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Feasibility Study Report
Installation Restoration Program Site 74

Naval Weapons Station
Seal Beach, California

November 2013
Document Control No: KCH-2622-0047-0021

Contract No: N62473-09-D-2622

CTO No: 0047

Prepared for:

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Prepared for:

Department of the Navy
Naval Facilities Engineering Command
Southwest

Prepared by:

CH2M HILL Kleinfelder, A Joint Venture (KCH)
1320 Columbia Street, Suite 310
San Diego, California 92101

Brenda McConathy Task Order Manager	Bryant Wong, PE Senior Engineer

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Executive Summary

This report presents the feasibility study (FS) conducted for soil and sediment at Installation Restoration Program (IRP) Site 74, Naval Weapons Station Seal Beach, in Seal Beach, California. IRP Site 74 is more commonly referred to as the Old Skeet Range (OSR). Based on the results of previous investigations conducted at IRP Site 74, remedial action is necessary to address site-related constituents of concern (COCs) in soil (lead, antimony, and polycyclic aromatic hydrocarbon [PAHs]) and sediment (lead and antimony). The purpose of this report is to develop and evaluate remedial alternatives to address contaminated soil and sediments at IRP Site 74.

This report was prepared under the Naval Facilities Engineering Command (NAVFAC) Southwest Contract No. N62473-09-D-2622, Contract Task Order Number 0047. The FS was prepared in accordance with the following documents:

- *Implementation Guide for Assessing and Managing Contaminated Sediment at Navy Facilities (NAVFAC, 2003)*
- *Guidance for Optimizing Remedy Evaluation, Selection, and Design (NAVFAC, 2010)*
- *Sustainable Environmental Remediation Fact Sheet (NAVFAC, 2009)*
- *SiteWise Version 2 User Guide (Battelle, 2011)*
- *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Remedial Investigation [RI]/FS Guidance) (United States Environmental Protection Agency [USEPA], 1988)*
- *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (USEPA, 2005)*

This FS meets the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substance Pollution Contingency Plan (National Contingency Plan or NCP). The results of this FS will be used to develop a Proposed Plan for remedial action and a Record of Decision (ROD) for IRP Site 74.

The United States Department of the Navy (Navy), with state regulatory oversight, is the lead agency for addressing contamination at IRP Site 74. The Navy is working in cooperation with California Department of Toxic Substances Control, California Regional Water Quality Control Board Santa Ana Region, and United States Fish and Wildlife Service in the implementation of the selected remedial action.

Background

IRP Site 74 was once an active skeet and trap range. The OSR was constructed in the late 1960s and consisted of two skeet houses, a trap house, a concrete pad with approximately six shooting stations, and a trailer. For approximately 25 years, the OSR was used regularly on the weekends and occasionally during the week. OSR members typically used 12-gauge shotguns to shoot the skeet/trap targets that were flung from the skeet or trap houses by a mechanical arm. The maximum range for the skeet/trap targets was estimated at approximately 100 feet from where the targets were launched along the concrete pad area. Because of the concern for waterfowl and other wildlife foraging at IRP Site 74 and ingesting the residual lead and antimony from the spent lead shot, the range was closed down in the early 1990s.

The historical skeet- and trap-shooting activities resulted in a widespread distribution of solid lead shot and broken clay targets within IRP Site 74. The lead shot (an alloy of lead and antimony) is the primary source of lead and antimony contamination at the site. Stray bullets from the nearby small-arms range are another likely source of the lead contamination. The skeet and trap targets were commonly made from clay and coal tar materials, which are the only known source of PAH contamination at IRP Site 74.

Two investigations were previously conducted at IRP Site 74:

- *Focused Site Inspection Phase II Report Naval Weapons Station, Seal Beach (Focused Site Inspection [FSI] Phase II) (SWDIV, 2002)*
- *Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach (Tier II Ecological Risk Assessment [ERA]) (SWDIV, 2005)*

In 2000, as part of the FSI Phase II, the Navy performed soil and sediment sampling at IRP Site 74 to provide data for evaluating ecological and human health risks. Surface (0.5 to 1.0 foot below ground surface [bgs]) and shallow subsurface (2.0 to 2.5 feet bgs) soil samples and surface sediment samples (0 to 0.25 foot below sediment surface) were collected. Soil samples were analyzed for lead, antimony, PAHs, and lead shot; sediment samples were analyzed for lead, antimony, and lead shot. PAHs were not analyzed in sediment because clay targets were not observed in the wetland area. A broken clay target, considered a potential source of PAHs, was also sampled and analyzed for PAHs.

The results of soil and sediment sample analyses were compared to human health and ecological screening criteria. The results indicated that concentrations of lead and antimony in soil and sediment samples at IRP Site 74 pose potential risk to human health and ecological receptors. In addition to lead and antimony, PAHs in soil were found to pose potential risk to human health. Each of the 16 PAHs was detected in the broken clay target sample at significantly higher concentrations than PAH concentrations found in the soil samples, indicating the broken clay targets are likely the source of PAH contamination at IRP Site 74 (SWDIV, 2002). The FSI Phase II report recommended remedial action to mitigate risks to human health and the environment at IRP Site 74.

In 2003, additional samples, including soil samples, sediment samples, bird liver samples, small mammal liver samples, and plant samples were collected at IRP Site 74 to support the Tier II ERA (SWDIV, 2005). The objectives of the Tier II ERA report were to delineate the spatial extent of the ecological risks and develop remediation goals for lead and antimony that would be protective of ecological receptors, which were deemed more sensitive to contaminant exposures than humans. Based on the results of the Tier II ERA, it was deemed appropriate to focus the development of the remediation goals on vertebrate receptors, including birds and mammals. Specifically, it was found that the Belding's savannah sparrow was the most sensitive ecological receptor in both the upland and wetland habitats and that remediation goals developed for this species were protective of all other ecological receptors at IRP Site 74. The Tier II ERA recommended that a comparative analysis of remedial alternatives be performed.

In 2006, the Navy prepared an internal engineering evaluation/cost analysis (EE/CA) to evaluate potential removal action alternatives for IRP Site 74. The EE/CA evaluated both capping and removal alternatives. In 2009, to supplement the EE/CA, the Navy also prepared an internal net environmental benefit analysis (NEBA). The NEBA was performed to evaluate the removal action alternatives from the EE/CA to determine which strategies would provide the greatest net environmental benefit to the public. In some cases, remedial actions may not change the overall risk scenario significantly, which was one of the concerns evaluated in the NEBA. Furthermore, remedial actions undertaken to further reduce or eliminate ecological risks can cause substantive ecological losses, which was a concern at IRP Site 74 because of the quality of salt marsh habitat in the wetland. Because some remedial actions provide little risk reduction benefit, they provide little or no value to the public at unnecessarily high cost both in terms of dollars and lost services of the environment. However, during development of the EE/CA and NEBA documents, the Navy determined that, given the timeline of the CERCLA process to that point and the nature of the risks involved, it would be more appropriate to transition within CERCLA from the removal action process to the remedial action process, with a related shift from finalization of the EE/CA and NEBA to preparation of this FS.

Remedial Action Objectives

The remedial action objectives (RAOs) for IRP Site 74 are as follows:

- Reduce risk to birds from ingestion of food items and incidental ingestion of soil and sediment containing elevated concentrations of lead and lead shot.
- Reduce risk to mammals from ingestion of food items and incidental ingestion of soil and sediment containing elevated concentrations of lead and antimony.
- Reduce potential future risk to human health from exposure to soil and sediment containing elevated concentrations of lead and antimony.

Remediation Goals

The following remediation goals for lead in soil and sediment will achieve the RAOs, based on post remediation area-weighted averages:

- Lead in soil – 68 milligrams per kilogram (mg/kg)
- Lead in sediment – 140 mg/kg

The remediation goals selected for soil in the upland area and sediment in the wetland area are based on protection of the most sensitive ecological receptor at IRP Site 74, the Belding's savannah sparrow. Locations identified as presenting unacceptable risk to Belding's savannah sparrow encompass the areas that present unacceptable risks to other species (i.e., other wildlife and mammal species). Additionally, locations identified as presenting unacceptable risk from lead are collocated with locations that present unacceptable risk from lead shot, antimony, and/or PAHs. As a consequence, the remediation goals developed to reduce risk to the Belding's savannah sparrow will address risks for all other species. Additionally, cleanup of lead concentrations will also address unacceptable risks from antimony and PAHs because the lead posing unacceptable risk is collocated with antimony and PAHs. Although the remedial footprint encompasses the areas that pose unacceptable risk at IRP Site 74, some areas of lower concentrations of lead and lower density of lead shot will remain. Remediation goals were not developed for human receptors because potential future risk to human health from exposure to soil and sediment will be reduced by achieving the remediation goals for ecological receptors.

Identification and Screening of Remedial Technologies

Technology screening was conducted following the technology screening guidance described in RI/FS Guidance (USEPA, 1988) and *Guidance for Optimizing Remedy Evaluation, Selection, and Design* (NAVFAC, 2010). In addition, the technologies identified and screened are consistent with *Implementation Guide for Assessing and Managing Contaminated Sediment at Navy Facilities* (NAVFAC, 2003) and *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA, 2005). Potential remedial technologies and process options were screened according to the following three established criteria:

- Technical effectiveness
- Implementability
- Cost

Remedial technologies and process options that would not effectively address soil and sediment contamination at IRP Site 74 were eliminated. The technologies and process options that were retained from the initial screening process were carried forward for the development of remedial alternatives.

Development of Remedial Alternatives

The descriptions of the remedial alternatives in this FS are conceptual and have been developed to a level of detail sufficient for the purposes of evaluating the alternatives against the NCP criteria, developing cost estimates of plus 50 to minus 30 percent, and comparing the alternatives. The selected alternative will be further developed during the remedial design process, and the specific methodologies and construction sequences used may change based on additional information that is gathered as part of pre-design investigations. Table ES-1 presents the components of the four remedial alternatives.

The following four alternatives were developed:

- Alternative 1: No action.

- Alternative 2: Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

- Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
- Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Evaluation of Remedial Alternatives

The NCP defines nine criteria, classified as threshold, balancing, or modifying, to be used for the detailed analysis of remedial alternatives. The remedial alternatives were evaluated against the first seven of nine criteria:

- Threshold criteria
  - Overall protection of human health and the environment
  - Compliance with Applicable or Relevant and Appropriate Requirements
- Balancing criteria
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost

The remaining two modifying criteria are state acceptance and community acceptance. The evaluation of these criteria is typically not completed until state and public comments are received on the proposed plan. The alternatives were also qualitatively evaluated with respect to sustainability and green remediation metrics. Because IRP Site 74 contains sensitive wildlife habitat, development of remedial alternatives and ultimate remedy selection will include consideration of which alternative(s) would result in the lowest level of habitat disruption.

The evaluation of remedial alternatives was performed using a two-step process. During the first step, each alternative was evaluated individually against the NCP criteria and the sustainability and green remediation metrics. In the second step, a comparative analysis was performed using the same criteria to identify key differences between alternatives. Tables ES-2 and ES-3 present the results of the detailed and comparative evaluations of the alternatives, respectively.

Recommendations

Based on the evaluation of the remedial alternatives against the NCP criteria, Alternative 4 is recommended for addressing contaminated soil and sediments at IRP Site 74. The comparative analysis of the alternatives in Section 4.0 shows this alternative as ranking the highest compared to the other alternatives. The ranking reflects the advantages and disadvantages of each alternative relative to the others. Although not the lowest ranked alternative in terms of cost, Alternative 4 would result in the least impact to habitat while providing long-term effectiveness and addressing the statutory preference for using treatment technologies that permanently reduce toxicity, mobility, or volume of hazardous substances. The Navy will ultimately present whichever alternative it proposes to implement to the public in a Proposed Plan, at which time regulatory agencies and the general public will have the opportunity to review the Proposed Plan and submit comments. After receipt and consideration of any comments received, the Navy will either document its remedy selection in a ROD or, if appropriate, issue a revised Proposed Plan.

