. The Navy's preferred alternative, as described in this Plan, includes dredging of marine sediments to remove MEC from the remaining 10 acres of Ostrich Bay.

This Plan fulfills the public participation requirements of Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan §300.430(f)(2). CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, is used to identify, assess, characterize, and clean up or control contamination from past hazardous waste-disposal operations and hazardous material spills. The steps in the CERCLA process for OU 3M are shown in Figure 2.

The purpose of this Plan is to:

- Provide basic background information about the site, including past uses of the site and past responses to DMM;
- Identify the preferred alternative for remedial action at the site and the reasons why the preferred alternative was selected;
- Describe the other remedial alternatives considered;
- Solicit public review of and comment on all alternatives evaluated; and
- Provide information on how the public can be involved in the remedy selection process.

This Plan was developed based on the information and findings of the Remedial Investigation (RI)/Feasibility Study (FS) Report and other documents related to OU 3M, which are contained in the Administrative Record for the site. The Navy encourages the public to review these additional documents for more detailed descriptions of the site, its cleanup history, and the Superfund activities that have been completed. The Administrative Record is available for review at the locations indicated at the end of this plan.

Public input on all alternatives and the rationale for the selection of the preferred alternative is vital to the decision-making process. The public is encouraged to provide comments on all of the alternatives presented in this Plan. The public comment period extends from October 6, 2017, through November 18, 2017.

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DATES TO REMEMBER

Public Comment Period:
October 6, 2017 – November 18, 2017

Public Meeting:
October 18, 2017, 6:00 p.m. to 8:00 p.m.

You are invited to attend a public meeting to discuss the Proposed Plan on October 18, 2017, at 6:00 p.m. at The Landings in Bremerton. The public comment period is open from October 6, 2017, through November 18, 2017.

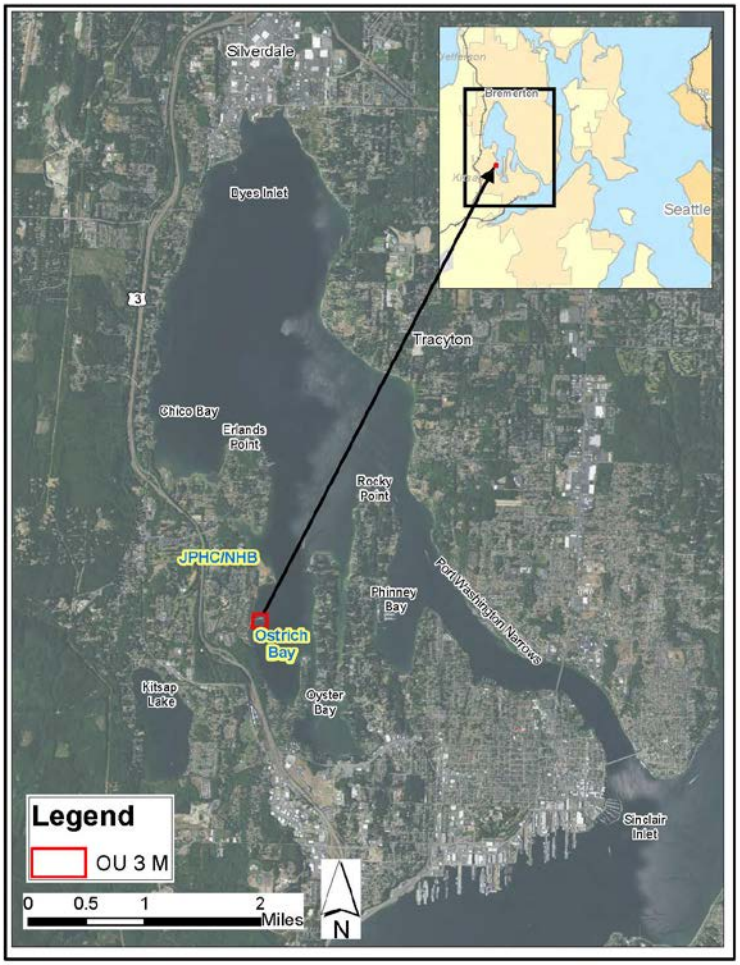

Figure 1. JPHC/NHB Vicinity and Location Map

The Navy will select and publish the final remedy in the Record of Decision (ROD) for OU 3M after reviewing and considering all information submitted during the public comment period. The Navy, in consultation with project members, may modify the preferred alternative or select another alternative described in this Plan. Any modification of the preferred alternative or selection of another alternative would be based on new information gathered subsequent to the date of this Plan or comments received from the public. If significant changes are necessary, the Plan will be revised and re-submitted for public comment.

SITE BACKGROUND

OU 3M occupies approximately 10 subtidal acres surrounding the existing pier (Pier 2) on the west side of Ostrich Bay (Figure 1). Ostrich Bay is bordered on the west by the terrestrial (or "upland") portion of the site and on the south and east by the city of Bremerton and is surrounded by suburban and rural development. Most of Ostrich Bay is state-owned aquatic land; however, some tidelands and subtidal lands are privately owned, and the Navy holds a deed for a portion of the bay. Ownership is shown on Figure 3. OU 3M is limited to 10 acres surrounding Pier 2 on subtidal land held by the Navy under a deed; no other subtidal areas are affected by OU 3M.

Ostrich Bay is within the Tribe's usual and accustomed fishing area. The Tribe has utilized the natural resources of Ostrich Bay, including fish and shellfish, for thousands of years and retains treaty-protected rights to harvest. Ostrich Bay has current restrictions under the JPHC OU 1 ROD and a Kitsap County Health Advisory, which prohibit harvest. The Tribe is actively involved in programs to restore beneficial uses to Ostrich Bay.

The site includes the former location of Naval Ammunition Depot (NAD) Puget Sound. NAD Puget Sound was used for storage, assembly, and demilitarization of military munitions and operated from 1904 to 1959, when it was officially closed. Based upon the data reviewed, the following munitions were most commonly assembled or stored at the site:

- Small arms ammunition (stored only)
- 20 mm projectiles
- 40 mm projectiles
- 5-inch projectiles
- 14-inch projectiles

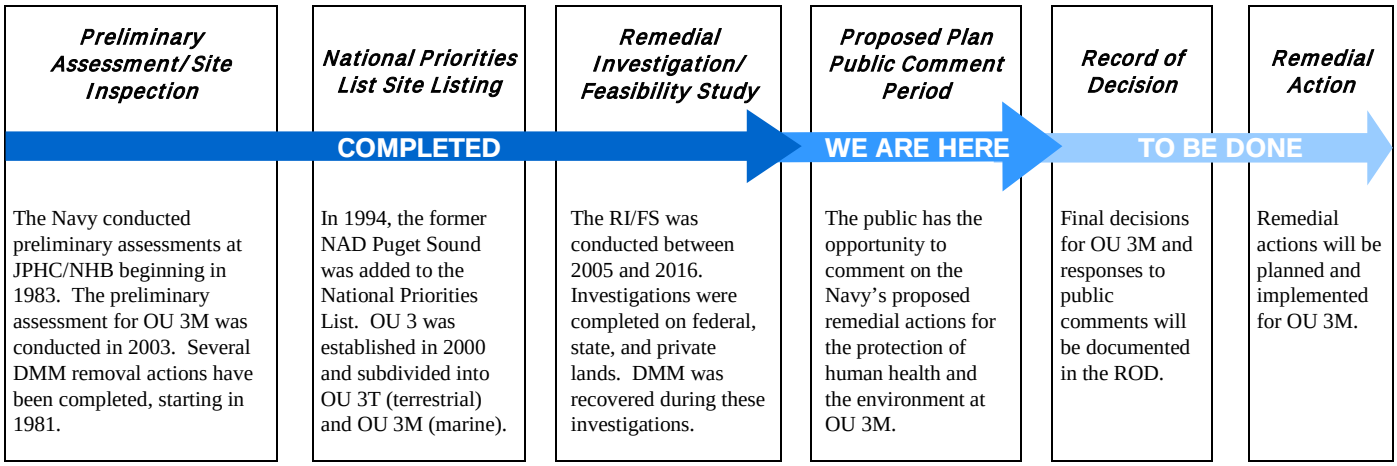

Figure 2. CERCLA Cleanup Process for OU 3M

During the operational history of NAD Puget Sound, Ostrich Bay was used as a harbor to support depot operations. Operations within Ostrich Bay included transportation of military munitions on barges within the shipping lanes, loading and unloading of the military munitions at three piers, and mooring of barges used in the transportation of military munitions. Ordnance was transported in and out of Ostrich Bay along shipping lanes. Barge activity was limited to waters deeper than 5 meters (16.5 feet) due to the draft of the barges. Two piers were associated with unloading and loading the military munitions barges (Pier 1 and Pier 2), and the third (Railroad Pier) was associated with the transport of military munitions within closed railroad cars (see Figure 3). Pier 1 and Pier 2 were the primary locations for transfer of over 200,000 pounds of military munitions from barges to on-shore storage and handling facilities each month. Barges were moored at mooring buoys located south of Piers 1 and 2 and at a Dolphin Pier located north of Piers 1 and 2.

Records from the 56-year operating history of NAD Puget Sound indicate that some military munitions were unintentionally lost or spilled during the loading and unloading of the barges on Ostrich Bay. Additional unintentional losses and spillage occurred during mooring or transport of military munitions on the barges within the bay. Although munitions losses occurred throughout the bay, the majority occurred near Piers 1 and 2. There is no indication, either in the written record or anecdotal, of any detonation of military munitions at JPHC, NHB, or in Ostrich Bay, nor is there any indication of intentional, systematic disposal of MEC within Ostrich Bay. In addition, there is no evidence of a member of the public finding a munition item in the subtidal portion of Ostrich Bay. This assertion is supported by the investigation of 100 percent of anomalies throughout Ostrich Bay and on private and public tidelands where no military debris was found.