Executive Summary Tables

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TABLE ES-1
Summary of Remedial Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

	Alternative 1 **No Action**	Alternative 2 - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	Alternative 3 - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	Alternative 4 - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Major Components	No remedial actions would be implemented under this alternative. There would be no provisions made for potential exposure to surface soil and sediment. There would be no provisions made to maintain a cap, and no land use restrictions would be implemented.	• Excavation of contaminated soil in the upland area (8.1 acres, 1 foot bgs) and sediment in the wetland area (2 acres, 1 foot bss). • Contaminated soil and sediment would be removed using standard excavation equipment (e.g., long-reach excavators). • Temporary barriers (e.g., sheet piles) would be installed in the wetland area to divert and control water away from the sediment excavation area and mitigate the release of resuspended sediment and contaminants outside of the removal area during remediation activities • Crane mats may be used to support heavy equipment (e.g., excavator) in soft subgrade areas. • Short-term monitoring would be implemented during construction activities for soil and sediment. • Excavated sediment would be dewatered onsite using passive dewatering methods (e.g., sediment drying bed). • The sediment decant water would be collected in a holding tank and sampled for lead and antimony prior to discharge back to the wetland or sanitary sewer, if available. The discharge would need to meet ARARs. Depending on the analytical results of the decant water, the water may be transported and disposed. • Excavated soil and excavated/dewatered sediment would be transported by truck to an offsite treatment/disposal facility. It was assumed the material would be solidified/stabilized offsite prior to disposal in a permitted landfill. • The soil and sediment excavation areas would be backfilled with a clean layer of material to pre existing grade and revegetated. • Confirmation soil and sediment samples would be collected to ensure cleanup goals were met.	• Contaminated soil in the upland area would be capped (8.1 acres) with a low-permeability cover (e.g., approximately 12-inch low-permeability soil cover, geosynthetic clay liner, composite drainage net, and 12 inches of topsoil for a vegetative layer). • Contaminated sediment in the wetland area would be capped (2.3 acres) with a low-permeability cover (approximately 6 inches with substrate on top to allow for revegetation). • Temporary barriers (e.g., silt curtain) would be installed in the wetland area to mitigate release of resuspended sediment, capping material, and contaminants outside of the capping area during capping activities. • Short-term monitoring would be implemented during construction activities. • Institutional controls would be implemented. • Long-term monitoring would be performed to ensure cap integrity. Long-term monitoring may include physical surveys to evaluate cap thickness, and collection of soil, sediment, and/or surface water samples to evaluate cap performance. Cap repairs would be performed as needed. • Wetland creation would be implemented to offset the loss in the wetland area as a result of capping. A 2.5-acre (2.3 acres of lost wetland plus an additional 10 percent) engineered wetland would be constructed at NAVWPNSTA Seal Beach.	• The remedy for soil in the upland area would be the same as the remedy described under Alternative 2. • The excavation of sediment in the wetland area (2 acres, 1 foot bss) would be achieved using amphibious equipment (e.g., marsh buggy/cargo buggy). • Temporary barriers (e.g., silt curtain) would be installed in the wetland area to control/mitigate release of resuspended sediment and contaminants outside of the removal area during remediation activities. • Short-term monitoring would be implemented during construction activities. • Excavated sediment would be dewatered onsite using passive dewatering methods (e.g., sediment drying bed). • The sediment decant water would be collected in a holding tank and sampled for lead and antimony prior to discharge back to the wetland or sanitary sewer, if available. The discharge would need to meet ARARs. Depending on the analytical results of the decant water, the water may be transported, treated, and disposed offsite as nonhazardous waste. • Excavated soil and excavated/dewatered sediment would be transported by truck to an offsite treatment/disposal facility. It was assumed the material would be solidified/stabilized offsite prior to disposal in a permitted landfill. • The sediment excavation areas would be backfilled with a clean layer of material and revegetated. • Confirmation soil and sediment samples would be collected to ensure cleanup goals were met.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
bgs = below ground surface
bss = below sediment surface
NAVWPNSTA = Naval Weapons Station

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TABLE ES-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		- Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment - Short-term monitoring during construction activities - Onsite dewatering of sediment - Transportation of soil and sediment offsite - Physical/chemical treatment of soil and sediment - Offsite disposal of soil and sediment - Site restoration in soil upland and sediment wetland areas	- Capping contaminated soil in upland area and sediment in wetland area - Short-term monitoring during construction activities - Institutional controls - Long-term monitoring - Wetland mitigation	- Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment - Short-term monitoring during construction activities - Onsite dewatering of sediment - Transportation of soil and sediment offsite - Physical/chemical treatment of soil and sediment - Offsite disposal of soil and sediment - Site restoration in soil upland and sediment wetland areas
Overall protection of human health and the environment				
Overall protection of human health and the environment	Alternative will not provide protection of human health and the environment: • RAOs would not be achieved. • Human health and ecological risks associated with contaminated soil and sediment would not be reduced or eliminated. • Contaminant concentrations in soil and sediment would not be reduced.	Alternative will provide protection of human health and the environment: • RAOs would be achieved upon completion of the remedy, which is estimated to be less than 1 year after the start of construction. • Removal of contaminated soil and sediment would eliminate long-term risks.	Alternative will provide protection of human health and the environment. • RAOs would be achieved upon completion of the remedy, which is estimated to be less than 1 year after the start of construction. • Capping of soil and sediment would reduce and control long-term risk. Placement of a cap would control risks associated with remaining soil and sediment by preventing wildlife and human receptors from exposure to COCs. • Loss of habitat would result from capping of the wetland area.	Same as Alternative 2. However, the use of amphibious equipment would reduce the destruction of sensitive habitat in the wetland area during the remedial activities.
Compliance with ARARs				
Chemical-specific ARARs	Not applicable because no remedial action is taken.	Alternative would be designed to comply with substantive requirements of the ARARs.	Same as Alternative 2.	Same as Alternative 2.
Location-specific ARARs	Not applicable because no remedial action is taken.	Alternative would be designed to comply with substantive requirements of the ARARs.	Same as Alternative 2.	Same as Alternative 2.
Action-specific ARARs	Not applicable because no remedial action is taken.	Alternative would be designed to comply with substantive requirements of the ARARs.	Same as Alternative 2.	Same as Alternative 2.
Long-term effectiveness and performance				
Magnitude and type of residual risk	Contaminated soil and sediment remain onsite. The long-term residual risk will be similar to the baseline risk, as contaminant concentrations in sediment and/or soil.	Soil and sediment with contaminant concentrations that exceed the cleanup goals would be removed and transferred offsite. The risks associated with contaminated soil and sediments at the site would be eliminated.	Soil and sediment with contaminant concentrations that exceed the cleanup goals would be capped. The risks associated with contaminated soil and sediment at the site would be reduced.	Same as Alternative 2.

Criteria	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Criteria	**<u>Alternative 1</u>** **No Action**	**<u>Alternative 2</u>** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**<u>Alternative 3</u>** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**<u>Alternative 4</u>** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Adequacy and reliability of controls	Does not include any controls for exposures or long-term management measures. Institutional controls/land use restrictions would not be implemented.	Provides adequate control because constituents would be removed from the site. Excavation is an established technology and would meet the performance specifications for the removal component of the alternative. Physical surveys would be conducted to confirm that removal depths were achieved. Confirmation soil and sediment samples would be collected to confirm that cleanup goals were met. The offsite treatment/disposal facility provides adequate long-term controls for the excavated soil and sediment.	Provides adequate control as long as the institutional controls are enforced through maintenance of the soil and sediment caps and long-term monitoring and reporting. Long-term management of the caps and performance specifications would be provided by an O&M Plan. Monitoring would be performed to determine whether the cap must be repaired or replaced. Capping is an established technology and would be designed to meet the performance specifications of the alternative, provided that effective source controls have been implemented, and the cap is constructed and maintained in accordance with the design specifications established for long-term isolation of the contaminated soil and sediments. Long-term monitoring and periodic maintenance would be required to ensure cap integrity. The O&M plan developed during the remedial design would determine the monitoring and maintenance frequencies required to ensure and maintain cap integrity based on site-specific factors: • Physical surveys and the collection of samples on a defined grid would be needed to assess cap layer thickness, cap performance and integrity, contaminant movement, and/or recontamination concerns. Samples for chemical analysis should also be collected at regular predetermined intervals. • The long-term monitoring plan should also specify monitoring requirements after severe storm events to assess cap integrity. • Cap repairs would be performed as needed. • Component failures (i.e., cap failure) could potentially result in the release of contaminants and exposure to ecological or human receptors; however, catastrophic failure of the cap is unlikely if appropriate long-term O&M plans are implemented.	Same as Alternative 2.

Criteria	**Alternative 1** **No Action**	**Alternative 2** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**Alternative 3** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**Alternative 4** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Reduction of toxicity, mobility, or volume through treatment[a]				
Treatment process and remedy	No treatment process is included.	No onsite treatment process is included. Treatment of excavated soil and sediment would be transferred to the treatment/disposal facility. Excavated sediment would be dewatered onsite using a drying bed. It is assumed that the water resulting from dewatering activities will be of a quality that can be returned to the wetland or sanitary sewer (if available) without additional treatment. However, if analytical results of the water resulting from dewatering activities indicate that it does not meet discharge requirements the water will be transported to the treatment/disposal facility.	No onsite treatment process for soil and sediment is included.	Same as Alternative 2.
Amount of hazardous material destroyed or treated	None. Contaminated soil and sediment remain onsite.	None. Contaminated soil and sediment will be transported offsite for treatment and disposal.	None. Contaminated soil and sediment remain onsite.	Same as Alternative 2.
Reduction in toxicity, mobility, or volume through treatment	Provides no reduction in toxicity, mobility, or volume of constituents in soil and sediment through treatment.	The volume of contaminated soil and sediment is reduced or eliminated at the site through excavation. Excavated soil/sediment would be solidified/stabilized offsite prior to disposal in a permitted landfill. The volume and toxicity would not be affected, but contaminant mobility would be reduced. Overall reduction of toxicity, mobility, or volume would be transferred to the offsite treatment and disposal facility.	The volume of soil and sediment and intrinsic toxicity of the constituents that are physically and chemically bound in the soil and sediment is not changed. Mobility of constituents in soil and sediment are expected to be reduced through capping and maintenance of the cap.	Same as Alternative 2.
Irreversibility of treatment	None. No treatment process is included.	Offsite solidification/stabilization is irreversible.	Not applicable. No onsite treatment process is included.	Same as Alternative 2.
Type and quantity of treatment residuals and associated risks	Not applicable.	Offsite treatment and disposal would not result in treatment residuals other than solidified/stabilized soil and sediment that would be disposed into a landfill. Residual risk at IRP Site 74 would be low because material is disposed offsite.	Not applicable.	Same as Alternative 2.
Statutory preference for treatment as a principal element	Not applicable.	Meets the statutory preference.	Same as Alternative 2.	Same as Alternative 2.
Short-term effectiveness				
Protection of community during remedial action	No construction activities are performed; therefore, this alternative would not have any adverse short- term effects that could pose risk to the community, workers, or environment.	Potential risks to the community may include increased levels of traffic, dust, noise, and odors during the excavation and handling of contaminated soil and sediment. There is an increased chance for exposure through inhalation or dermal contact. Engineering controls and best management practices can mitigate most potential risks: • Access to the active work and support zones would be prohibited.	Potential risks to the community may include increased dust, noise, and odors during the placement of the caps. There is an increased chance for exposure through inhalation or dermal contact. Engineering controls and best management practices can mitigate most potential risks: • Access to the active work and support zones would be prohibited. • Dust and noise levels would be monitored.	Same as Alternative 2.

Criteria	**Alternative 1** **No Action**	**Alternative 2** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**Alternative 3** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**Alternative 4** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
		• Noise levels would be monitored. • Work periods may be restricted to specific time frames for especially noisy operations (e.g., sheet pile installation). • Traffic effects can be managed by a haul plan that uses less-traveled routes. • Trucks used to transport contaminated materials will be decontaminated and/or covered to prevent the spread of contamination along haul routes. • Staging areas would be established in an area zoned for industrial use. • Dust emissions and odors may result from excavation activities. Air quality monitoring may be performed.	• Work periods may be restricted to specific time frames for especially noisy operations. • Staging areas would be established in an area zoned for industrial use. • Traffic effects can be managed by designing a haul plan that uses less-traveled routes. • Dust emissions and odors may result from capping activities. Air quality monitoring may be performed.	
Protection of workers during remedial actions	No construction activities are performed; therefore, there is no risk to workers.	Potential risks to workers would include physical hazards associated with general construction, potential exposure to and direct contact with contaminated soil and sediment, noise, odors, dust, and vapors. These would be mitigated through the following: • Engineering controls and best management practices. • Compliance with appropriate health and safety plans, construction procedures, and site management plans. • Use of appropriate personal protective equipment.	Same as Alternative 2.	Same as Alternative 2.

Criteria	**Alternative 1** **No Action**	**Alternative 2** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**Alternative 3** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**Alternative 4** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Environmental impacts	No construction activities are performed; therefore, no adverse environmental impacts are anticipated.	• Excavation of soil and sediment would temporarily disrupt sensitive habitats at the site during the activities. • Construction traffic would increase during soil and sediment remedial activities. Trucks used to transport materials would be decontaminated and/or covered. Trucks will follow designated haul routes designed to follow less travelled routes. • Dust emissions and odors would be controlled by air monitoring. • An erosion control plan would be developed for stockpiling excavated soil and sediment. Plastic sheeting would be used for stockpiles in the staging area. • Excavation of sediment in the wetland may resuspend and/or release contaminants from the excavation area. Temporary barriers (e.g., sheet pile, silt curtain) would help control suspension and release of contaminants from the excavation area. • Excavated and dewatered sediment would be contained in the drying bed in the staging area. The water collected as a result of dewatering activities would be sampled for lead and antimony prior to discharge back into the wetland or sanitary sewer, if applicable. However, if the water resulting from dewatering activities does not meet discharge requirements, it will be transported offsite for treatment and disposal. • Greenhouse gases would be generated as a result of offsite transport of wastes and during backfill operations.	• Capping of soil and sediment would disrupt sensitive habitats present at the site. A new wetland would be constructed to offset the loss of wetland area. • Dust emissions and odors would be controlled by air monitoring. • Cap delivery methods may disturb and resuspend contaminated sediment. Temporary barriers (e.g., silt curtains) would help control turbidity, suspension, and release of contaminants from the capping area. • Greenhouse gases would be generated as a result of the manufacture and transportation of capping materials, and also as a result of transportation of personnel and use of equipment.	Same as Alternative 2. The use of amphibious equipment would reduce the disruption to sensitive habitat in the wetland area during the remedial activities. Temporary barriers (e.g., silt curtain) would help control turbidity, suspension, and release of contaminants from the excavation area.
Time until RAOs are achieved	RAOs are not achieved under Alternative 1.	The duration of the short-term risks would be the time required for construction, which is estimated to be less than 1 year.	The duration of the short-term risks would be the time required for construction, which is estimated to be less than 1 year. Institutional controls and long-term monitoring and maintenance would be implemented thereafter for a period of 30 years.	Same as Alternative 2.
Implementability				
Ability to construct and operate the technology	Not applicable. No actions are taken under this alternative.	Excavation is technically implementable and is an established standard construction practice. Excavation would be performed with standard excavation equipment. Dewatering of removed sediment by using a drying bed is an established technology. Short-term monitoring requirements can be performed using standard practices and technologies. Site-specific features may complicate excavation of soil and sediment (e.g., vegetation such as tall grass and shrubs in the upland area and marsh vegetation in the wetland; sensitive	Capping is technically implementable and is an established technology. Placement of caps is a standard construction practice. Pilot testing may be required to determine the most suitable cap placement methods based on site-specific soil and sediment characteristics. The short-term and long-term monitoring requirements can be performed using standard practices and technologies. Construction of a new wetland area would follow established guidance and regulations.	Same as Alternative 2, except excavation of sediment in the wetland area would be done using amphibious equipment. Many contractors have the appropriate skill and experience to use amphibious equipment, and training is available from the vendors.

Criteria	Alternative 1 No Action	Alternative 2 - Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment - Short-term monitoring during construction activities - Onsite dewatering of sediment - Transportation of soil and sediment offsite - Physical/chemical treatment of soil and sediment - Offsite disposal of soil and sediment - Site restoration in soil upland and sediment wetland areas	Alternative 3 - Capping contaminated soil in upland area and sediment in wetland area - Short-term monitoring during construction activities - Institutional controls - Long-term monitoring - Wetland mitigation	Alternative 4 - Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment - Short-term monitoring during construction activities - Onsite dewatering of sediment - Transportation of soil and sediment offsite - Physical/chemical treatment of soil and sediment - Offsite disposal of soil and sediment - Site restoration in soil upland and sediment wetland areas
		wildlife including threatened and endangered species; and tidal fluctuations in the wetland).		
		Vegetation may be removed prior to excavation activities, if necessary. Construction activities would not take place during breeding/nesting seasons (April through September). The excavation area in the wetland would be dewatered prior to excavation activities using sheet pile or another similar technology. Crane mats would be used to support the heavy equipment in soft subgrade, if necessary. It is assumed that the majority of sediment in the wetland area can be removed using long-reach excavators stationed on Case Road.		
Reliability of the technology	Not applicable. No actions are taken under this alternative.	Excavation and disposal are reliable technologies for removing contaminated soil and sediment from the site.	Capping is a reliable technology to minimize exposure to soil and sediment when maintained over time. Institutional controls and long-term monitoring are implemented for reliability of the cap. The cap may require replacement/repair if material is disturbed.	Same as Alternative 2.
Ease of undertaking additional remedial action	Not applicable. No actions are taken under this alternative.	Additional action is implementable, but materials placed during site restoration (clean backfill) would need to be removed.	Additional action is implementable, but the cap would need to be removed.	Same as Alternative 2.
Monitoring considerations	Not applicable. No actions are taken under this alternative.	Short-term monitoring (e.g., air quality) would be performed during construction activities. Confirmation soil and sediment sampling would be conducted following the excavation activities to determine effectiveness of the remedial action. Physical surveys of the soil and sediment would be performed prior to the remedial action and following placement of clean backfill to determine whether the site was restored to original elevations.	Short-term monitoring (e.g., air quality) would be performed during construction activities. Institutional controls would be enforced through long-term monitoring to determine the condition of the caps. Analytical samples may be collected to determine effectiveness of the caps. Physical surveys of the cap would be performed to ensure cap thicknesses are achieved.	Same as Alternative 2.
Coordination with other agencies	Not applicable. No actions are taken under this alternative.	This alternative will require coordination with regulatory agencies (DTSC, RWQCB Santa Ana Region, USFWS, and CDFG). Permits may be required prior to excavation and site restoration (placement of clean backfill) activities. Waste profiling is required prior to disposal.	This alternative will require coordination with regulatory agencies (DTSC, RWQCB Santa Ana Region, USFWS, and CDFG). Operation and maintenance plans for the caps would be reviewed by regulatory agencies to ensure adequate future monitoring and controls. Regulatory agencies would be involved in implementation and enforcement of institutional controls.	Same as Alternative 2.
Availability of treatment, storage capacity, and disposal services	Not applicable. No actions are taken under this alternative.	Excavated material will be stored onsite in a designated staging area until it is transported offsite for treatment and disposal. Offsite treatment and disposal facilities are available.	Not applicable. Soil and sediment will not be removed from the site and, therefore, would not require storage, treatment, and disposal.	Same as Alternative 2.
Availability of necessary equipment and specialists	Not applicable. No actions are taken under this alternative.	• Equipment, materials, and specialists required for the sheet piling and silt curtain installation, excavation, transportation, treatment / disposal, placement of backfill, and physical surveys would be commercially available.	• Equipment, materials, and specialists required for the physical surveys and cap placement would be commercially available.	Same as Alternative 2, except for sheet piling installation. Many contractors have the appropriate skill and experience to use the amphibious equipment, and training is available from the vendors.

TABLE ES-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	Alternative 1 **No Action**	Alternative 2	Alternative 3	Alternative 4
		- **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	- **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	- **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
		• Landfill capacity for contaminated soil and sediments within the geography may be limited. Available landfill facilities and associated capacities will need to be identified during the remedy selection process. • Treatability testing would be needed to determine the final waste characterization of solidified/stabilized soil and sediment. • Equipment, materials, and specialists required for the dewatering of excavated sediment would be commercially available.	• Pilot testing may be needed to determine the suitability of cap materials to address site-specific soil and sediment characteristics at the site. • There may be few contractors who have significant experience in new wetland construction.	
Cost				
Capital cost	$0	$9,758,000	$5,896,000	$10,426,000
Operating and maintenance cost	$0	$193,000	$5,516,000	$193,000
Net present value[b]	$0	$11,946,000	$12,725,000	$12,747,000

Notes:

a For the purposes of the evaluation in this Feasibility Study, it was assumed that solidification/stabilization would occur offsite at the treatment/disposal facility. However, during the remedial design process onsite solidification/stabilization may be chosen.
b The net present value of future cash flows was calculated on the basis of a real discount rate of 1.1 percent per year based on a 30-year duration for Alternative 3, and on the basis of a real discount rate of negative 1.4 (-1.4) percent per year based on a 2-year duration for Alternatives 2 and 4 (using real discount rates [adjusted for inflation] from Office of Management and Budget [OMB] Circular A-94 Appendix C, December 2012) (OMB, 2012). See Appendix B for additional cost detail for each alternative.
ARAR = Applicable or Appropriate and Relevant Requirement
CDFG = California Department of Fish and Game
COC = constituent of concern
DTSC = California Department of Toxic Substances Control
O&M = operations and maintenance
RAO = remedial action objective
RWQCB = Regional Water Quality Control Board
USFWS = United States Fish and Wildlife Service

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TABLE ES-3
Comparative Analysis of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Alternative	Threshold Criteria[a]		Balancing Criteria				
	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[b]
Alternative 1 No Action	○	○	○	○	●	●	**$0**
Alternative 2 Removal of contaminated soil in upland area and sediment in wetland area Short-term monitoring during construction activities Onsite dewatering of sediment Offsite transportation of soil and sediment Physical/chemical treatment of soil and sediment Offsite disposal of soil and sediment Site restoration in soil upland and sediment wetland areas	●	●	●	●	◕	●	**$11,946,000**
Alternative 3 Capping contaminated soil in upland area and sediment in wetland area Short-term monitoring during construction activities Institutional controls Long-term monitoring Wetland mitigation	●	●	◑	○	◑	◕	**$12,725,000**
Alternative 4 Removal of contaminated soil in upland area and sediment in wetland area Short-term monitoring during construction activities Onsite dewatering of sediment Offsite transportation of soil and sediment Physical/chemical treatment of soil and sediment Offsite disposal of soil and sediment	●	●	●	●	●	●	**$12,747,000**

Notes:

[a] Threshold Criteria (Overall protection of human health and the environment and compliance with ARARs) are evaluated as either meeting or not meeting these criteria.
[b] Net Present Value – See Appendix B for additional cost detail.