The physical characteristics of the MEC ensured that once it entered the water through unintentional loss or spillage, it sank to the bottom of Ostrich Bay. In areas of the bay with soft silt, the MEC sank into the substrate and over time became encapsulated with mineral deposits. Figure 4 shows military munitions removed from the bay. In areas with harder substrate, the MEC remained on the bottom surface. Because the site is a net depositional environment, site conditions do not support transport of the MEC once it has been deposited on the bottom of the bay, and any objects become buried over time. Therefore, the principal media of concern are the marine sediments containing MEC.

The Navy has prepared community relations plans and implemented these plans to establish and promote community involvement in the CERCLA investigations and cleanup at the site. Information has been provided to the public through fact sheets, meetings, and news articles. The JPHC/NHB Restoration Advisory Board (RAB) was formed when the site was placed on the National Priorities List (NPL) in 1994 and remained active through 2008. Since that time, community interest and participation in the RAB has declined; however, the Navy is seeking community interest in participating in a RAB. If you are interested, please contact the Naval Base Kitsap Public Affairs Officer at 360-627-4030. If there is significant interest, the Navy will resume the RAB meetings.

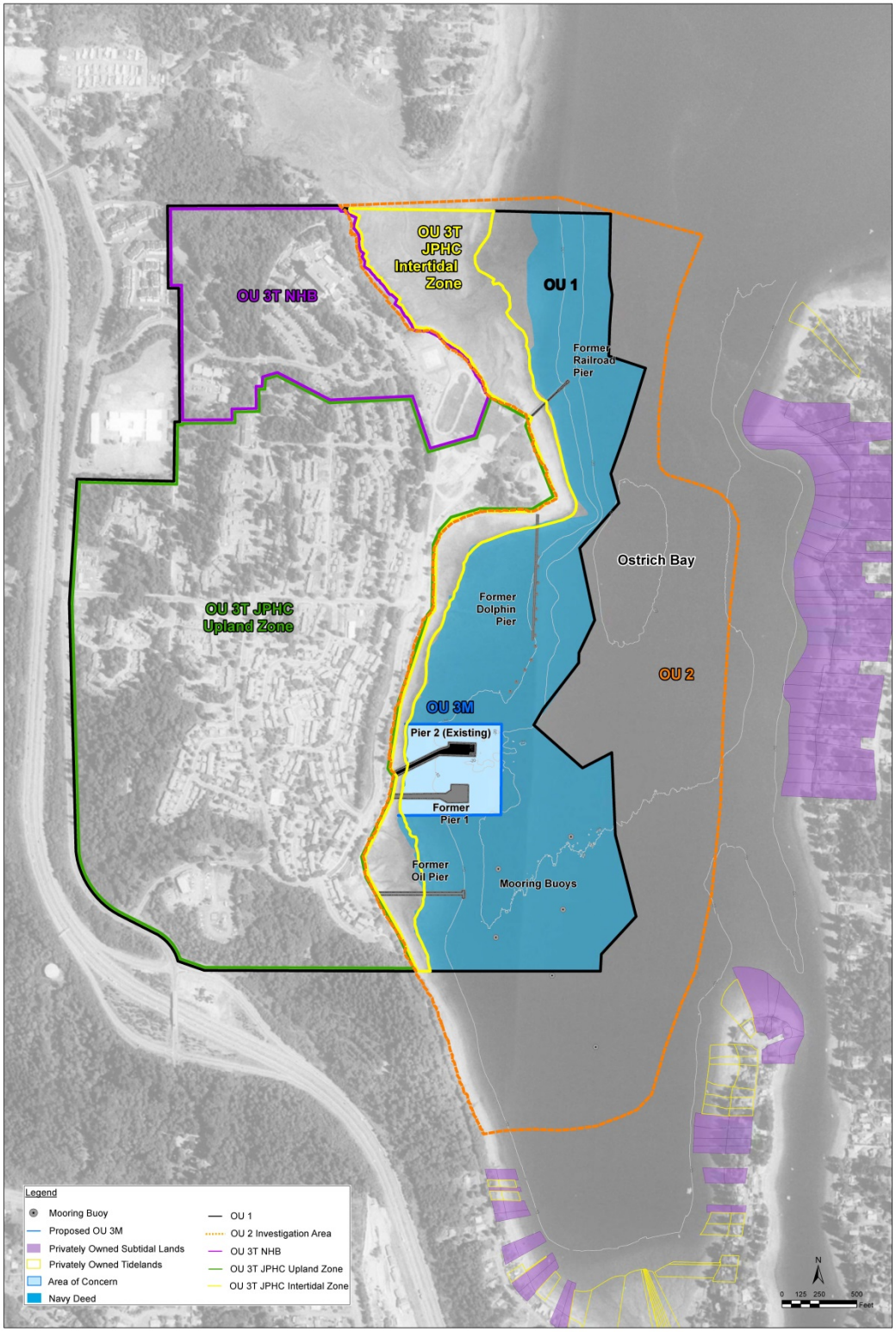

Figure 3. JPHC/NHB Operable Units

Figure 4. Military Munitions Recovered during the RI

ENVIRONMENTAL SETTING

Ostrich Bay is an appendage of Dyes Inlet, which connects to Puget Sound via the Port Washington Narrows. It is approximately 0.5 mile wide and varies in depth from tidally exposed areas to approximately 12 meters (40 feet) mean lower low water (MLLW) deep. The bay is generally shallow with depths averaging 4.5 meters (15 feet). It deepens toward mid-channel and in the previously dredged area next to an abandoned military munitions handling pier (Pier 1). The deepest part of Ostrich Bay is located southeast of Elwood Point. Two tide flats, exposed during low tide, are found to the north of Elwood Point and to the south of Pier 1. Located to the east of Ostrich Bay is the Port Washington Narrows, a constricted inlet that enables tidal exchange with central Puget Sound.

Ostrich Bay is part of the Port Orchard circulation system, which includes Liberty Bay, Agate Pass, Port Orchard Narrows, Rich Passage, Sinclair Inlet, Port Washington Narrows, and Dyes Inlet. The average tidal range in Dyes Inlet is approximately 2.6 meters (8.5 feet), with a mean tide level of 2.2 meters (7.2 feet). During spring tide conditions, a maximum range of 5.4 meters (18 feet) between high and low tides can be observed. Current speeds in Dyes Inlet are relatively weak, averaging 5 centimeters per second (0.1 knot). Data on current velocity for Ostrich Bay were not available, but weak currents similar to upper Dyes Inlet are probable.

Ostrich Bay's environment is net depositional, with rates of natural sedimentation calculated to range from 0.3 to 0.8 centimeter per year for midbay and nearshore areas. Sedimentary material in Ostrich Bay originates from suspended material transported through Port Washington Narrows or from local shoreline erosion, not from resuspension and transport from northern Dyes Inlet. In addition, fine-grained sedimentary material, once deposited in Ostrich Bay, does not resuspend or move north to Dyes Inlet. The trend for sediment movement is from the north, with fine-grained suspended material in the water column depositing throughout southern Dyes Inlet and then Ostrich Bay on the incoming and slack tide. Surface sediments in the offshore area of the site range from medium and fine sands to silt with increasing percentages of medium sands toward the shoreline.

SUMMARY OF ORDNANCE INVESTIGATIONS AND REMOVALS

The Navy has conducted an extensive amount of work at the site over more than 30 years of investigation and removal activities and, with the exception of the 10 acres in the vicinity of Pier 2, all known MEC and MPPEH have been removed and destroyed. Within the 10-acre area, the density of metallic debris precludes the use of divers to investigate individual anomalies; therefore, this area is the focus for development of remedial alternatives.

The site investigations, environmental studies, feasibility studies, removal actions, and remedial actions that have been performed for OU 3M include the following:

- 1981 – Explosive ordnance disposal (EOD) detachment clearance
- 2000 to 2001 – OU 1 ROD remedial action
- 2000-2001 – OU 3M time-critical removal action (TCRA)
- 2006 – Phase 1 RI
- 2008 – EPA diving
- 2008 – EOD diving
- 2009-2010 – Phase 2 RI and pilot study
- 2014-2015 – Phase 3 RI
- 2014 – Underwater habitat survey
- 2016 – Final RI/FS

Table 1 summarizes the results of these studies. The MEC at this site is a 20 mm projectile or larger (by net explosive weight) containing HE, including fuze components that may contain small quantities of explosives.

During investigation and removal activities conducted prior to beginning the RI investigations, more than 10,000 MEC and/or MPPEH items were recovered from Ostrich Bay in the vicinity of the two piers. Because locational information is not available for the investigations and removals were conducted prior to the RI, this information was not used in summarizing the nature and extent of contamination for OU 3M.

During the RI, geophysical surveys were conducted in 2006 and 2009 that covered all of Ostrich Bay. A total of 1,185 anomalies were identified during these two geophysical surveys. Of the 1,185 anomalies detected, 1,128 were investigated intrusively by divers. The remaining 57 anomalies were not selected for investigation because the anomaly attributes did not meet the criteria for investigation. At the conclusion of the three phases of the RI, 100 percent of the geophysical anomalies selected for investigation located outside of the 10-acre area around the pier were investigated, and all MEC and/or MPPEH identified during the RI were recovered. Therefore, there is no known MEC or MPPEH remaining in the bay outside the 10-acre area surrounding the piers.

Phase 2 of the RI also included a pilot study and a surface beach sweep of the south and west shores of Ostrich Bay. During the pilot study, an additional geophysical survey was conducted in the pilot study area north of Pier 2. All 50 anomalies identified during this geophysical survey were investigated. Following the investigation of the 50 anomalies, four different methods to recover MEC and/or MPPEH were tested in four test lanes of the pilot study area. During the surface beach sweep, the south and west shores of Ostrich Bay were inspected for items of military origin, including MEC and/or MPPEH. Beach inspections were conducted only on properties where the Navy was able to obtain authorization to access the property. Of the 122 properties proposed for the beach sweep, the Navy obtained access agreements for 102 properties. Therefore, 85 percent of the area proposed for the beach sweep, or 35 acres, was included in the surface beach sweeps. No items of military origin were found during the surface beach sweep.