Modifying Criteria (State Acceptance and Community Acceptance) will be evaluated in the Record of Decision based on comments on the Proposed Plan.
ARARs = Applicable or Relevant and Appropriate Requirements

Legend:

Balancing Criteria:

○ Does not satisfy criterion

● Satisfies criterion

Threshold Criteria:

○ Low

◔ Low to Moderate

◑ Moderate

◕ Moderate to High

● High

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Acronyms and Abbreviations

95 UCL	95th percentile upper confidence limit of the mean
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
bss	below sediment surface
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Level
CNRSW	Commander Navy Region Southwest
COC	constituent of concern
EE/CA	engineering evaluation/cost analysis
ERA	ecological risk assessment
ELCR	excess lifetime cancer risk
FS	feasibility study
FSI	focused site inspection
GHG	greenhouse gas
GRA	general response action
GSR	green and sustainable remediation
HHRA	human health risk assessment
HQ	hazard quotient
HI	hazard index
IRP	Installation Restoration Program
LOAEL	lowest observed adverse effects level
mg/kg	milligrams per kilogram
NAVFAC	Naval Facilities Engineering Command
NAVWPNSTA	Naval Weapons Station
Navy	United States Department of the Navy
NCP	National Contingency Plan
NEBA	net environmental benefit analysis
NOAEL	no observed adverse effect level

NWR	National Wildlife Refuge
O&M	operations and maintenance
OSR	Old Skeet Range
PAH	polycyclic aromatic hydrocarbon
PRG	preliminary remediation goal
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
rPRG	residential preliminary remediation goal
RAO	remedial action objective
Res.	Resolution
RI	remedial investigation
ROD	record of decision
SWRCB	California State Water Resources Control Board
TBC	to be considered
USC	United States Code
USEPA	United States Environmental Protection Agency
ULBV	upper limit background value
USFWS	United States Fish and Wildlife Service

1.0 Introduction

This report presents the feasibility study (FS) conducted for soil and sediment at Installation Restoration Program (IRP) Site 74, Naval Weapons Station (NAVWPNSTA), Seal Beach, in Seal Beach, California. Based on the results of previous investigations conducted at IRP Site 74, remedial action is necessary to address site-related constituents of concern (COCs) in soil (lead, antimony, and polycyclic aromatic hydrocarbons [PAHs]) and sediment (lead and antimony).

This report was prepared under the Naval Facilities Engineering Command (NAVFAC) Southwest, Contract No. N62473-09-D-2622, Contract Task Order Number 0047. This FS was prepared in accordance with the following documents:

- *Implementation Guide for Assessing and Managing Contaminated Sediment at Navy Facilities (NAVFAC, 2003)*
- *Guidance for Optimizing Remedy Evaluation, Selection, and Design (NAVFAC, 2010)*
- *Sustainable Environmental Remediation Fact Sheet (NAVFAC, 2009)*
- *SiteWise Version 2 User Guide (Battelle, 2011)*
- *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Remedial Investigation/Feasibility Study [RI/FS] Guidance) (USEPA, 1988)*
- *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (USEPA, 2005)*

This FS meets the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund"), as amended, and the National Oil and Hazardous Substance Pollution Contingency Plan (National Contingency Plan or NCP). The results of this FS will be used to develop a Proposed Plan for remedial action and a Record of Decision (ROD) for IRP Site 74.

The United States Department of the Navy (Navy), with state regulatory oversight, is the lead agency for addressing contamination at IRP Site 74. The Navy is working in cooperation with California Department of Toxic Substances Control, California Regional Water Quality Control Board Santa Ana Region, and United States Fish and Wildlife Service (USFWS) in the implementation of the selected remedial action.

1.1 Purpose and Organization of Report

The purpose of this report is to develop and evaluate remedial alternatives to address contaminated soil and sediments at IRP Site 74.

The report is organized into the following sections:

1. **Introduction**. Briefly describes the regulatory framework, FS purpose and organization, and site setting, and summarizes the results of previous investigations, human health risk assessments (HHRAs) and ecological risk assessments (ERAs), for IRP Site 74.
2. **Development of Remedial Action Objectives.** Presents the remedial action objectives (RAOs) and remediation goals for IRP Site 74, and summarizes the potential Applicable or Relevant and Appropriate Requirements (ARARs). This section also identifies the cleanup areas and depth of the soil and sediment to be addressed by the remediation.
3. **Identification and Screening of Remedial Technologies.** Identifies and describes a range of remedial approaches, technologies, and process options that could be used to address contaminated soil and sediment at IRP Site 74, and screens them based on effectiveness, implementability, and cost.
4. **Development and Evaluation of Remedial Alternatives.** Develops remedial alternatives for IRP Site 74 soil and sediment by combining the remedial approaches, technologies, and process options that were retained after the screening described in Section 3.0, and presents detailed individual and comparative analyses of the remedial alternatives using the nine evaluation criteria defined in the NCP. A sustainability evaluation was also considered. The sustainability evaluation addresses the Navy's environmental strategy to incorporate sustainable remediation into the environmental remediation process.
5. **Recommendation**. Recommends one of the four alternatives.
6. **References**. Provides the references cited in the report.

The report appendices provide supporting information as follows:

A – Potential Applicable or Relevant and Appropriate Requirements
B – Estimated Costs
C – Sustainability Evaluation

1.2 Site Description and Background

1.2.1 Location

NAVWPNSTA Seal Beach is 26 miles south of metropolitan Los Angeles, as shown on Figure 1. NAVWPNSTA Seal Beach consists of 5,000 acres of land along Anaheim Bay on the Pacific Coast and within the City of Seal Beach in Orange County, California, as shown on Figure 1. The major urban areas that surround NAVWPNSTA Seal Beach are the cities of Long Beach, Westminster, Huntington Beach, Los Alamitos, and Seal Beach. A portion of IRP Site 74 is within Seal Beach National Wildlife Refuge (NWR). The site is bisected by Case Road, and the portion of the site to the west of Case Road falls within the NWR (Figure 2). The site is approximately 23 acres in size, consisting of 10.4 acres of upland habitat to the east of Case road and 13 acres of wetland habitat to the west of Case Road.

1.2.2 NAVWPNSTA Seal Beach History

The NAVWPNSTA Seal Beach was originally commissioned in 1944 at the height of World War II. At the time, it was called the Naval Ammunition and Net Depot. In 1962, the Naval Ammunition and Net Depot was re-designated as the Naval Weapons Station. The disestablishment of the Naval Ordnance Center Pacific Division at Seal Beach resulted in the station being designated as the lead Weapons Support Facility, Seal Beach, in October 1997. In October 1998, the station was re-designated as Naval Weapons Station Seal Beach.

NAVWPNSTA Seal Beach is currently part of the Commander Navy Region Southwest (CNRSW). The station provides fleet combatants with ready-for-use ordnance. Because of its geographic location, the station serves as a supply point for the operating forces of the Navy and the United States Marine Corps in the Pacific and along the west coast of the United States.

1.2.3 National Wildlife Refuge

The NWR is within the boundaries of NAVWPNSTA Seal Beach and occupies 911 of the 5,000 acres that comprise the station. In 1964, Anaheim Bay and its tidal salt marsh were designated as an NWR. In 1972, the bay and tidal salt marsh was established as the Seal Beach NWR (NEESA, 1985). In 1990, the Port of Long Beach completed its creation of 116 acres of wetland habitat within the NWR as mitigation for the construction of its Pier J Landfill. The mitigation project of the Port of Long Beach consisted of creating four tidally influenced ponds, two of which have islands to provide additional habitat for birds. The Navy has administrative jurisdiction of the land that comprises the Seal Beach NWR, the USFWS serves as the NWR manager and the National Resources Trustee.

Several bird species known to be resident or migrants at NAVWPNSTA Seal Beach are listed by federal or state agencies, or both, as threatened or endangered. They include the light-footed clapper rail, western snowy plover, California least tern, and Belding’s savannah sparrow (Recon, 1997). The breeding season for these species extends from approximately March 15th to September 15th.

The light-footed clapper rail is a resident of the NWR, obtaining its entire food supply there. The California least tern occupies the NWR only during the breeding season, thus much of its food supply comes from the NWR during that period (USFWS, 1990).

1.2.4 IRP Site 74 Description

IRP Site 74, more commonly referred to as the Old Skeet Range (OSR), was once an active skeet and trap range. The OSR was constructed in the late 1960s and consisted of two skeet houses, a trap house, a concrete pad with approximately six stations, and a trailer. Figure 2 depicts the site layout. For approximately 25 years, the OSR was used regularly on the weekends and occasionally during the week. OSR members typically used 12-gauge shotguns to shoot the clay targets flung from the skeet or trap houses by a mechanical arm. Maximum ranges of the 12-gauge shot (pellets) were estimated at approximately 250 yards (750 feet) from the concrete pad area (Wayland, 1999; Wallace, 1999). The maximum range for the clay targets was estimated at approximately 100 feet from the concrete pad area. Because of the concern for waterfowl and other wildlife foraging at IRP Site 74 and ingesting the residual lead and antimony from the spent lead shot, the range was closed down in the early 1990s.

The historical skeet- and trap-shooting activities resulted in a widespread distribution of solid lead shot and broken clay targets within IRP Site 74. The lead shot (an alloy of lead and antimony) is the primary source of lead and antimony contamination at the site. Stray bullets from the nearby small-arms range are another likely source of the lead contamination. The “clay” skeet and trap targets were commonly made from coal tar materials and are the only known source of PAH contamination at IRP Site 74.

1.2.5 Geology

Most of NAVWPNSTA Seal Beach lies on flat, alluvial deposits that slope evenly from approximately 20 feet above sea level in the northeast part of the facility to sea level in the tidal flats of the station in the southwest. Bedrock in the vicinity of the NAVWPNSTA Seal Beach is a thick sequence of Tertiary and Quaternary sedimentary rocks deposited on a basement of pre-Tertiary metamorphic and crystalline rocks. Tertiary rocks range in age from Oligocene to Pliocene and include sandstone, siltstone, shale, and mudstone; they are almost exclusively of marine origin (Poland et al., 1956). The most prominent geologic feature on NAVWPNSTA Seal Beach is the Newport-Inglewood Fault zone, which cuts diagonally, paralleling the coast, across the southwestern part of the station. Landing Hill, situated on the southwestern side of NAVWPNSTA Seal Beach, is an uplift along the Newport-Inglewood Fault zone that reaches a maximum elevation of about 50 feet. The fault has been active in recent times, as indicated by the major Inglewood earthquakes in 1921, 1933, and 1941 (Poland et al., 1956). Soils typically contain abundant clay and silt, and are poorly drained. Six soil types (Alo clay, beaches, Bolsa silt loam, Bolsa silt clay loam, Myford sandy loam, and tidal flats) have been identified at NAVWPNSTA Seal Beach (SCS, 1978).

The portion of IRP Site 74 east of Case Road (upland area) is relatively flat and is predominantly covered with tall grass and shrubs. This area contains silty clays with a high percentage of sand and occasional shell deposits. Certain isolated areas within this half of the site that contain fine silts are completely devoid of vegetation (exhibiting characteristics of salt panes). During periods of heavy rains, ponding is observed in these portions of the site. The remainder of the upland area is covered by a concrete pad, gravel, and asphalt-paved road. The soils in this area are silty sands with large amounts of black-colored broken clay targets. To the west of Case Road, within the NWR, the site becomes part of a southern coastal salt marsh and is characterized by tidal flats of stratified clayey to sandy deposits that are poorly drained and high in salts.

1.2.6 Surface Water Hydrology

Surface water drainage at NAVWPNSTA Seal Beach is provided by ditches and tidal sloughs through flat-lying clay deposits. Stream flow in ditches is intermittent and dependent on rainfall and excess irrigation runoff. Water in tidal sloughs is dependent on tide elevation of Anaheim Bay and rainfall, and ultimately drains to the tidal salt marsh within NAVWPNSTA Seal Beach. Generally, tidal areas are wet or damp, except during extended dry periods (NAVFAC Southwest, 1990). During high tides, water floods the tidal flats. Nearly the entire marsh becomes inundated during spring high tides (NEESA, 1990). Across the Seal Beach NWR, the extent of tidal flooding is controlled by raised roadbeds that serve as barriers. Water is present perennially in the lower reaches of the major sloughs.

At IRP Site 74, extreme high tides occasionally flood the wetland area within the NWR and portions of the upland area east of Case Road. Flooded water is not able to drain back out of the upland area, but it eventually evaporates or is absorbed into the soil.

1.2.7 Hydrogeology

NAVWPNSTA Seal Beach is in the southwestern corner of the Orange County Basin of the Los Angeles Basin. Depth to groundwater in the upper part of the alluvial deposits of Recent age ranges from just below ground surface (bgs) in the NWR to approximately 20 feet bgs at higher ground elevations (NEESA, 1985). Although no groundwater data are available for IRP Site 74, the depth to groundwater is expected to be approximately 5 to 7 feet bgs, and the water is considered to be saline based on groundwater sample data from NAVWPNSTA Seal Beach (SWDIV, 1997). Shallow groundwater in this area is hydraulically connected to the surface waters in the NWR and is tidally influenced. Fresh surface water is present on the site only during periods of high rainfall or when irrigation runoff is excessive.

1.2.8 Ecological Setting

Several bird species known to be residents or migrants at NAVWPNSTA Seal Beach are listed by federal or state agencies, or both, as threatened or endangered. They include the light-footed clapper rail (Rallus longirostris levipes), western snowy plover (*Charadrius alexandrinus nivosus*), California least tern (*Sterna antillarum browni*), green sea turtle (Chelonia mydas), southern sea otter (Enhydra lutris nereis), and Belding's savannah sparrow (*Passerculus sandwichensis beldingi*). The breeding season for these species extends from approximately mid-March to October.

The light-footed clapper rail is a subspecies of clapper rail that is a resident of the NWR, thus obtaining its entire food supply there. The mangrove clapper rail (*R. l. insularium*), California clapper rail (*R. l. obsoletus*), and Yuma clapper rail (*R. l. yumanensis*) are also subspecies of clapper rail in California. Life history and risk estimates are assumed to be similar among these four subspecies (Eddleman and Conway, 1998). The California least tern occupies the NWR only during the breeding season, but most of its food supply comes from the NWR during that period (USFWS, 1990).

Small mammals such as voles, shrews, and ground squirrels, and other mammals such as Audubon's cottontail (*Sylviagus audubonii*) and the brush rabbit are likely to be found in the upland area east of Case Road.

1.2.9 Land Use

NAVWPNSTA Seal Beach encompasses about 5,000 acres. Of the 5,000 acres, approximately 75 percent is covered by explosives safety quantity distance arcs that restrict development to specific permitted uses. Two agricultural leases totaling approximately 2,000 acres are used for farming (irrigated and dry farming). Approximately 100 acres of land is currently being leased for oil production. In addition to the outleased land, the Seal Beach NWR, a major biological resource, encompasses approximately 911 acres. Other land uses on the NAVWPNSTA Seal Beach include residential; ordnance transfer operations; weapons production, evaluation, and quality assurance; storage (inert and explosive); and administration/community support. Access to NAVWPNSTA Seal Beach is restricted; therefore, off-station populations would not likely be directly exposed to COCs.

The current occupants at NAVWPNSTA Seal Beach include civilians, contractors, and military personnel. Of these, only military personnel reside at NAVWPNSTA Seal Beach. IRP Site 74 is open space, and no buildings or structures are present. IRP Site 74 is not currently being used for residential or recreational purposes. The wetland portion of the site is within the NWR; therefore, land uses other than continued open space providing salt marsh habitat are highly unlikely. The active small-arms range is immediately adjacent to IRP Site 74; therefore, it is unlikely to be developed for residential use. USFWS identified the upland area of the site as an area for potential wetland restoration in the future because of its proximity to the NWR and current open space use. Therefore, it is unlikely that IRP Site 74 land use will change in the foreseeable future.

Groundwater under NAVWPNSTA Seal Beach is not currently used as a drinking water source. Water to NAVWPNSTA Seal Beach is supplied by the City of Seal Beach via a gravity-fed distribution system. Nonpotable water used for agricultural purposes is supplied by agricultural wells at NAVWPNSTA, with screened intervals between 140 to 600 feet bgs.

1.3 Previous Investigation Summary

Two investigations were previously conducted at IRP Site 74, including the *Focused Site Inspection Phase II Report Naval Weapons Station, Seal Beach* (Focused Site Inspection [FSI] Phase II (SWDIV, 2002) and the *Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach* (Tier II Ecological Risk Assessment [ERA]) (SWDIV, 2005).

In 2000, as part of the FSI Phase II (SWDIV, 2002), the Navy performed a sampling and analysis program at 15 sites within NAVWPNSTA Seal Beach to provide data for evaluating ecological and human health risks. IRP Site 74 was one of the sites investigated. Sampling and analysis of 52 surface soil samples (0.5 to 1.0 foot bgs), 21 shallow subsurface soil samples (2.0 to 2.5 feet bgs), and 66 surface sediment samples (0 to 0.25 foot below sediment surface [bss]) were collected. Figure 3 shows the historical soil and sediment sample locations at IRP Site 74. Soil samples were analyzed for lead, antimony, PAHs, and lead shot; sediment samples were analyzed for lead, antimony, and lead shot. PAHs were not analyzed in sediment because fragments of the clay targets were not observed in the wetland area. A broken clay target, considered a potential source of PAHs, was also sampled and analyzed for PAHs.

The results of soil and sediment samples were compared to human health and ecological screening criteria. The results indicated that concentrations of lead and antimony in soil and sediment samples at IRP Site 74 pose potential risk to human health and ecological receptors. In addition to lead and antimony, PAHs in soil were found to pose risk to human health. The results of the HHRA are discussed in more detail in Section 1.5.1. Each of the 16 PAHs was detected in the broken clay target sample at concentrations significantly higher than those found in the soil samples, indicating the broken targets are likely the source of PAH contamination at IRP Site 74 (SWDIV, 2002). The FSI Phase II report recommended that a removal action be conducted to mitigate risks to human health and the environment at IRP Site 74.

In 2003, additional samples, including 21 soil samples, 21 sediment samples, 15 bird liver samples (western meadowlarks), 20 small mammal liver samples (mice), and 35 plant samples were collected at IRP Site 74 to support the Tier II ERA (SWDIV, 2005). Figure 3 shows the soil and sediment sample locations at IRP Site 74. The objectives of the Tier II ERA report were to delineate the spatial extent of the ecological risks and develop remediation goals for lead and antimony that would be protective of ecological receptors, which were deemed more sensitive to contaminant exposures than humans. Based on the results of the Tier II ERA, it was deemed appropriate to focus the development of the remediation goals on vertebrate receptors, including birds and mammals. Specifically, it was found that the Belding's savannah sparrow was the most sensitive ecological receptor in both the upland and wetland habitats and that cleanup goals developed for this species were protective of all other ecological receptors at the site. The Tier II ERA recommended that a comparative analysis of remedial alternatives be performed. The results of the ERA for IRP Site 74 are further discussed in Section 1.5.2.

In 2006, the Navy prepared an internal engineering evaluation/cost analysis (EE/CA) to evaluate potential removal action alternatives for IRP Site 74. The EE/CA evaluated both capping and removal alternatives. In 2009, to supplement the EE/CA, the Navy also prepared an internal net environmental benefit analysis (NEBA). The NEBA was performed to evaluate the removal action alternatives from the EE/CA to determine which strategies would provide the greatest net environmental benefit to the public. In some cases, remedial actions may not change the overall risk scenario significantly, which was one of the concerns evaluated in the NEBA. Furthermore, remedial actions undertaken to further reduce or eliminate ecological risks can cause substantive ecological losses, which was a concern at IRP Site 74 because of the quality of salt marsh habitat in the wetland. Because some remedial actions provide little risk reduction benefit, they provide little or no value to the public at unnecessarily high cost both in terms of dollars and lost services of the environment. However, during development of the EE/CA and NEBA documents, the Navy determined that, given the timeline of the CERCLA process to that point and the nature of the risks involved, it would be more appropriate to transition within CERCLA from the removal action process to the remedial action process, with a related shift from finalization of the EE/CA and NEBA to preparation of this FS.

1.4 Nature and Extent of Contamination

This section describes the COCs for IRP Site 74 and the extent of contamination.

1.4.1 Constituents of Concern

Lead, antimony, and PAHs in soil are COCs for human health (SWDIV, 2002), and lead and antimony in soil and sediment are COCs for ecological receptors at IRP Site 74 (SWDIV, 2002; SWDIV, 2005). In addition, lead shot poses a risk to ecological receptors. Figures 4 through 6 present the distribution of lead, lead shot, and antimony concentrations at IRP Site 74.

1.4.2 Extent of Contamination

Lead is the primary COC in soil and sediment at IRP Site 74. Lead was detected above its upper limit background value (ULBV) for NAVWPNSTA Seal Beach (SWDIV, 1997) in the majority of surface soil and sediment sampling locations. Concentrations of lead in surface soil and sediment samples exceeding the USEPA Region 9 residential preliminary remediation goals (rPRGs) (USEPA, 2000) are within a 160 degree arc and a distance of approximately 200 to 400 feet from the shooting area. Concentrations of lead in soil ranged between 5 and 80,300 milligrams per kilogram (mg/kg) (Figure 4). Lead concentrations in sediment ranged between 8.7 and 154,000 mg/kg (Figure 4).

Three distinct areas of high lead concentrations (greater than 10,000 mg/kg) were observed:

1. Small areas west of the berm surrounding the small-arms range near soil sample location 74B12
2. Larger and central area on either side of Case Road, directly west of the shooting area
3. Small area southwest of the OSR near soil sample location 74B37 (Figure 3)

It is likely that the small area of lead contamination west of the small-arms range berm may have been a result of fugitive bullets from the small-arms range. Also, the area of lead contamination south of the OSR can be attributed to past operations at the patterning board and turkey shoot area. The patterning board area (also referred to as turkey shoot area) was used to pattern the shotguns over various distances. The predominant lead contamination observed to the west of the shooting area can be directly associated with the pattern expected from the OSR operations. Residual antimony from the spent lead shot also follows this pattern. Antimony was frequently detected at locations where lead concentrations exceed the ULBV and rPRG. Concentrations of antimony in soil ranged between 0.1 and 3,930 mg/kg. Concentrations of antimony in sediment ranged between 19.8 and 2,980 mg/kg. Figures 4 and 6 present the distribution of lead and antimony concentrations in soil and sediment at IRP Site 74, respectively.

Lead shot (made of an alloy of lead and antimony) was found in soil and sediment samples, and some samples contained greater than 100 lead shot per kilogram of soil or sediment sample (Figure 5). The lead shot in soil and sediment samples was distributed within a 180 degree arc, approximately 500 feet in length from the shooting area. The greatest number of lead shot was present in soil and sediment samples collected in an area (within this arc) approximately 250 to 450 feet from the target release area. The maximum number of lead shot in soil was found in samples collected from soil sample location 74B31 (Figure 3), south of the OSR. The greatest amount of lead shot in sediment was found in samples collected from sample location 74G13, about 400 feet west of the OSR. The lead shot present in samples varied in diameter, ranging from 2 to 4 millimeters. Figure 5 presents the distribution of lead shots in soil and sediment at IRP Site 74.

A total of 16 priority PAHs was detected in soil samples from IRP Site 74. Based on the results presented in the FSI Phase II report (SWDIV, 2002), PAH detections were limited to surface soil samples and were not observed in shallow subsurface samples. The maximum concentrations and 95th percentile upper confidence limit of the mean (95 UCL) concentrations were compared to the rPRGs (USEPA, 2000). The maximum concentrations of seven PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene) were detected above their respective rPRGs. The 95 UCL concentrations of five PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene) exceeded the rPRGs. The concentrations of the majority of the PAHs detected above the rPRGs were detected in soil samples located in the immediate vicinity (within approximately 100 feet) of the target release area. The majority of PAHs concentrations detected above rPRGs were found at soil sample locations 74B01 through 74B05, 74B21, 74B32, 74B34, and 74B44 (Figure 3). A broken clay target, considered a potential source of PAHs was sampled and analyzed for PAHs. Sixteen PAHs were detected in this sample at significantly higher concentrations than those found in the soil samples, indicating the broken target is likely the source of PAH contamination at IRP Site 74.

1.5 Summary of Ecological and Human Health Risk Assessments

The HHRA for IRP Site 74 is presented in the FSI Phase II report (SWDIV, 2002). The ERAs are presented in the FSI Phase II (SWDIV, 2002) and Tier II ERA (SWDIV, 2005). A brief discussion of the HHRA and ERA follows.