MEC was recovered from Ostrich Bay as summarized below:

- A total of 55 DMM items were recovered from 22 anomaly locations during the three phases of the RI.
- A total of 16 DMM items were recovered from six locations during the Phase 2 pilot test (3 DMM items were recovered from three geophysical survey anomaly locations, and the remaining 13 DMM items were recovered during the equipment-testing operations from within three of the four pilot test lanes).

The results of the three phases of the RI, not including the Phase 2 pilot study, are summarized on Figure 5. Less than 2 percent of the 1,128 investigated anomaly locations contained DMM-HE. In addition, the locations where MEC or MPPEH was found were co-located near piers, mooring buoys, and transit lanes, all areas where munitions were handled or transported. MEC or MPPEH was not found to be scattered throughout the bay. Furthermore, 56 percent of the 55 DMM-HE items were recovered from two locations, both of which are near the former ammunition loading railroad pier on Elwood Point. The remaining items were recovered in areas proximal to the former NAD Puget Sound piers, mooring buoys, and/or transit lanes. No items related to military operations were located near private property on the south and east shores of Ostrich Bay. Therefore, the distribution of MEC and/or MPPEH recovered from Ostrich Bay is consistent with incidental loss during the operating history of the site. All military munitions found at the JPHC/NHB site, including subtidal areas of Ostrich Bay, have been unfired/unarmed DMM. Therefore, there is no indication of any detonation of DMM at JPHC, NHB, or in Ostrich Bay. In addition, the RI identified no evidence of intentional, systematic disposal of MEC or MPPEH at OU 3M.

Table 1. Summary of Site Investigations, Environmental Studies, Feasibility Studies, Removal Actions, and Remedial Actions Related to OU 3M

Previous Investigation, Study, or Removal/Remedial Actions	Date	Summary of Activities
EOD Detachment Clearance	1981	Navy divers performed an investigation and removal near Pier 2 and former Pier 1 locations. Recoveries were extensive and ranged from small arms ammunition to a single anti-submarine "Hedgehog" rocket. During this removal action, 9,818 DMM items were recovered.
OU 1 ROD Remedial Action	2000–2001	A military munitions clearance was conducted in support of removal of mooring dolphins, pilings, the railroad pier, and fender piles north and south of Elwood Point and along Pier 2. During this removal action, 270 DMM items were recovered from the vicinity of Pier 2.
OU 3M TCRA	2000–2001	An investigation and clearance was undertaken near Pier 2 and former Pier 1 based on the MEC and MPPEH discoveries during the OU 1 fender pile removal. Numerous items, including 733 DMM-HE, were recovered from around the piers. Work also included investigations in the central portion of Ostrich Bay to define the limits of MEC and/or MPPEH contamination.
Phase 1 RI	2006	A demonstration of marine magnetometer capabilities, a geophysical survey, and diving were conducted. The survey encompassed the areas surrounding the piers, Elwood Point, and the likely shipping lanes into and out of Ostrich Bay. Over 600 anomalies were identified in the survey, of which 102 were selected for investigation by Navy divers. No MEC or MPPEH was recovered, and no munitions-related items were found in Ostrich Bay beyond the pier areas.
EPA Diving	2008	EPA divers swam transects as part of a biological survey of Ostrich Bay in January 2008 to observe and document bottom conditions. No MEC or MPPEH was reported by the EPA divers. EPA divers did observe a shell casing during the dive.
EOD Diving	2008	Navy divers swam transects in Ostrich Bay in April 2008 to investigate the EPA-observed shell casing and document bottom conditions closer to the piers. The shell casing was removed and determined to be munitions debris. No MEC or MPPEH was observed around the pier area.
Phase 2 RI and Pilot Study	2009–2010	Three principle activities were accomplished during the Phase 2 RI—beach sweeps for MEC or MPPEH that may be present in the intertidal area on the south and east sides of Ostrich Bay, a geophysical survey of the southern and eastern portions of Ostrich Bay that were not surveyed as part of the Phase 1 RI, and diving on additional selected anomalies to ensure that the data have been collected to adequately define the nature and extent of MEC and/or

Previous Investigation, Study, or Removal/Remedial Actions	Date	Summary of Activities
		MPPEH. The pilot study included an evaluation of three sediment removal techniques and three sediment screening techniques. A total of 822 anomaly locations were investigated, including anomalies identified during both the Phase 1 and Phase 2 RI geophysical surveys. The Phase 2 RI resulted in the recovery of 48 DMM items from 18 locations. In addition, 16 DMM items were recovered during the pilot study. No items of military origin were identified or recovered during the beach sweep operation.
Phase 3 RI	2014-2015	Diver investigations were conducted as part of the Phase 3 RI over two field seasons. These included an investigation of the remaining accessible uninvestigated anomalies from the 2006 and 2009 geophysical surveys, a reinvestigation of a subset of previously investigated anomaly locations, and expanded (step-out) diver investigations in areas surrounding locations where MEC or MPPEH was recovered during Phases 2 and 3 of the RI. The Phase 3 RI resulted in the recovery of seven DMM-HE items from five anomaly locations, which included recovery of one DMM-HE item from an anomaly location that was previously investigated during the Phase 2 RI.
Underwater Habitat Survey	2014	An underwater habitat survey and assessment of the 10-acre area surrounding Pier 2 was performed during Phase 3 of the RI. This survey included an assessment of bottom conditions and potentially harvestable resources (i.e., sea cucumbers, Olympia oysters, and geoduck). The substrate of the surveyed area primarily consisted of sand and silt, with the exception of larger grain sized sediments (pea gravel) and shell hash being dominant in the areas immediately below and in proximity to Pier 2. Species observed during the habitat survey included two species of macroalgae, two species of fish, moon snails, cockles, giant plumose anemones, two species of crabs, sea cucumbers, and three species of clams.
Final RI/FS	2016	The Final RI/FS was completed and included results of all three phases of the RI. During the three phases, 100 percent of accessible geophysical anomalies were investigated and removed, and no known MEC or MPPEH remained in the bay outside of the OU 3M boundaries. The boundary of OU 3M was found to be an approximately 10-acre area surrounding Pier 2.

Table Notes:
DMM – discarded military munitions
DMM-HE – discarded military munitions containing high explosive
EOD – explosive ordnance disposal
EPA – U.S. Environmental Protection Agency
FS – feasibility study
M – marine
MEC – munitions and explosives of concern
MPPEH – material potentially presenting an explosive hazard
OU – operable unit
RI – remedial investigation
ROD – record of decision
TCRA – time-critical removal action

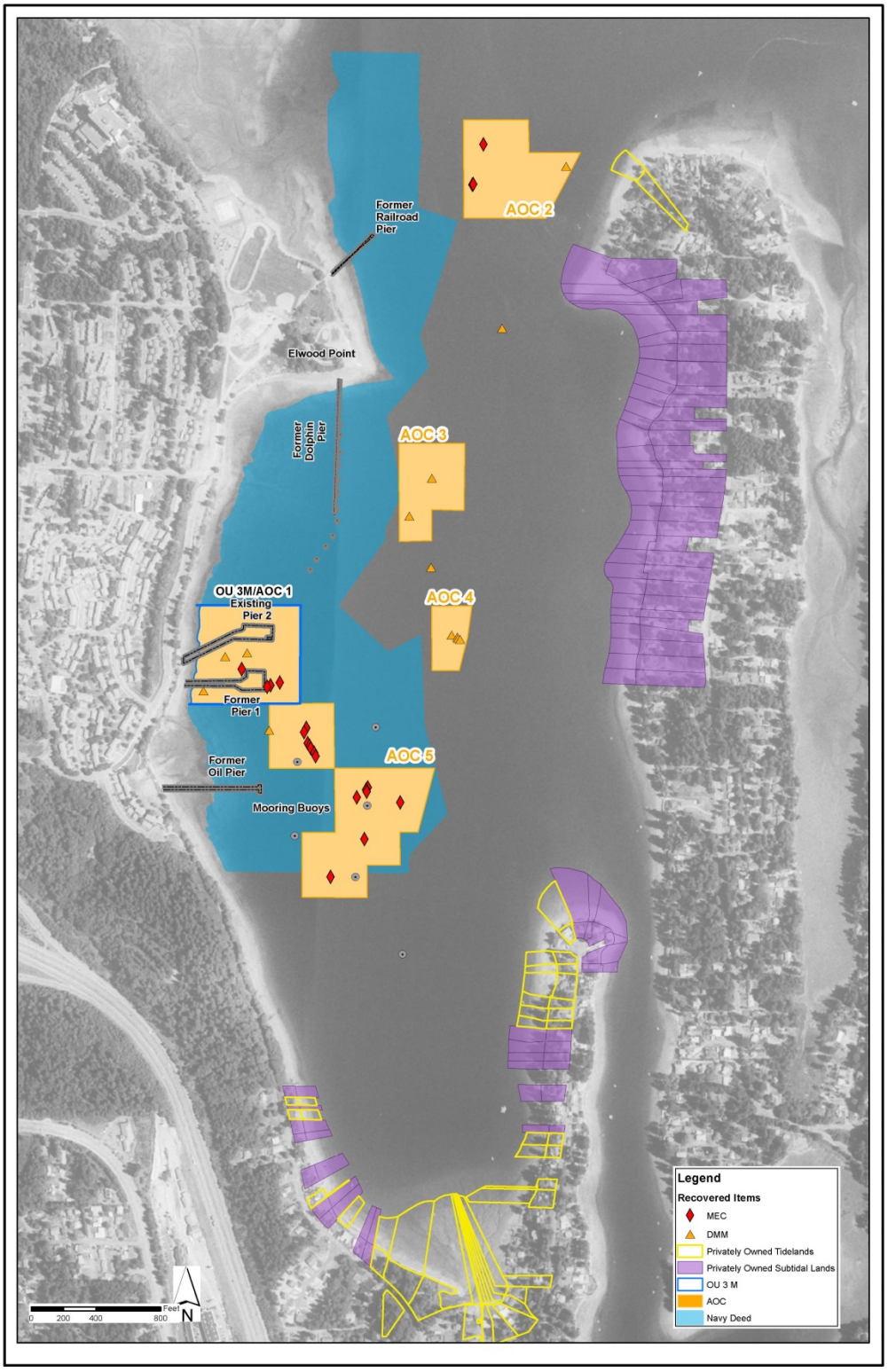

Figure 5. Results of the RI

DEPARTMENT OF DEFENSE NOTIFICATION REQUIREMENT

The Department of Defense (DoD) requires munitions notification in all areas where munitions have been found. At the request of the Navy, the National Oceanic and Atmospheric Administration (NOAA) added a cautionary note to two nautical charts in 2015: 18449 and 18474. These nautical charts indicate where munitions were found in Ostrich Bay in the past, label these areas as UXO areas, and include the following cautionary note:

CAUTION
UNEXPLODED ORDNANCE

> Mariners and divers are cautioned against anchoring, dredging, trawling or otherwise disturbing the bottom sediments in this vicinity due to the possible existence of unexploded ordnance. For additional information contact Naval Base Kitsap Public Affairs Office at (360) 627-4030.