1.5.1 Human Health Risk Assessment

The soil and sediment analytical results from the FSI Phase II (SWDIV, 2002) were used to estimate excess lifetime cancer risk (ELCR) and noncancer health effects to human health for the screening level evaluation. The maximum and 95 UCL concentrations in soil and sediment analytical data were compared with applicable ULBVs for NAVWPNSTA Seal Beach (SWDIV, 1997). Soil concentrations were also compared to USEPA Region 9 rPRGs (USEPA 2000). The ELCR was calculated for PAHs, and hazard quotients (HQ) were calculated for each COC.

Antimony and lead exceeded their corresponding noncancer rPRGs by several orders of magnitude. The 95 UCL concentration for antimony in soil is 373 mg/kg and the rPRG for antimony is 31 mg/kg (yielding an HQ of 12, which exceeds the noncancer threshold of 1). The 95 UCL concentration for lead in soil is 9,609 mg/kg. At the time that the FSI Phase II report was prepared, the rPRG for lead was 400 mg/kg. Currently, the residential California Human Health Screening Level (CHHSL) for lead in soil is 80 mg/kg.

The ELCR estimated from exposure to PAHs associated with the 95 UCL concentration in soil is $1x10^{-4}$, while the noncancer hazard index (HI) is less than 0.1 for PAHs at IRP Site 74. Although the ELCR for PAHs is at the upper end of the risk management range, the risk was conservatively calculated based on screening levels associated with residential land use, which is an unlikely end use for the site. Elevated PAHs are collocated with the high lead concentrations. PAHs were not analyzed in sediment because clay target fragments were not observed in the wetland area; therefore, an ELCR or HI was not estimated for PAH exposure to sediments.

As reported in the FSI Phase II report, the combined HI of 60 represents the overall human health noncancer HI for IRP Site 74, which exceeds the noncancer threshold of 1. In addition, the lead concentrations at IRP Site 74 exceed the residential CHHSL for lead in soil by several orders of magnitude. The HI is a conservative estimate that assumes a residential land use scenario in which people could be exposed in both the wetland and upland areas.

1.5.2 Ecological Risk Assessment

A screening-level ERA was performed as part of the FSI Phase II (SWDIV, 2002). Soil and sediment sample data were compared to ULBVs or "safe" ecological preliminary remediation goals (PRGs) developed for four terrestrial receptors at the site (clapper rail, American kestrel, mourning dove, and ground squirrel). Ecological risks to mallards and clapper rails from ingestion of lead shot were calculated by comparing sample data to literature results on the effects of lead shot ingestion in mallards, ring-necked ducks, and black ducks. Based on the results of the screening-level ERA, risks were identified for terrestrial receptors from lead and antimony in soil and sediments. Maximum and 95 UCL concentrations of these metals exceeded the safe ecological PRGs for the representative receptors. Lead was identified as the primary contributor of risk to these receptors at IRP Site 74.

The Tier II ERA (SWDIV, 2005) evaluated risks in both the upland and wetland habitats of the site. In support of the Tier II ERA, additional data were collected at IRP Site 74, including collocated soil/sediment and biota samples (marsh plants and invertebrates; terrestrial plants and invertebrates) and bird and mammal liver tissues (meadowlarks and small mammals). A bioaccessibility study was performed using soil and sediment samples. The samples were analyzed in a way that simulates gastric digestion to determine the fraction of lead and antimony in soil or sediment that is bioavailable. Additionally, site-specific plant bioassays were conducted using soil, and site-specific plant and sediment invertebrate bioassays were conducted using sediment. Reference samples were also analyzed for each evaluation. Risks to ecological receptors at IRP Site 74 were evaluated using a weight-of-evidence approach. Lines of evidence for the assessment included both site-specific measures (i.e., tissue residues and bioassays) and literature measures (i.e., effects data and toxicity reference values). Ecological risks were determined by dividing the exposure estimate by the appropriate toxicity reference value to obtain an HQ.

The results of the Tier II ERA indicated that lead and antimony in soil and sediment do not present risk to plants; salinity appeared to be a limiting factor (i.e., excessive salinity concentrations in soil and sediment were correlated with low germination). Lead and antimony concentrations in sediment presented risk to sediment invertebrates (other chemicals do not contribute). The results of the Tier II ERA for vertebrates concluded that antimony and lead present risks to resident birds and mammals. Measured lead concentrations in livers of meadowlarks and small mammals suggested exposure was occurring but little risk was present; however, the conclusion was limited because of the small sample size of meadowlark livers. Lead shot was also identified to pose risk to birds. The Tier II ERA recommended that remedial alternatives be evaluated to address these risks.

Figure 3 presents the habitat designations for the upland and wetland areas at IRP Site 74.

1.6 Fate and Transport Summary

The COCs at IRP Site 74 are not very mobile and tend to sorb to soil and sediment. The primary transport mechanism for these chemicals is the movement of soil and sediment via erosion. The primary source of lead and antimony in the soil and sediment is from the lead shot used from historical skeet- and trap-shooting activities that resulted in a widespread distribution of the solid lead shot. As previously described, stray bullets from the nearby small-arms range are another likely source of lead contamination. Similarly, the source of the PAHs in soil is likely from the clay targets. The COCs in soil or sediment may be directly bioaccumulated by plants or invertebrates present in the soil and sediments. Wildlife may be exposed directly to contaminants in soil or sediment through incidental ingestion and by ingestion of contaminated food items. Human receptors include site workers (conducting maintenance or landscaping) and future residents (upland area only). Humans could be exposed to the COCs in soil and the lead shot through incidental ingestion and dermal contact. Human exposure to COCs in sediment is not likely because the wetland area is not used for recreational activities.

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2.0 Development of Remedial Action Objectives

This section presents the RAOs, remediation goals, remediation areas, and ARARs for IRP Site 74. The RAOs are a general description of what the cleanup is expected to accomplish. The RAOs provide the basis for developing numerical remediation goals, which are used to identify the extent of the cleanup (i.e., the remediation areas) needed to achieve the RAOs. RAOs are medium-specific goals for protecting human health and the environment. Each RAO specifies the COC, the exposure routes, and the receptors. RAOs include both an exposure pathway and a remediation goal for chemicals for a given medium because protectiveness can be achieved in two ways: by limiting or eliminating the exposure pathway or by reducing or eliminating chemical concentrations. The media of concern for this FS are soil and sediment. As previously described, groundwater is not considered to be a complete pathway for human exposure to contaminants because the groundwater is not potable, and complete exposure pathways for ecological receptors for groundwater do not exist. Surface water is not a media of concern because the COCs (lead, antimony, and PAHs) at IRP Site 74 are not very soluble and tend to sorb to soil and sediment.

2.1 Remedial Action Objectives

The following are RAOs for IRP Site 74:

- Reduce risk to birds from ingestion of food items and incidental ingestion of soil and sediment containing elevated concentrations of lead and lead shot.
- Reduce risk to mammals from ingestion of food items and incidental ingestion of soil and sediment containing elevated concentrations of lead and antimony.
- Reduce potential future risk to human health from exposure to soil and sediment containing elevated concentrations of lead and antimony.

2.2 Development of Remediation Goals

The following remediation goals for lead in soil and sediment will achieve the RAOs, based on post remediation area-weighted averages:

- Lead in soil – 68 mg/kg
- Lead in sediment – 140 mg/kg

The remediation goals selected for soil in the upland area and sediment in the wetland area are based on protection of the most sensitive ecological receptor, the Belding's savannah sparrow. Locations identified as presenting unacceptable risks to Belding's savannah sparrow encompass the areas that present unacceptable risks to other wildlife and mammal species. Additionally, locations identified as presenting unacceptable risk from lead are collocated with areas presenting unacceptable risks from lead shot, antimony, and/or PAHs. As a consequence, the remediation goals developed to reduce risk to the Belding's savannah sparrow will address risks for all other species. Additionally, cleanup of lead concentrations will also address unacceptable risks posed by antimony and PAHs because the lead posing unacceptable risk is collocated with antimony and PAHs. Although the remedial footprint encompasses the areas that pose unacceptable risk at the IRP Site 74, some areas of lower concentrations of lead and lower density of lead shot will remain. Remediation goals were not developed for human receptors because potential future risk to human health from exposure to soil and sediment will be reduced by achieving the remediation goals developed for ecological receptors. IRP Site 74 is not used for residential or recreational purposes and not expected to change in the foreseeable future. IRP Site 74 is adjacent to an active small-arms range, and portions of the upland area may be developed as a wetland.

PRGs for the wildlife receptors at IRP Site 74 were calculated as part of the Tier II ERA (SWDIV, 2005). These values were derived by back-calculation of the exposure models and represent thresholds for potential adverse effects for each receptor. This method entails setting the HQ for either the no observed adverse effect level (NOAEL) or low observed adverse effect level (LOAEL) to 1 and back-calculating through the exposure calculation to obtain a soil or sediment concentration. The following are included in the exposure calculation and risk estimate:

- Literature-derived toxicity data – developed collaboratively with involved agencies and considered site-specific.
- Exposure equation – where total exposure is equal to the sum of exposure from incidental soil/sediment ingestion and ingestion of contaminated dietary items.
- Site-specific and literature-derived bioaccumulation models.
- Site-specific bioaccessibility (applied to soil ingestion).
- Literature-derived food ingestion rates.

A range of PRGs were calculated based on both dietary- and tissue-based exposures. PRGs were derived using the LOAEL as the toxicity benchmark for receptors evaluated at the population level (i.e., California vole, ornate shrew, mallard, and western meadowlark). To provide a range of potential values, PRGs for receptors evaluated at the individual level (i.e., light-footed clapper rail and Belding's savannah sparrow) were based on both the NOAEL and the LOAEL. PRGs were calculated separately for the upland (soil-based) and wetland (sediment-based) portions of the site. The selected remediation goals are the dietary exposure-based PRGs for soil and sediment (driven by the Belding's savannah sparrow), which are based on the NOAEL and are the most protective values. The range of PRGs calculated for the birds and mammals are presented in Table 2-1. Additionally, PRGs for benthic invertebrates (based on site-specific lowest observed effect concentrations developed from site-specific bioassays) and soil invertebrates (based on literature-derived lowest observed effect concentrations) are provided in Table 2-1. These values are presented in Table 2-1 to demonstrate that the selected remediation goals are protective of all potential receptors at IRP Site 74.

2.3 Remediation Areas

As discussed in Section 2.2, the risks at IRP Site 74 are driven spatially by the Belding's savannah sparrow. Locations identified as presenting risk to the Belding's savannah sparrow also presented risk to other species, as determined by a point-by-point comparison with PRG's presented in the Tier II ERA (SWDIV, 2005), and in fact these locations encompass all areas of actionable risk to such other species. Therefore, the remediation area that will reduce risks to this species also will address risks for all other species at IRP Site 74.

Post remediation or "residual risks" were calculated for lead and lead shot exposures to the Belding's savannah sparrow. To evaluate residual risk at the site, lead and lead shot HQs for the upland and wetland areas were calculated separately for the Belding's savannah sparrow. Lead shot was removed from soil and sediment samples before analyzing them for the concentration of lead. Therefore, lead concentrations in soil and sediment are not a result of lead shot in the sample. The upland HQ was determined by dividing the arithmetic mean lead concentration in the upland area by the soil-based remediation goals, and the wetland HQ was calculated by dividing the arithmetic mean lead concentration in the wetland area by the sediment-based remediation goal. Additionally, an area-weighted sitewide lead and lead shot arithmetic mean and HQ for the Belding's savannah sparrow were calculated using the total area of IRP Site 74.

The arithmetic mean represents an average exposure over the site or portion of the site and was calculated separately for upland and wetland portions of the site for each remediation area (i.e., 8.1 acres in the upland and 2 acres in the wetland areas based on the locations with the highest lead concentrations). As with the HQs, an area-weighted sitewide mean lead concentration was also calculated for each of the remediation areas. For the purposes of these mean calculations, it was assumed that the fill material would have lead concentrations equal to background. Base-specific studies at NAVWPNSTA Seal Beach indicated the ULBV for lead was 35.7 mg/kg. It was assumed that lead shot would not be present in fill material and that antimony in fill material would be below concentrations of concern. The lead concentration at each sampling location within the remediation footprint was given a value of 35.7 mg/kg (background). The measured lead or lead shot concentration was retained in the calculations for sampling locations outside the remediation areas.

A remediation footprint of the wetland area that would have fewer impacts to the wetland habitat while still being protective of ecological receptors was evaluated. The wetland remediation area footprint was developed by selecting sediment sample locations that contained the highest concentrations of lead in sediment and would result in the least amount of habitat damage to the wetland. This area includes remediation of sediment at and surrounding (the midpoint between samples within the remediation area and adjacent samples) 14 sample locations (74G38-00, 74G38-03, 74G04-00, 74G04-03, 74G05-00, 74G05-03, 74G36-00, 74G36-03, 74G12-00, 74G02-00, 74G03-00, 74G37-03, 74G26-03, and 74G13-00) (Figure 7). This area includes the sediment sample location (74G05-00) containing the highest lead concentration (154,000 mg/kg) measured in sediment.

Residual risk calculations indicate that the remediation goals discussed in Section 2.2 would address risks to ecological receptors in the upland and wetland areas of IRP Site 74. The risks would be reduced to acceptable levels by addressing the highest concentrations of lead at IRP Site 74. By applying the remediation goals discussed in Section 2.2, the sitewide area-weighted average for lead and lead shot both result in HQs less than 1. Tables 2-2 and 2-3 present the residual risk for lead and lead shot based on the remediation goals for soil and sediment at IRP Site 74. Figure 7 displays the spatial distribution of soil and sediment samples that would be addressed by application of the remediation goals based on residual risk calculations. This area identified based on the application of the remediation goals is approximately 10.1 acres, consisting of 8.1 acres in the upland and approximately 2.0 acres in the wetland area at a depth of 1 foot in all areas.

2.4 Potential Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA requires that remedial alternatives attain ARARs unless they are waived in accordance with CERCLA. ARARs are regulations, standards, criteria, or limitations promulgated under federal or more stringent state laws. An ARAR may be either “applicable” or “relevant and appropriate,” but not both. Sometimes a state requirement may be considered a federal ARAR when it is part of an approved federal program. Further explanation of the detailed ARARs evaluation is included in Appendix A. This section summarizes the ARARs identified for this remedial action.

2.4.1 Chemical-Specific ARARs

Chemical-specific ARARs include laws and requirements that define health- or risk-based numerical values or methodologies applied to site-specific conditions that can be used to establish remediation goals. Many potential ARARs associated with specific remedial actions can be characterized as action-specific but include numerical values or methodologies to establish them, so they fit in both the chemical- and action-specific categories.

Federal

The California Toxics Rule for lead at 40 Code of Federal Regulations (CFR) §131.38 is a potential federal ARAR for the remedial action, and the remedial action is expected to be in compliance with it.

Substantive provisions of the following requirement were identified as federal ARARs for characterizing waste generated during the remedial action:

- RCRA definition of hazardous waste in California Code of Regulations (CCR) Title 22, §66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100

Release of emissions into the atmosphere during excavation must comply with the Southern California Air Quality Management District Rules 401 and 403 prohibitions on visible emissions as potential federal ARARs for remedial alternatives being considered under this action.

State

The following state ARARs were identified for surface water for potential discharges during the remedial action, and the proposed remedial action is expected to comply with the substantive provisions of these ARARs:

- Porter-Cologne Water Quality Control Act, Cal. Water Code §§13241, 13243, 13263(a), 13269, and 13360 as enabling legislation for the Basin Plan, and California State Water Resources Control Board (SWRCB) Res. 88-63 and Res. 68-16.
- Water Quality Control Plan Santa Ana River Basin, Chapter 3 (Beneficial Uses) and Chapter 4 (Water Quality Objectives) (RWQCB, 1995) for the discharge to surface water from the remedial action.
- SWRCB Resolution (Res.) 88-63 to determine whether the surface water is a potential source of drinking water.
- SWRCB Res. 68-16 for a new discharge during the remedial action.

Substantive provisions of the following requirements were identified as state ARARs for characterizing waste generated during the remedial action:

- Definitions of designated waste, nonhazardous waste, and inert waste in CCR Title 27, §20210, 20220, and 20230.

2.4.2 Location-specific ARARs

Location-specific ARARs are requirements that relate to the geographical position of the site. State and federal laws and regulations that apply to the protection of wetlands, construction in floodplains, and protection of endangered species are examples of location-specific ARARs.

Federal

IRP Site 74 is within a potential floodplain, and a portion of the site is within a wetland; therefore, Executive Order No. 11990 and No. 11988 have been determined to be potentially relevant and appropriate for the Site 74 remedial action. The substantive provisions at CCR Title 22, §66264.18(b) that require construction to prevent washout form a 100-year flood are potentially relevant and appropriate for capping.

Overall, the remedial action is expected to mitigate potential threats to endangered species. Potential federal ARARs include the following:

- Endangered Species Act of 1973 (16 United States Code [USC] §§1531-1543)
- Migratory Bird Treaty Act of 1972 (16 USC §703)
- NWR System Administration Act of 1966 (16 USC §§668dd-668ee)

State

Potential state ARARs include the following:

- California Department of Fish and Game §2080 and §2081(b) for endangered and threatened species; §1908 for rare and native plant species; §3511 for fully protected birds; and §5650(a) and (b) for prohibitions of deleterious substances placement where passing to waters is a potential.

2.4.3 Action-specific ARARs

Action-specific ARARs regulate the specific type of action or technology under consideration, including the management of regulated materials.

Federal

The following federal ARARs have been identified for the excavation and temporary storage of waste:

- Onsite waste generation and determination requirements in CCR Title 22 §§66262.10(a), 66262.11, and 66262.13(a) and (b).
- Substantive requirements of CCR Title 22, §66262.34 (pertaining to hazardous waste accumulation) will be applicable (or relevant and appropriate if waste does not meet the definition of hazardous waste but is similar to RCRA hazardous waste).
- For storage of waste in staging piles, substantive requirements of 40 CFR §264.554(d)(1)(i-ii) and (d)(2)(e), (f), (h), (i), (j), and (k) are relevant and appropriate. CCR Title 22, §66264.258(a) (pertaining to the clean closure of staging piles) is a relevant and appropriate requirement.
- For the potential use of tanks and piping for dewatering the wetlands or sediment removed from the wetlands, the substantive provisions of the following regulations are relevant and appropriate: CCR Title 22, §§66264.192(a), (b), (c), (e), (f), and (g) for design and installation requirements; 66264.193(b), (c), (d), and (e) and 66264.193(f) for secondary containment of tanks and associated tank systems and ancillary equipment; 66264.194(a) and (b) for spill prevention; 66264.195(a), (b), and (c) for inspection; 66264.196(b) except (b)(5) and (b)(7) for response to spills and leaks; 66264.197(a) and (b) for closure and postclosure; and 66264.553(b), (d), (e), and (f) as alternatives for temporary systems.
- CCR Title 22, §66264.111(a) and (b) for maintenance minimization and CCR Title 22, §66264.114 for clean closure for Alternatives 2 and 4 where contaminated soil and sediment will be removed.
- The substantive provisions of the requirements for stormwater plans, best management practices, and effluent limitations reflecting the best practical technology currently available set forth in 40 CFR §122.44(k)(2) and (4) under Clean Water Act Section 402 are potential federal ARARs.
- Substantive provisions at Clean Water Act Section 301(b) that require all direct dischargers meet technology-based requirements, including the best control technology and the best available technology economically achievable, are potentially applicable.

Substantive provisions of the following requirements regarding discharge of fill material were identified as potential federal ARARs for placement of the cap and backfilling after excavation:

- 33 CFR §320.4 (general policies for evaluating permit applications).
- 40 CFR §230.10(a) – requires that the discharge represent the least damaging, practicable alternative.
- 40 CFR §230.10(c) – requires that discharge of dredged material not result in significant degradation of the aquatic ecosystem.
- 40 CFR §230.10(d) – requires that all practicable means be utilized to minimize adverse environmental impacts.
- 40 CFR §230.11 (factual determinations).
- 40 CFR §§230.20–230.25 (potential impacts on physical and chemical characteristics of the aquatic ecosystem such as substrate, suspended particulate/turbidity, water, current patterns and water circulation, normal water fluctuations, and salinity gradients).
- 40 CFR §§230.31 and 230.32 (potential impacts on biological characteristics of the aquatic ecosystem such as fish, crustaceans, mollusks, other aquatic organisms in the food web, and other wildlife).
- 40 CFR §230.53 (potential effects on human use characteristics, such as aesthetics).

The RCRA landfill closure requirements in CCR Title 22, §66264.111 are relevant and appropriate for capping the site as general performance standards that eliminate the need for further maintenance and control and eliminate postclosure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products.

State

Although not a potential ARAR, the Navy will implement the best management practices and prepare a CERCLA stormwater plan that will include monitoring, sampling and analysis, and numeric action level and effluent limit requirements, as specified under California's General Construction Storm Water Permit (SWRCB Order No. 2009-0009-DWQ, as amended by 2010-0014-DWQ).

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3.0 Identification and Screening of Remedial Technologies

This section presents the process by which potential remedial technologies for IRP Site 74 soil and sediment are identified and screened. The following three-step process was used:

1. Identify general response actions (GRAs) that can accomplish the RAOs identified in Section 2.0.
2. Establish the process for initial screening of potential remedial technologies and evaluation criteria.
3. Identify and screen potential remedial technologies against the evaluation criteria and in consideration of the nature and extent of contamination and other site-specific factors.

3.1 General Response Actions

GRAs are broad categories of action that, with the exception of the no action alternative, can be expected to accomplish the RAOs. GRAs may be used in combination with one another. Inclusion of the no action alternative is required by NCP (Title 40 CFR §300.430(e)) as a baseline alternative against which all other alternatives are compared.

The GRAs selected to address the RAOs were developed from nine primary remediation strategy categories. Table 3-1 lists the GRAs that are appropriate for consideration at IRP Site 74.

3.2 Technology Screening Process and Evaluation Criteria

Technology screening was conducted following the technology screening guidance described in RI/FS Guidance (USEPA, 1988) and *Guidance for Optimizing Remedy Evaluation, Selection, and Design* (NAVFAC, 2010). In addition, the technologies identified and screened are consistent with *Implementation Guide for Assessing and Managing Contaminated Sediment at Navy Facilities* (NAVFAC, 2003) and *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA, 2005). Potential remedial technologies and process options were screened according to the following three established criteria:

- Technical effectiveness
- Implementability
- Cost

3.2.1 Technical Effectiveness

The technical effectiveness of a technology/process option was evaluated based on its ability to meet the RAOs under the conditions and limitations at the site. The technical effectiveness criterion was used to determine which remedial technologies would be effective based on the nature and extent of contamination, site characteristics, and other engineering considerations. The NCP defines effectiveness as the "degree to which an alternative reduces toxicity, mobility, or volume through treatment, minimizes residual risk, affords long-term protection, complies with ARARs, minimizes short-term impacts, and how quickly it achieves protection." Remedial technologies that are not likely to be effective for addressing soil and sediment contamination at IRP Site 74 are screened out and are not retained for further evaluation.

3.2.2 Implementability

Implementability refers to the relative degree of difficulty anticipated in implementing a particular technology/process option under the regulatory and technical constraints posed at the site. Implementability is evaluated in terms of the technical and administrative feasibility of constructing, operating, and maintaining the technology/process option, as well as the availability of services and materials. Technical feasibility refers to the ability to construct and reliably operate the technology/process option and to comply with regulatory requirements during its implementation. Technical feasibility also refers to the future operation, maintenance, and monitoring after the technology/process option has been completed. Administrative feasibility refers to the ability to coordinate with and obtain approvals and permits from regulatory agencies. Services and materials may include the availability and capacity of treatment, storage, and disposal; the availability of bulk materials; and the requirements for and availability of specialized equipment and technicians. Remedial technologies that cannot be implemented at the site are screened out and not retained for further evaluation.