SCOPE AND ROLE OF OPERABLE UNIT

In 1994, the site was listed on the CERCLA NPL. Following listing, the site was divided into three OUs for site investigation and remediation activities: OU 1, OU 2, and OU 3. Generally, these three OUs address different receptor types (human or ecological) and different contaminant types (chemical or ordnance) as follows:

- OU 1 addresses human health risks from chemical residuals.
- OU 2 addresses ecological risks from chemical residuals.
- OU 3 addresses potential explosive hazards from ordnance.

The site was separated into two operable units in May 1995: OU 1 and OU 2. OU 1 was established to address human health risks from potential chemical impacts in soil and groundwater in the terrestrial portion of the site and ingestion of shellfish from Ostrich Bay. OU 2 was established to address ecological risks to the marine environment from potential chemical impacts on marine sediments in Ostrich Bay. In 2000, OU 3 was established to address ordnance in both the marine and terrestrial environments. Over time, OU 3 was further subdivided into three OU subunits:

- OU 3T JPHC, which consists of terrestrial (or "upland") areas, including the entire housing complex and all intertidal areas of the site between 0 meter (0 foot) MLLW and mean higher high water (MHHW)
- OU 3T NHB, which consists of terrestrial areas within the NHB property boundaries above MHHW
- OU 3M, which consists of the 10-acre subtidal area (elevations less than 0 meter [0 foot] MLLW) in Ostrich Bay that surrounds Pier 2 where MEC may still be present within the sediments (note: the OU 3T JPHC remedial action included MEC removal in the area between an elevation of 0 meter [0 foot] MLLW and -1.4 meters [-4.5 feet] MLLW.)

Remedies have been selected in the signed RODs for OU 1, OU 3T JPHC, and OU 3T NHB and the signed ROD Amendment No. 1 for OU 1. A ROD is currently under development for OU 2. Figure 3 shows the OUs associated with the site.

The preferred alternative presented in this Plan is intended to be the final remedy for OU 3M and is to be implemented after the ROD for OU 3M is signed. It is the Navy's expectation that once all anticipated actions have been completed at OU 3M, the remedy will be protective for all anticipated uses.

SUMMARY OF SITE RISKS

Current land use includes subsistence, commercial, and recreational use (e.g., fishing, diving, and boating) of the subtidal portions of Ostrich Bay, including OU 3M. Shellfish harvesting in Ostrich Bay is currently prohibited by the Kitsap County Health District (Health District) because of pollution, including bacterial contamination by other parties. The Health District advisories currently aim to prevent shellfish harvesting (tribal or nontribal) for ceremonial, commercial, recreational, or subsistence purposes because of recurring nonpoint pollution from sewage, oil, and chemicals that run off the land into the bay during heavy rainfall events. In addition, shellfish harvesting is restricted by the OU 1 ROD remedy for marine tissue, and this restriction will remain in effect until the Navy reaches concurrence with EPA, Washington State Department of Ecology, and Washington State Department of Health.

Future land use is anticipated to be the same as the current land use and may include subsistence, commercial, and recreational use (e.g., fishing, boating, diving) of the subtidal portions of Ostrich Bay, including OU 3M.

The exposure route for the contaminant of concern (DMM) is direct contact. The opportunity for contact may arise through fishing and diving, which are activities that are currently allowed without any restrictions, as discussed above. However, there have been no documented events demonstrating that contact with MEC has occurred at OU 3M. Opportunity for contact with MEC may arise in the future from commercial, subsistence, and recreational marine species harvesting, if and when the harvesting restriction is lifted.

Site risks for this OU stem from the potential for exposure to acute explosive hazards that could cause injury or death. The Navy used a qualitative weight of evidence approach to estimate the remaining explosive hazards in Ostrich Bay based on the results of the investigations and removals conducted during the RI. Based on this qualitative weight of evidence approach, the Navy concluded that only the 10-acre area around Pier 2 continues to have a risk of exposure to explosive hazards, and this risk is considered low due to the confirmed presence of MEC (DMM, not UXO). This qualitative approach considers two questions when estimating explosive hazards or risks:

- Will contact with MEC result in an explosion?
- What are the chances that a potential receptor will contact MEC?

The first question considered in evaluating the explosive hazard associated with the site is the likelihood that an encounter with an MEC item will result in an explosion. All MEC found at the site, including subtidal areas of Ostrich Bay, have been unfired/unarmed DMM. None of the munitions items found are UXO. The items found, unlike UXO, are less sensitive to external physical forces and would require significant or deliberate force to cause a detonation. It is unlikely that current and future land uses at the site would result in detonation of any MEC. This opinion is supported by Naval Ordnance Safety and Security Activity (NOSSA), the Department of Navy's technical authority on explosives safety, which agrees that the explosive hazard posed by MEC, including DMM, is significantly lower than that posed by UXO that have been fired and failed to function as intended. On this basis, NOSSA concurs that the explosive safety hazard associated with exposure to these items is low for the potential current and future land uses.

The second question listed above is discussed separately for outside and inside the 10-acre area around Pier 2. At the conclusion of the RI, 100 percent of the geophysical anomalies outside of the 10-acre area around Pier 2 were investigated, and all MEC and/or MPPEH identified during the RI were recovered. Therefore, there is no known MEC or MPPEH remaining in the areas of the bay outside the 10-acre area surrounding Pier 2, and the probability of an encounter with MEC or MPPEH is considered at or near zero. Based on this, the area outside of the 10-acre area is designated for unlimited use/unlimited exposure (UU/UE) and is not included within the OU 3M boundary.

The geophysical survey conducted in the 10-acre area around Pier 2 showed high levels of metallic contamination in certain areas. Individual anomalies could not be identified or investigated in these areas of high metallic density, and these areas likely contain MEC and MPPEH. Based on the overall RI results for Ostrich Bay, 22 of 1,128 anomaly locations investigated contained MEC, which is approximately 2 percent of all of the locations investigated. Furthermore, for the 10-acre area, 4 of the 84 anomaly locations investigated contained MEC, which is approximately 5 percent of the locations investigated within the 10-acre area. Based on this, the potential for the receptors discussed above to contact MEC is considered to be moderate; however, the overall explosive risks are considered to be low for the 10-acre area for the activities included in the site conceptual site model (CSM).

In the Navy's judgment, remedial actions around the pier area are necessary to reduce the explosive hazard associated with contact with MEC items to levels consistent with the other portions of Ostrich Bay, and the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVE

Remedial action objectives (RAOs) were developed to protect human health and the environment in consideration of the current and anticipated future land uses of Ostrich Bay. The RAO for OU 3M is UU/UE of the subtidal areas of Ostrich Bay. Achievement of the RAO will be met by management of the potential explosive hazards from contact with MEC in sediment.

As agreed to by the project team during development of the RI work plans, the contaminant of concern or item of interest for OU 3M is a 20 mm projectile or larger (by net explosive weight) containing HE, including fuze components that may contain small quantities of explosives. The Navy has investigated for and removed all identified MEC/MPPEH items outside the 10-acre area, and considers MEC to be of potential concern at the site only within the 10-acre area. There are no chemical contaminants of concern for OU 3M.

SUMMARY OF REMEDIAL ALTERNATIVES

The Navy developed four remedial alternatives for MEC items in the RI/FS to satisfy the RAO (Figure 6). The alternatives were developed considering the results of prior removal actions, results of the RI, and the expected current and future land uses. These four alternatives include the following:

- Alternative 1 – No Action
- Alternative 2 – Land Use Controls
- Alternative 3 – Engineered Cap with Land Use Controls
- Alternative 4 – Targeted Dredging, Sediment Screening, and Recovery of MEC, and Diver Verification

Summary descriptions of these alternatives are provided below, and the estimated costs for implementing these alternatives are summarized in Table 2 for the full 500-year implementation period until all explosive risks are removed due to disintegration of the items over time. Based on the detailed analysis of the alternatives (see Evaluation of Alternatives Section below), Alternative 4 is the preferred alternative for OU 3M. A more detailed description and evaluation of the alternatives is provided in the RI/FS.

Table 2. Summary of Costs to Implement the Alternatives

Alternative	Capital Cost	Operation, Maintenance, and Monitoring	5-Year Review Costs	Present Worth[1]	Future Worth[2]	Present Value[3]
Alternative 1	$0	$0	$0	$0	$0	$0
Alternative 2	$2,871,000	$0	$2,640,000	$5,511,000	$4,481,925,000	$3,213,000
Alternative 3	$7,949,000	$1,084,000	$2,640,000	$11,673,000	$6,933,770,000	$8,766,000
Alternative 4	$11,730,000	$0	$0	$11,730,000	$11,730,000	$11,730,000

[1]Present worth – The total cost of the work in today's dollars.

[2]Future worth – The total cost of the work in future dollars assuming a 2% discount rate.

[3]Present value – The amount of money that would need to be set aside at the start of the remedy implementation to cover its cost over the full 500-year implementation period assuming a 1.5% discount rate.

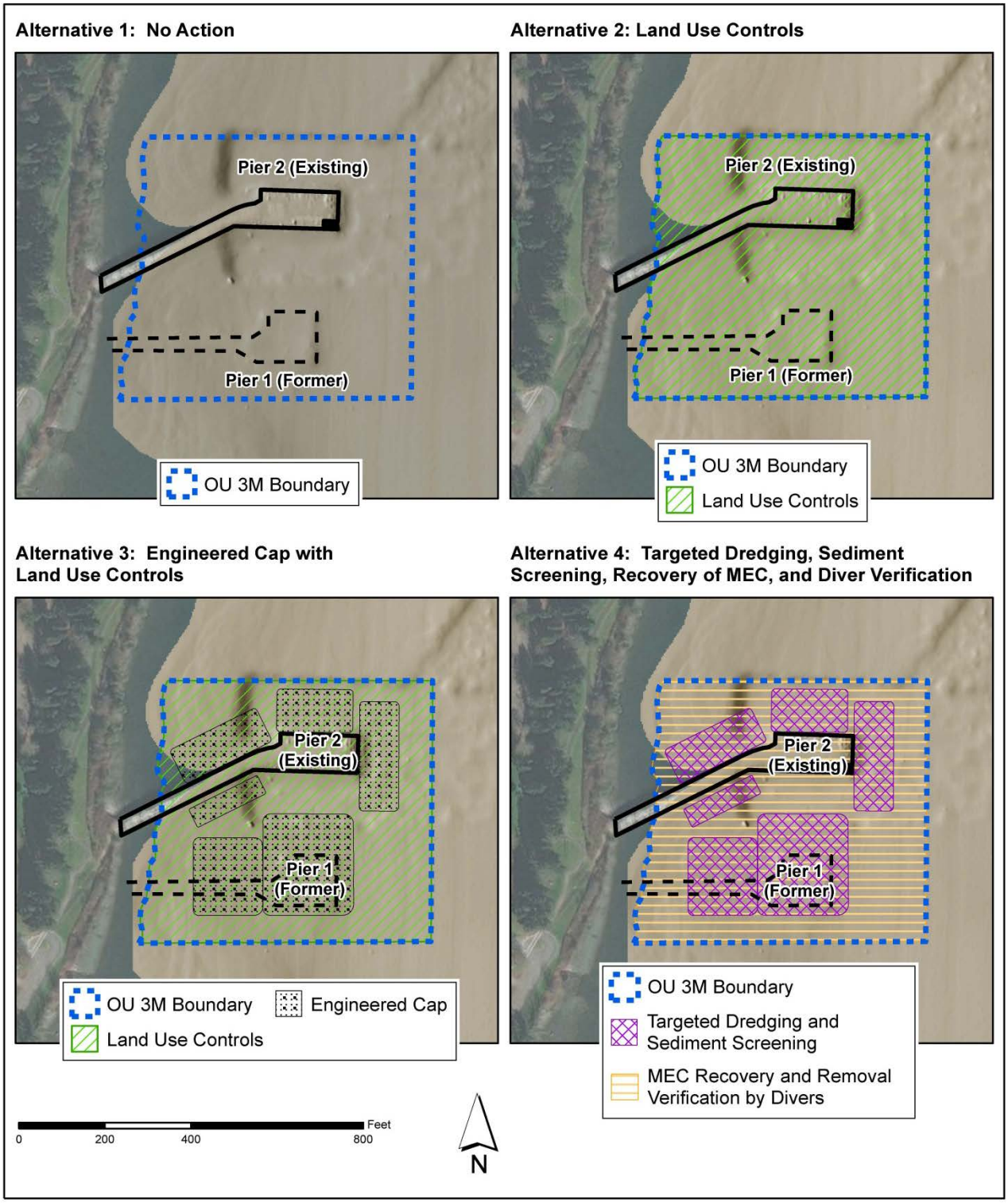

Figure 6. Remedial Alternatives 1, 2, 3, and 4

Alternative 1 - No Action

This alternative provides a baseline against which to compare the performance and effectiveness of the other alternatives and is required to be evaluated by CERCLA. The No Action alterative provides a basis for determining whether a remedial action is necessary at a site and can only be selected if the RI/FS reveals that there are no remaining unacceptable human health or environmental risks at the site. The No Action alternative assumes that no remedy components would be implemented, including any form of land use control (LUC). Therefore, there would be no munitions-related restrictions on future use of OU 3M, and no additional actions would be taken to locate, remove, or dispose of any potential MEC or non-munitions scrap.

Alternative 2 - Land Use Controls

Alternative 2 consists of the following LUC: use of and access to the 10-acre subtidal area (elevations less than 0 meter [0 foot] MLLW) around Pier 2 would be restricted (note: the OU 3T JPHC remedial action included MEC removal in the area between an elevation of 0 meter [0 foot] MLLW and -1.4 meters [-4.5 feet] MLLW). This LUC comprises a response action designed to limit the public's exposure to MEC items that remain in the subtidal areas surrounding Pier 2, while not containing or removing/treating the source of contamination. This alternative would not meet the RAO of UU/UE of the subtidal areas of Ostrich Bay.

The LUC implemented by this alternative would include a public notice identifying the potential explosive hazard remaining at OU 3M and restricting entry and use of the area. To implement this LUC, the NOAA nautical chart for Ostrich Bay would be permanently amended to show the location of OU 3M and state that this area contains MEC and use of the area, including any shellfish harvesting, is restricted. The LUCs under this alternative are estimated to take 1 year to implement and would remain in effect for approximately 500 years or until such time when MEC is no longer present at the site. If this alternative were selected, OU 3M would be subject to 5-year reviews because CERCLA requires remedial actions that result in any hazardous substances, pollutants, or contaminants remaining at the site that do not allow UU/UE be subject to 5-year reviews.

Alternative 3 – Engineered Cap with Land Use Controls

Alternative 3 consists of LUCs, an engineered cap, and long-term sampling. The LUC component of this alternative would consist of a dig restriction in the cap area. Any digging in this area would be limited to commercial, subsistence, and/or recreational shellfish harvesting by divers to a depth of 1.2 meters (4 feet) in the substrate. This is the maximum depth that a geoduck harvester would dig based on the maximum shellfish burrow depth. To implement this LUC, the NOAA nautical chart for Ostrich Bay would be amended to show the location of the OU 3M cap area and state that digging is limited to recreational, commercial, and/or subsistence shellfish harvesting to a maximum depth of 1.2 meters (4 feet). All other digging in this area would be restricted.

The capping component of this alternative is a containment action that would be used to prevent exposure to potential MEC that exists within the approximate 5-acre dredge cut perimeter of Pier 2 (Figure 6). A sediment cap consisting of a 6-inch reactive barrier layer of granulated activated charcoal as the lower layer, a 1-foot layer of armor quarry spall, and a 4-foot layer of sand habitat mix as the upper layer would be constructed in the existing dredge cut surrounding Pier 2. No cap material would be placed outside of the dredge cut area within the remaining approximately 5 acres of the total 10-acre area of OU 3M. The engineered cap is estimated to take 2 years to design and install. The design life of the reactive barrier is unknown and would be evaluated based on the sampling plan described below.

The long-term sampling component of this alternative would include sampling of munition constituents to verify that any remaining military munitions are not releasing munition constituents to the environment. Although munition constituents are not contaminants of concern for OU 3M, the Navy has agreed to include this sampling based on an agreement with EPA. The long-term sampling program would include 10 sampling events over a 500-year timeframe. In addition, the cap would be monitored and maintained for 500 years, and the dig restriction would remain in effect for 500 years or until MEC was no longer present at OU 3M (e.g., through a removal action). This timeframe was agreed upon by the Navy and EPA in July 2013. Because LUCs are required for this site, this alternative would not meet the RAO of UU/UE of the subtidal areas of Ostrich Bay. However, this alternative would allow recreational, commercial, and/or subsistence shellfish harvesting to a maximum depth of 1.2 meters (4 feet) and all other recreational activities identified for Ostrich Bay. OU 3M would be subject to 5-year reviews because CERCLA requires remedial actions that result in any hazardous substances, pollutants, or contaminants remaining at the site that do not allow UU/UE be subject to 5-year reviews.

Alternative 4 - Targeted Dredging, Sediment Screening, and Recovery of MEC, and Diver Verification

Alternative 4 consists of recovery of MEC and is the only alternative that includes treatment and that meets the RAO. This alternative is estimated to take 3 years to design and implement. The alternative consists of three elements: targeted dredging to remove metals from areas saturated with metallic anomalies, diver verification and inspection to ensure removal of MEC from dredged areas, and diver investigation and removal of MEC from areas where discrete anomalies can be identified.

Dredging would be performed in targeted areas of high metallic debris based on the geophysical survey within the 10-acre area surrounding Pier 2. The area to be dredged would be determined during the dredging operations and is estimated to be between 2.5 and 5 acres with an average depth of 1 meter (3 feet). To be conservative, the costs for implementing Alternative 4 were estimated assuming 5 acres would require dredging. The dredged materials would be processed through screens mounted over bottom-dump scows; screens would be sized to remove 20 mm and larger MEC. The scows would hold the screened material until the divers performed an investigation of the dredged area with metal detectors to verify the area is free of metallic debris and ensure no MEC or MPPEH was missed during the dredging. Divers would investigate discrete anomalies individually, in areas where dredging was not implemented. The combination of divers and dredging provides an actual removal depth of 1.5 meters (5 feet) assuming the detection and removal of MEC and/or MPPEH to a depth of 0.6 meter (2 feet) below the dredge cut surface by the divers. Divers would also investigate and remediate the area under the deck of Pier 2 using handheld metal detectors to survey, investigate, and remove metallic anomalies.

After the verification dives, the screened material would be returned to the dredged area by opening the bottom-dump scow. After the material is returned to the bottom, the divers would verify that the margins of the targeted dredged areas are clear of 20 mm or larger MEC/MPPEH by searching the perimeter of the dredge cut in 25-foot grid squares until an MEC/MPPEH-free square is located. The grid squares surrounding the MEC/MPPEH-free square would also be searched to verify they too are clear.

Any MEC and MPPEH recovered during dredging or by the divers would be appropriately managed in a manner similar to that performed during the Phase 3 RI. For MEC, this may include temporary storage of MEC in an underwater cage or within a properly sited explosives magazine and subsequent on-site treatment of MEC using a buried explosive module.

When dredging and diver investigation and removal have been completed, there would be no restrictions on use or access within the area around Pier 2. This alternative would meet the RAO of UU/UE because removal of 100 percent of the identified anomalies would have been completed. Because no hazardous substances, pollutants, or contaminants would remain at the site, OU 3M would not be subject to 5-year reviews if this alternative were selected.

APPLICABLE, RELEVANT, AND APPROPRIATE REQUIREMENTS (ARARS)

Applicable, relevant, and appropriate requirements (ARARs) are any standards, requirements, methods of control, or limitations specified in federal or state environmental laws and regulations. These requirements may specify a cleanup level or method of controlling an action or put limitations on where or how a remedial alternative can be implemented. These ARARs must be met or a waiver justified. There are two types of ARARs: “applicable” and “relevant and appropriate.” “Applicable” requirements are specifically identified in the law or regulation to apply to the remedial alternative. “Relevant and appropriate” requirements are not identified in the law or regulation as being applicable; however, relevant and appropriate requirements address a problem or issue at the site that is similar to what the regulation or law addresses and is important to meet in implementing the alternative. To-be-Considered (TBCs) are non-promulgated advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential ARARs. However, in many circumstances, TBCs are considered along with ARARs and may be used in determining the necessary level of cleanup for protection of health or the environment. Activities conducted entirely on a site need only comply with the substantive aspects of ARARs and not the administrative aspects, such as permitting, which are specifically exempted under CERCLA Section 121[e]. There are three categories of ARARs:

- **Chemical-specific ARARs** – set health or risk-based concentrations in environmental media (i.e., soil, sediment, groundwater, surface water) for specific hazardous substances, pollutants, or contaminants.
- **Action-specific ARARs** – set controls or restrictions on particular types of activities included in the selected remedial alternative. These ARARs may specify performance levels, actions, or technologies to be used to manage hazardous substances, pollutants, or contaminants.

- **Location-specific ARARs** – set restrictions on activities within geographic areas (e.g., wetlands, floodplains, shorelines) and on potential impacts to fish, wildlife, habitat, and cultural resources depending on the location of the activity and the immediate environment.

Alternatives 1 and 2 do not trigger any chemical-, action-, or location-specific ARARs because neither alternative requires any physical action to implement the alternative. However, several TBCs cover the implementation of LUCs included in Alternatives 2 and 3. In addition, a number of chemical-, action-, and location-specific ARARs apply to Alternatives 3 and 4 because these alternatives include intrusive activities being implemented in navigable waterways. The following list outlines the key TBCs and chemical-, action-, and location-specific ARARs applicable to Alternatives 2, 3, and 4:

- Alternatives 1, 2, 3, and 4 trigger the following TBC related to the presence of potentially explosive munitions:
  - DoD Ammunition and Explosives Safety Standards, 6055.9-STD, which specify that maximum possible protection must be provided for people and property from the damaging effects of DoD military munitions (explosive and chemical)
- Alternatives 2 and 3 trigger the following key TBCs related to the implementation of LUCs:
  - EPA Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities is applicable to alternatives that include LUCs
  - DoD Ammunition and Explosives Safety Standards, 6055.9-STD, which specify that written notification to the public must be provided following completion of a response action that includes a LUC
- Alternatives 3 and 4 trigger the following key TBC related to military munitions cleanup actions:
  - DoD Ammunition and Explosives Safety Standards, 6055.9-STD, which specify the appropriate clearance depths to protect receptors for the planned land use (cover depth for Alternative 3 and clearance depth for Alternative 4)
- Alternatives 3 and 4 trigger the following key ARARs related to dredge and fill operations that could impact water quality; affect threatened and endangered species, migratory birds and bald or golden eagles, marine mammals, and essential fish habitat; and could affect historical or cultural resources:
  - Clean Water Act, which contains water quality standards and specifies requirements for dredging and filling of navigable waters of the U.S.
  - Clean Air Act, which specifies requirements to control releases of fine particulate emissions
  - Endangered Species Act, which specifies that any actions do not result in the "take" of a listed species or the destruction/alteration of critical habitat
  - Section 10 of the Rivers and Harbors Act for work in a navigable waterway
  - Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act, the Migratory Bird Treaty, the Bald and Golden Eagle Protection Act, and the Marine Mammal Protection Act, which require the protection of these wildlife resources
  - National Historic Preservation Act, which requires the identification and protection of historic properties and cultural resources eligible for listing on the National Register of Historic Places
  - Native American Grave Protection and Repatriation Act, which provides protection for Native American human remains and funerary objects
  - Washington Sediment Management Standards, which require protection and maintenance of beneficial sediment uses, specify no further degradation of sediments that would interfere with or damage existing beneficial uses, and provide a management and decision process for the cleanup of contaminated sediment sites
- Alternative 4 alone triggers the following key ARARs because this is the only alternative that includes dredging and the recovery of MEC from the site, with possible on-site treatment:
  - Resource Conservation and Recovery Act (RCRA), which specifies requirements for on-site management and treatment of hazardous waste (which includes DMM-HE)
  - RCRA Military Munitions Rule, which specifies requirements for management of military munitions
  - Hazardous Materials Transportation Act, which specifies requirements for transportation of hazardous materials
  - Clean Air Act, which specifies requirements for releases of air pollutants from treatment operations
  - Dredged Material Management Program, which regulates testing and decision-making regarding the disposal of dredged sediments

EVALUATION OF ALTERNATIVES

The Navy evaluated remedial alternatives for OU 3M using the nine CERCLA criteria described in the CERCLA Evaluation Criteria Box. The first two criteria are called threshold criteria. They must be met by the preferred remedial action alternative. Criteria 3 through 7 are balancing criteria, which are used to compare the alternatives. The final two criteria, Criteria 8 and 9, are modifying criteria, which are evaluated after receiving public and state comments on the cleanup action alternatives. They are not evaluated in this Plan. The evaluation of each of the alternatives using these criteria is described below and in greater detail in the RI/FS. Figure 7 graphically summarizes the comparative evaluation of the proposed alternatives.

Overall Protection of Human Health and the Environment

This threshold criterion evaluates a remedial alternative's ability to provide adequate protection of human health and the environment and evaluates how potential explosive hazards are effectively eliminated or reduced through controlling exposures by treatment, engineering controls, or institutional controls.

There has been no previously recorded explosive safety incident or near incident at the site. No restrictions have been in place that limit access to or use of any part of Ostrich Bay subtidal lands, including the area around Pier 2. Because none of the MEC items found to date has been fired or used for their intended purpose, the explosive hazard associated with the items that have been found at the site is significantly lower than for fuzed and fired items that might be found on a former active training range.

CERCLA Evaluation Criteria

Threshold Criteria

1. **Overall protection of human health and the environment**: This criterion evaluates a remedial alternative's ability to provide adequate protection of human health and the environment and evaluates how potential explosive hazards are eliminated or reduced through treatment, engineering controls, or institutional controls.
2. **Compliance with ARARs**: This criterion is used to determine how each proposed alternative complies with federal and state standards, requirements, criteria, or limitations under federal or more stringent state environmental or facility siting law, or if a waiver is required and how it is meets the criteria for an ARAR waiver under CERCLA Section 121(d)(4).

Balancing Criteria

3. **Long-term effectiveness and permanence**: This criterion addresses the ability of the cleanup action to protect human health and the environment over time. The factors to be evaluated include the adequacy, suitability, capabilities, and limitations of current technologies, and the long-term reliability and enforceability of management controls for providing continued protection from residual hazards.
4. **Reduction of toxicity, mobility, and volume through treatment**: This criterion addresses the statutory preference for selecting cleanup actions that permanently reduce the toxicity, mobility, or volume of the contaminants.
5. **Short-term effectiveness**: This criterion addresses how quickly the cleanup action is able to protect human health and the environment and its potential to create adverse effects during construction and implementation.
6. **Implementability**: This criterion addresses the feasibility of implementing a proposed alternative and the reliability of the supply of various services and materials that would be required during its implementation.
7. **Cost**: This criterion addresses costs to build, operate, and maintain the cleanup action.

Modifying Criteria

8. **State and Tribal acceptance**: This criterion evaluates whether, based on its review of the project documents and the Plan, the state agrees with, opposes, or has no comment on the preferred alternative. This criterion is determined after reviewing comments received on this Plan from the state.
9. **Community acceptance**: This criterion evaluates whether the public agrees with, opposes, or has no comment on the preferred alternative. This criterion is determined after reviewing the public comments received on this Plan.

Alternatives 1 and 2 may not provide protectiveness, as it is not known whether MEC is present in the 10-acre area surrounding the existing Pier 2 and the former Pier 1. The degree to which the components of Alternative 3 are more protective than Alternatives 1 or 2 is largely dependent on whether any MEC items are actually present in the area being capped (existing dredge cut; approximately 5 acres). Should MEC be present in the dredge cut area, the placement of the cap would provide a sufficient barrier to protect all anticipated receptor groups, as identified in the current CSM, from contact. The sediment cap installation does not provide protection for the entire footprint of the 10-acre area around Pier 2; however, it does cover areas believed to have the highest concentration of potential MEC. For areas within the OU 3M boundary that are outside the perimeter of the cap, dig restrictions would provide the same level of protectiveness as Alternative 2. Alternative 4 is considered more protective than Alternatives 1, 2, or 3 because this alternative provides the most comprehensive treatment option. It includes the use of targeted dredging and diver verification to screen areas of high metallic concentration sediments in the targeted area, estimated to be between 2.5 to 5 acres, within the 10-acre area, and diver investigation and removal for any discrete anomalies or areas where dredging is not practical within the remainder of the 10-acre area.

Alternatives 1 and 2 do not involve any physical actions to investigate or remove potential MEC from OU 3M. Therefore, Alternatives 1 and 2 do not have direct short-term impacts on the environment. The short-term impacts to the environment from Alternatives 3 and 4 are much higher than those from Alternatives 1 and 2 because these alternatives include extensive disturbance of the environment during dredging and/or filling operations. Fairly widespread displacement and/or mortality to benthic flora and fauna could occur for Alternatives 3 and 4, and recovery of the benthic habitat would probably require months to years. In addition, both Alternatives 3 and 4 would cause turbidity during construction of the remedy (dredging and/or filling), with the most turbidity caused by Alternative 4 because that alternative includes both dredging and filling.

Compliance with ARARs

This threshold criterion is used to evaluate how each proposed alternative complies with applicable or relevant and appropriate federal and state statutory requirements, or if a waiver is required and how the waiver is justified. If no ARARs are available, other considerations such as policies, guidance, and advisories are evaluated as TBCs. The assessment may also address information from advisories, criteria, and guidance that the lead and support agencies designate as TBCs.

Several of the chemical-specific, location-specific, and action-specific ARARs and TBCs would be directly applicable to the response actions being considered for OU 3M. The majority of these requirements would apply to alternatives that include active remedial actions (dredging and/or filling), as discussed in the ARARs section above. The ARARs and TBCs associated with each alternative are discussed in more detail in the RI/FS. All of the alternatives are expected to comply with ARARs, and no ARAR waivers are expected to be needed for any of the alternatives.

CERCLA Criteria	Alternative 1 No Action	Alternative 2 Land Use Controls	Alternative 3 Engineered Cap with Land Use Controls	Alternative 4 Targeted Dredging, Sediment Screening and Recovery of DMM, and Diver Verification
Overall Protection of Human Health and the Environment				
Compliance with ARARs				
Long-Term Effectiveness				
Reduction of Toxicity, Mobility, or Volume				
Short-Term Effectiveness				
Implementability				
Cost				
Cost (Present Value)	$0	$3.2 M	$8.8 M	$11.7 M

Highest
High
Medium
Low
Lowest

Notes:
ARAR Applicable or relevant and appropriate requirement
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
DMM Discarded military munitions

Figure 7. Comparative Evaluation of Alternatives

Long-Term Effectiveness and Permanence

This balancing criterion evaluates the level of residual explosive hazard posed by MEC after the remedial alternative has been implemented and the need to rely on LUCs to manage that residual explosive hazard. The factors to be evaluated include the adequacy, suitability, capabilities, and limitations of current technologies, and the long-term reliability and enforceability of LUCs for providing continued protection from residual explosive hazards. The shorter the duration of time that these LUCs would need to be maintained, the better the alternative would be ranked.

Alternative 4 is ranked the highest for long-term effectiveness and permanence. Because MEC is removed in targeted areas within OU 3M, it achieves the lowest level of residual hazard. However, geophysical surveys cannot detect all MEC present in the environment because of the limitations of the detection technology. Therefore, some residual risk would remain following implementation of this alternative. Alternative 4 does not rely on LUCs to protect human health and the environment after remedy implementation; therefore, the adequacy and reliability of LUCs is not a factor with this alternative.

Alternative 3 is ranked the second highest for this criterion. Because MEC present in sediments within the approximate 5-acre dredge cut perimeter of Pier 2 would be capped, this alternative achieves the next lowest level of residual risk. Although the cap would provide a sufficient barrier to protect all anticipated receptor groups in the area of the dredge cut, it does not provide protection for the entire footprint of the 10-acre area around Pier 2, although it does cover areas believed to have the highest concentration of potential MEC. Based on this, residual risks would remain outside of the 5-acre cap area. Furthermore, Alternative 3 relies on LUCs to protect human health and the environment by limiting excavation within the cap area to commercial, subsistence, and/or recreational shellfish harvesting to a depth of 1.2 meters (4 feet). Therefore, the adequacy and reliability of LUCs would have to be ensured for a 500-year period or until such time as a removal action is implemented.

Alternative 2 is ranked second lowest for long-term effectiveness and permanence. Because MEC remains in sediment within the boundaries of the OU, this alternative relies solely on LUCs to manage residual risks. The LUCs would restrict access and use of the 10-acre area. However, not all receptors may be aware of this LUC; they may not view the NOAA nautical chart and may enter the area unaware of the restrictions, or they may decide not to heed the restrictions and enter the area anyway (trespasser scenario). Therefore, residual risks are expected to be greater than with either Alternative 3 or 4. Similar to Alternative 3, the adequacy and reliability of LUCs would have to be ensured for a 500-year period with Alternative 2 or until such time as a removal action is implemented.

Alternative 1 is ranked lowest for this criterion because no actions would be implemented to reduce risks.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

This balancing criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce the toxicity, mobility, or volume of the contaminants. The factors to be evaluated include the treatment process employed; the amount of hazardous material removed and destroyed; the degree of reduction expected in toxicity, mobility, or volume; the type and quantity of treatment residuals; and whether environmental controls are necessary. The rating of an alternative's ability to reduce the toxicity, mobility, or volume of MEC relates to how much MEC that alternative removes, clears, and destroys. In addition, this evaluation considers the potential release of munitions constituents from military munitions left in place and the disturbance of potentially contaminated sediments during the implementation of the remedial action.

Alternative 4 is ranked the highest for this criterion because it would remove and treat (destroy) MEC within the 10-acre area around Pier 2, thereby reducing the toxicity, mobility, and volume of MEC. Alternative 3 is ranked the second highest for this criterion, because approximately half of the 10-acre area would be capped (which includes a reactive barrier), thereby reducing the toxicity and mobility of MEC. Alternatives 1 and 2 are ranked the lowest for this criterion because these alternatives do not include any investigation or treatment of MEC. Therefore, they do not result in any reduction in toxicity, mobility, or volume of MEC.

Although munitions constituents are not contaminants of concern for OU 3M, the potential release of these compounds is considered in evaluating the alternatives for this criterion. Because Alternatives 1, 2, and 3 leave military munitions in place within the sediment, it is possible that some would release munitions constituents into the sediment and water. Alternative 3 mitigates impacts of the potential future release of munitions constituents through the use of a reactive barrier layer in the cap, which would provide some control of these potential releases. In addition, any potential releases would occur below the sediment

cap and would therefore not be in the biologically active zone. The effectiveness of the containment of munitions constituents would be verified by sediment sampling over a 500-year period.

Although chemical residuals in Ostrich Bay sediments are not the contaminants of concern for OU 3M and were addressed by OU 1 (human health risk) and will be addressed further by the remedial action selected for OU 2 (ecological risk), both Alternatives 3 and 4 would result in the disturbance of potentially contaminated sediment during dredging and/or filling activities. Therefore, the toxicity and mobility of existing contamination in Ostrich Bay sediments was evaluated for Alternatives 3 and 4. The dredging and filling activities may increase the toxicity and mobility of contaminants within the disturbed sediments. The effects would include suspension of sediments in the water column and redistribution and mixing of sediment resulting in potentially higher chemical concentrations in the biologically active zone. However, these effects would be temporary under both alternatives and could be effectively controlled and monitored during remedy implementation. Alternative 4 is expected to cause more widespread sediment disturbance than Alternative 3 because it involves both dredging and filling actions. The results of the OU 2 sediment sampling would be used during the remedial design phase to establish procedures to mitigate the potential spread of contamination from the capping, dredging, and/or filling activities.

Short-Term Effectiveness

This balancing criterion addresses the effects of a proposed alternative on the remediation workers, the community, and the environment during its implementation and up until the time the remedial objectives have been met. Each proposed alternative is evaluated with respect to the degree to which the community and on-site workers are protected from exposure and hazard during the remedial action, and the nature and magnitude of ecological impacts associated with the implementation of the remedial alternative. The risk to workers includes exposure to MEC from handling and treatment, as well as hazards associated with methods employed to access the MEC. The risk to workers increases with increased exposure to MEC. The risks to the community typically result from increased traffic congestion, drains on community utilities and emergency services, and impacts to the air, water quality, and noise. Additional impacts to the community could occur with regard to waterway access (such as recreational boating) if exclusion zones are established during remedial operations. Risks to the environment may take many different forms depending on the extent and duration of sediment disturbance and the habitats being supported.

Alternatives 1 and 2 are ranked the highest for this criterion because no on-site construction would be performed; therefore, there are no short-term risks or impacts to the remediation workers (there are none), the community, or the environment.

Alternative 3 is ranked the next highest for this criterion. Risks to remediation workers include those associated with working over water in boats and barges. However, procedures would be in place to protect workers during remedy implementation. Impacts to the community include noise disturbance and restrictions on boating access within Ostrich Bay during remedy implementation. Risks to community members from exposure to MEC are not anticipated. The environmental impacts of this alternative would include direct impacts on populations of benthic fauna, primarily marine macro- and micro-invertebrates that reside in the sediments inside of the work area during filling (capping) operations; indirect impacts on eelgrass beds, oyster beds, or other benthic environments due to migration and deposition of suspended sediments outside of the work area; and indirect impacts on the surface water quality due to spills or releases of petroleum oils and fuel. Best management practices would be employed to minimize the potential for indirect environmental impacts.

Alternative 4 is ranked the lowest for this criterion. Implementation of Alternative 4 would result in the same risks and impacts as Alternative 3. In addition, remediation workers would experience risks associated with diving operations and with activities where MEC is transported (including recovery by divers), handled (dredging and sediment screening), and destroyed. However, procedures would be in place to protect workers during remedy implementation. Furthermore, impacts to community members and the environment would occur over a longer period of time for Alternative 4 compared to Alternative 3.

Implementability

This balancing criterion evaluates the technical, administrative, and operational feasibility of implementing a proposed alternative. The rating of alternatives based on this criterion depends primarily on whether the response is feasible for the site, can be shown to be proven reliable in its performance, can be monitored relative to its long-term effectiveness, and can be shown to not involve any insurmountable legal or administrative barriers.

Alternatives 2, 3, and 4 are considered to be equally implementable and were ranked the highest for this criterion. Each of these alternatives has minor unique challenges with regards to implementability, which are discussed below. While implementable,

Alternative 1 is not considered acceptable under Navy policy because anomalies around Pier 2 have not been investigated, which potentially leaves suspected MEC in place. Because of this, Alternative 1 is ranked the lowest for this criterion.

Alternative 2 relies upon LUCs (access restrictions) that potential receptors may not be aware of because they have not viewed the NOAA nautical chart or may choose to ignore as there are no physical deterrents to access. There are no active means of enforcement, and the only monitoring that would occur would be during 5-year reviews or in the event of a reported incident related to MEC. Furthermore, the LUCs would need to be maintained for approximately 500 years or until such time when MEC is no longer present at the site.

Alternative 3 also relies upon LUCs (dig restrictions) that potential receptors may not be aware of or may ignore. However, receptors should be protected for the anticipated land uses (commercial, subsistence, and/or recreational shellfish harvesting) because the dig restriction would allow digging by divers to a depth of 1.2 meters (4 feet), which is the maximum depth that a geoduck harvester would dig based on the maximum shellfish burrow depth. Similar to Alternative 2, the LUCs included in Alternative 3 would be maintained for approximately 500 years or until such time when MEC is no longer present at the site. In addition, sediment sampling and cap monitoring and maintenance would be performed during this period.

Although Alternative 4 does not rely upon LUCs or engineering controls that need to be maintained for a very long time, it is the most complicated alternative in terms of the construction activities to be performed. However, Alternative 4 uses proven and accepted technologies such as dredging and diver investigation using handheld detector instrumentation for remedy implementation, which would be capable of removing detected anomalies to the limits of current and accepted technology. These technologies have been proven during the RI and the pilot study.

Cost

This balancing criterion combines capital costs and operation and maintenance costs associated with implementing a remedial alternative into a total present value to facilitate comparison among the alternatives. Capital costs consist of direct and indirect costs. Direct costs include expenditures for the equipment, labor, and material necessary to perform the remedial action and are based on actual costs incurred over the past several years by the Navy. Indirect costs include expenditures for engineering, financial, and other services that are not part of the actual response activities and services but are required to complete the implementation of the remedial alternative. Operation and maintenance costs are post-construction costs required to ensure the continued performance of the remedial action. These costs are estimated and provide an accuracy of +50 percent to -30 percent, consistent with CERCLA guidance.

The preparation of cost estimates for each alternative followed the guidance document *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*.[1] Table 2 provides a summary of the costs for the four alternatives. A 500-year present value analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year (2015). This allows the cost of remedial alternatives to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover all costs associated with the remedial alternative during its planned life. A full documentation of these costs can be found in the RI/FS.

PREFERRED ALTERNATIVE

In accordance with EPA guidance, several remedial action alternatives were developed to address the explosive hazard at OU 3M and were evaluated against the CERCLA criteria used for remedy selection. The results of the alternative evaluation documented in this report support a conclusion that Alternative 3 or Alternative 4 may be considered acceptable for selection as a preferred remedy. The LUC option described in Alternative 2 was not selected because it does not lower the residual risk, it leaves the source of contamination in the sediment, and it restricts access to the areas surrounding Pier 2 for potential future subsistence and commercial harvest of marine species. Alternative 1 does not support current or future unrestricted use of OU 3M.

Alternative 3 would provide a significant reduction in explosive hazard for all receptor groups in the vicinity of Pier 2. It is the least expensive active remedial action option, at a cost of $8.8 million. It consists of the following elements:

[1] U.S. Environmental Protection Agency. 2000. *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*. 540-R-00-002. July.

- Place an engineered sediment cap in the existing dredge cut surrounding Pier 2.
- Carry out a 500-year sampling plan to test for the release of munitions constituents.

Alternative 4 would provide a similar reduction (compared to Alternative 3) to long-term residual explosive hazard for all receptor groups in the vicinity of Pier 2. It is estimated to cost $11.7 million and consists of the following elements:

- Conduct targeted dredging and sediment processing in the areas saturated with metallic debris.
- Have divers verify the effective removal of MEC within the dredged area and also establish that the boundaries of the dredged area are clear of MEC.

Alternative 4 is the Navy's preferred alternative for the following reasons:

- Alternative 4 is the only alternative that results in the removal and treatment of MEC because it includes provisions to dredge and remove sediments in areas with significant metallic anomalies (clutter).
- Alternative 4 is the only alternative that meets the RAO, UU/UE of the subtidal areas of Ostrich Bay.

Based on information currently available, the Navy believes that the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Navy expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs (or justify a waiver); 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element. The EPA concurs with the Preferred Alternative.

The Navy's policy includes deed restrictions for any future land transfer and also provides for continued education to receptor groups whenever there is the potential for exposure. This would apply to Alternatives 1, 2, and 3.

FOR MORE INFORMATION

This Plan summarizes information contained in the RI/FS for OU 3M. The Navy has supplied hard copies of the RI/FS report and other significant documents related to the cleanup efforts at OU 3M to the Public Information Repository at the Kitsap Regional Library, Sylvan Way Library. The public can review documents at this location. The library's location and hours of operation are as follows:

Sylvan Way Library
1301 Sylvan Way
Bremerton, Washington 98310
360-405-9100
Monday 1:00 p.m. – 8:00 p.m.
Tuesday–Wednesday 10:00 a.m. – 8:00 p.m.
Thursday 1:00 p.m. – 5:00 p.m.
Friday 10:00 a.m. – 6:00 p.m.
Saturday 10:00 a.m. – 5:00 p.m.
Sunday Closed
http://www.krl.org/

The Administrative Record for the JPHC/NHB site is kept at Naval Facilities Engineering Command Northwest located at Naval Base Kitsap Bangor. Arrangements can be made for members of the public to review this record by contacting the Naval Facilities Engineering Command Northwest Public Affairs Officer at (360) 627-4030.

Naval Facilities Engineering Command Northwest
Public Affairs Office
120 South Dewey, Bldg. 443
Bremerton, Washington 98314-5020
Monday – Friday 8:00 a.m. to 4:30 p.m.

HOW TO PROVIDE INPUT TO THE NAVY

Comments from the public will be used to help determine what action to take. We invite you to comment on this Plan. You may communicate verbally or in writing at the Public Meeting on October 18, 2017. If you prefer, you may submit written comments during the public comment period, October 6 through November 18, 2017. Public comments received during the public comment period or in person at the public meeting will be included in the Responsiveness Summary section of the ROD and considered in the final remedy decisions for the site. The Preferred Alternative may change in response to public comments or new information.

PUBLIC MEETING: October 18, 2017, at 6:00 PM, The Landings, 71 Olding Road, Bremerton

You are invited to attend a public meeting to discuss information presented in this Plan regarding this site. Navy representatives will provide visual displays and information on the investigations, removal actions completed, and the cleanup alternatives evaluated. You will have the opportunity to ask questions on the alternatives. Both oral and written comments will be accepted during the meeting.

PUBLIC COMMENT PERIOD: October 6 to November 18, 2017

We encourage you to comment on this Plan during the public comment period. You may submit written comments by mail, postmarked no later than November 18, 2017, to:

Silvia Klatman
Public Affairs Officer
Naval Base Kitsap
120 South Dewey, Bldg. 443
Bremerton, WA 98314-5020

Comments may also be sent by e-mail to: pao.nbk.cnrnw@navy.mil

GLOSSARY

Anomaly. Any identified subsurface mass that may be geologic in origin, MEC, MPPEH, DMM, or some other man-made material. Such identification is made through geophysical investigation and reflects the response of the sensor used to conduct the investigation.

Applicable or Relevant and Appropriate Requirement (ARARs). ARARs include any federal or state standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate to a CERCLA site or action.

Discarded Military Munitions (DMM). Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations (10 U.S.C. 2710(e)(2)). The DMM of concern for this site is a 20 mm projectile or larger (by net explosive weight) containing HE, including fuze components that may contain small quantities of explosives.

Discarded Military Munitions with High Explosives (DMM-HE). For purposes of this CERCLA action and NPL Site, DMM-HE is considered to be an explosively configured item equivalent to a 20 mm projectile or larger (by net explosive weight) containing HE, including fuze components that may contain small quantities of explosives. Please see definitions of DMM and high explosive.

Explosive. A substance or mixture of substances, which is capable, by chemical reaction, of producing gas at such a temperature, pressure, and rate as to be capable of causing damage to the surroundings. The term "explosive" includes all substances variously known as high explosives and propellants, together with igniters, primers, initiators, and pyrotechnics (e.g., illuminant, smoke, delay, decoy, flare, and incendiary compositions).

High Explosive. An explosive substance designed to function by detonation (e.g., main charge, booster, or primary explosive). A high explosive is characterized by the extreme rapidity with which its decomposition occurs; this action is known as detonation. When initiated by a blow or shock, it decomposes almost instantaneously, either in a manner similar to an extremely rapid combustion or with rupture and rearrangement of the molecules themselves.

Land Use Control (LUC). Any restriction or administrative action, including institutional or engineering controls, arising from the need to reduce the risk to human health and the environment.

Material Potentially Presenting an Explosive Hazard (MPPEH). Material potentially containing explosives or munitions. Material potentially containing a high enough concentration of explosives such that the material presents an explosive hazard.

Mean Higher High Water (MHHW). The average of the higher high water heights of each tidal day observed during a specific 19-year period over which tide observations are taken.

Mean Lower Low Water (MLLW). The average of the lower low water heights of each tidal day observed during a specific 19-year over which tide observations are taken.

Military Munitions. All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the U.S. Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, and demolition charges; and devices and components of any item thereof. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, other than nonnuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed (10 U.S.C. 101(e)(4)).

Munitions and Explosives of Concern (MEC). A term distinguishing specific categories of military munitions that may pose unique explosives safety risks, including UXO, DMM, and munitions constituents present in high enough concentrations to pose an explosive hazard.

Munitions Constituent. Any materials originating from unexploded ordnance, DMM, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

Small Arms Ammunition. Ammunition up to and including .50 caliber and all gauges of shotgun shells.

Unrestricted Use/Unlimited Exposure (UU/UE). UU/UE is generally the level of cleanup at which all exposure pathways present an acceptable level of risk for all land uses.

Unexploded Ordnance (UXO). Military munitions that have been primed, fused, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or materiel; and remain unexploded either by malfunction, design, or any other cause.