3.2.3 Cost

The primary purpose of the cost-screening criterion is to allow for a comparison of rough costs associated with the technologies/process options. The cost criterion addresses costs to implement the technology/process option and long-term costs to operate and maintain the remedy. At this stage of the process, the cost criterion is qualitative and used for rough comparative purposes only.

3.3 Identification of Remedial Technologies and Initial Screening

This section presents an overview of the remedial technologies and process options that were identified to address the contaminated soil and sediment at IRP Site 74. GRAs may be addressed by several types of remedial technologies and process options. Remedial technologies (e.g., capping and disposal) are general categories of technologies, and process options (e.g., reactive cap and landfill) are specific processes within a remedial technology category. The identification of remedial technologies and process options and the initial screening process are intended to evaluate the various technologies identified against the established criteria (effectiveness, implementability, and cost) and eliminate technologies and process options that are inappropriate or infeasible for addressing RAOs established for the site. Remedial technologies/process options that are retained after screening are then combined into potential remedial alternatives for the site. Table 3-2 presents the descriptions of the remedial technologies and process options that were identified and the initial screening evaluation as they apply to soil and sediment at IRP Site 74.

3.4 Results of Technology Screening Using Established Criteria

The initial screening process evaluated the remedial technologies and process options for effectiveness, implementability, and cost. Remedial technologies and process options that would not effectively address soil and sediment contamination at IRP Site 74 were eliminated. The remedial technology types that were not retained include monitored natural recovery, reactive/adsorptive cap, all types of in situ treatment, vacuum removal, ex situ thermal and biological treatments, ex situ soil and sediment washing, confined aquatic disposal, and confined disposal facility. The technologies and process options that were retained from the initial screening process are listed in Table 3-2 and are carried forward for the development of remedial alternatives in Section 4.0.

One technology that the community indicated may be favorable and less disruptive the wetland habitat at IRP Site 74 was vacuum removal. The Navy thoroughly evaluated this technology and contacted a number of vendors (Table 3-2). Five vacuum guzzler (or similar) vendors were contacted during the technology screening process to discuss the applicability of the technology for the wetland at IRP Site 74. Representatives from these companies were not aware of their technology being used in a salt marsh wetland or in any wetlands in California. The vendors indicated their technology is predominately used in storm sewer cleanout operations and is used to remove fine sediment and light foliage from drainage swales.

The vacuum technology may be used in a sediment environment but site-specific characteristics of the wetland would need to be evaluated during a pilot test prior to implementation. The pilot test would add additional time and cost to implementing the remedy at IRP Site 74. Furthermore, there is limited time to complete remedial activities at IRP Site 74 due to the nesting/breeding season of special status species at the site. Prior to implementation of the technology, vegetation would need to be removed from the wetland to prevent blockages in the suction pipelines. Suction distances would vary and would depend on the bulk density and water content of the sediment material. One unit evaluated reportedly can provide vacuum dredging capabilities to areas up to a 150-foot distance away from the equipment. The distance from Case Road to the outer bound of the wetland remediation area is approximately 300 feet; therefore, crane mats or a similar material would need to be laid down to support equipment access to the furthest locations. Alternatively, the equipment could be mounted to amphibious equipment; however, the construction of site-specific units could lengthen the remediation schedule. In comparison to other technologies evaluated (e.g., amphibious excavation), vacuum technology was considered less favorable for sediment removal given the site-specific conditions of the wetland at IRP Site 74 and the added complexity of implementation versus more traditional excavation using amphibious equipment.

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4.0 Development and Analysis of Remedial Alternatives

The purpose of this section is to develop and evaluate remedial alternatives that will address the RAOs for IRP Site 74 soil and sediment. The remedial alternatives were developed by assembling the remedial technologies and process options retained in Section 3.0. This section defines the evaluation criteria, presents detailed descriptions of the alternatives, analyzes each alternative using the established evaluation criteria, and provides a comparative evaluation of the alternatives.

4.1 Evaluation Process and Criteria

The detailed analysis was performed using a two-step process. In the first step, each alternative was evaluated individually against the NCP criteria and the sustainability/green remediation metrics. In the second step, a comparative analysis was performed using the same criteria to identify key differences between alternatives. The detailed analysis presents the significant components of each alternative, the assumptions used, and the uncertainties associated with the assessment.

4.1.1 NCP Criteria

The NCP defines nine criteria, classified as threshold, balancing, or modifying, to be used for the detailed analysis of remedial alternatives. The definitions of these criteria from the RI/FS Guidance (USEPA, 1988) are presented below.

4.1.2 Threshold Criteria

To be eligible for selection, an alternative must meet the threshold criteria described below, or in the case of compliance with ARARs, a waiver, if necessary, must be justified.

Overall Protection of Human Health and the Environment

This criterion evaluates whether an alternative can protect human health and the environment. This criterion draws on the analyses performed for other evaluation criteria, particularly long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Evaluation of overall protection of human health and the environment offered by each alternative focuses on the following:

- Determining whether an alternative achieves adequate protection
- Considering how site risks associated with each exposure pathway are eliminated, reduced, or controlled through treatment, engineering, or institutional controls
- Determining whether an alternative will result in any unacceptable short-term or cross-media effects

Compliance with ARARs

This evaluation criterion is used to determine whether an alternative meets the substantive portions of the federal and state ARARs defined in Section 2.0. Under CERCLA, permits are not required for actions conducted onsite; however, the substantive requirements of the associated ARARs must be met.

CERCLA authorizes the waiver of an ARAR with respect to a remedial alternative if any of the following bases exist (USEPA, 1988):

- The alternative is an interim measure that will become part of a total remedial action that will attain the ARAR.
- Compliance with the requirement will result in greater risk to human health and the environment than other alternatives.
- Compliance with the requirement is technically impracticable from an engineering perspective.
- The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through use of another method.
- With respect to a state requirement, the state has not consistently applied, or demonstrated the intention to consistently apply, the promulgated requirement in similar circumstances at other remedial actions within the state.
- For Superfund-financed response actions only, an alternative that attains the ARAR will not provide a balance between the need for protection of human health and the environment at the site and the availability of Superfund monies to respond to other sites.

4.1.3 Balancing Criteria

Alternatives meeting the threshold criteria are further evaluated using the following five balancing criteria.

Long-term Effectiveness and Permanence

The assessment against this criterion evaluates the long-term effectiveness of the alternatives in maintaining consistent protection of human health and the environment after the RAOs have been met. A key component of this evaluation is to consider the extent and effectiveness of controls that may be required to manage risk posed by treatment residuals and/or untreated waste. The long-term effectiveness of an alternative is assessed by considering the following two factors:

- **Magnitude of residual risk** assesses the residual risk remaining from untreated waste or treatment residuals at the conclusion of the remedial activities.
- **Adequacy and reliability of controls** evaluates the capability and suitability of controls, if any, that are used to manage treatment residuals or untreated wastes that remain at the site.

Reduction of Toxicity, Mobility, or Volume through Treatment

This evaluation criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies resulting in the permanent and significant reductions of toxicity, mobility, or volume of the hazardous substances as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media. The following six factors are considered when evaluating alternatives against this criterion:

- Treatment processes that the remedy will employ and the materials they will treat
- Amount of hazardous materials that will be destroyed or treated (including how the principal threats will be addressed)
- Degree of expected reduction in toxicity, mobility, or volume measured as a percentage of reduction (order of magnitude)
- Degree to which the treatment is irreversible
- Type and quantity of treatment residuals remaining following treatment
- Whether the alternative satisfies the statutory preference for treatment as a principal element

Of particular importance in evaluating this criterion is the assessment of whether treatment is used to reduce principal threats, including the extent to which toxicity, mobility, or volume is reduced, either alone or in combination.

Short-term Effectiveness

This criterion assesses the effects of the alternative during its construction and implementation until the RAOs are met. Alternatives are evaluated with respect to their effects on human health and the environment during their implementation. The following factors are considered when evaluating alternatives against this criterion:

- **Protection of the community during remedial actions.** This factor addresses any risk resulting from the remedy implementation. Examples include dust from excavations, transportation of hazardous materials, and air quality impacts.
- **Protection of workers during remedial actions.** This factor assesses threats potentially posed to workers and the effectiveness and reliability of protective measures that would need to be taken.
- **Environmental impacts.** This factor considers the environmental impacts potentially resulting from the construction and implementation of the alternative and assesses the reliability of available mitigation measures for preventing or reducing those impacts.
- **Time until RAOs are achieved.** This factor includes an estimate of the time required to achieve protection for either the entire site or individual elements associated with specific site areas or threats.

Implementability

The implementability criterion assesses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during the remedy implementation. The following factors are considered when evaluating alternatives against this criterion:

- Technical feasibility includes the following:
  - **Construction and operation** relate to the technical difficulties and unknowns associated with a technology.
  - **Reliability of technology** focuses on the likelihood that technical problems associated with the implementation will result in schedule delays.
  - **Ease of undertaking additional remedial action** includes a discussion of what, if any, future remedial actions may need to be performed and how difficult it would be to implement those actions.
  - **Monitoring considerations** address the ability to monitor the effectiveness of the remedy and include an evaluation of exposure risk should monitoring be insufficient to detect a failure.
- **Administrative feasibility** assesses the activities required to coordinate with other offices and agencies (e.g., access and right-of-way).
- **Availability of services and materials** includes an evaluation of the availability of appropriate treatment, storage capacity, and disposal services; necessary equipment and specialists; services and materials (including the potential for competitive bidding); and the availability of prospective technologies.

Cost

This criterion includes all the engineering, construction, and operations and maintenance (O&M) costs incurred over the life of the project. The evaluation of cost includes three principal components:

- **Capital costs** include direct (construction) and indirect (nonconstruction and overhead) costs. Equipment, labor, and materials required for the installation of the remedy are considered direct costs. Indirect costs consist of those expenses related to the engineering, financial, and other services that are necessary to complete the remedy installation but are not part of the actual installation or construction activities.
- **Annual O&M costs** refer to postconstruction expenditures required to ensure continued effectiveness of the remedial action. Components of annual O&M costs include auxiliary materials, monitoring expenses, equipment or material replacement, and 5-year review reporting.
- **Present worth analysis** is a method of evaluating expenditures such as construction and O&M that occur over different lengths of time. This evaluation allows costs for remedial alternatives to be compared by discounting all costs to the year that the alternative is implemented. The present worth of a project represents the amount of money, which if

invested in the initial year of the remedy and disbursed as needed, would be sufficient to cover all costs associated with the remedial action.

The level of detail required to analyze each alternative with respect to the cost criteria depends on the nature and complexity of the site, the types of technologies and alternatives being considered, and other project-specific considerations. The analysis is conducted in sufficient detail to understand the significant aspects of each alternative and to identify the uncertainties associated with the evaluation.

The cost estimates presented for each alternative have been developed for the purpose of comparing the alternatives (Appendix B). The final costs of the selected remedy will depend on actual labor and material costs, competitive market conditions, final project scope, the implementation schedule, and other variables. The cost estimates are order-of-magnitude estimates with an intended accuracy range of plus 50 to minus 30 percent. The range applies only to the alternatives as they are described in this report and does not account for changes in the scope of the alternatives. Selection of specific technologies or processes to configure remedial alternatives is not intended to limit flexibility during remedial design but to provide a basis for preparing cost estimates. The specific details of the selected remedial alternative and the corresponding cost estimate need to be refined during the final remedial design.

4.1.4 Modifying Criteria

The two modifying criteria are state acceptance and community acceptance. The evaluation of these criteria will be addressed in the ROD following comments on the FS and proposed plan.

4.1.5 Sustainability Evaluation

Consideration of sustainable practices is becoming increasingly important throughout the remediation community, and this emphasis is now being reflected in policy and guidance. Executive Order 13423, released on January 26, 2007, mandated that all federal agencies conduct their environmental, transportation, and energy activities in an environmentally, economically, and fiscally sound, integrated, continuously improving, efficient, and sustainable manner. In April 2008, USEPA issued the guidance document, *Green Remediation: Incorporating Sustainable Environmental Practices into the Remediation of Contaminated Sites* (USEPA, 2008), dedicated to developing and promoting innovative cleanup strategies that restore contaminated sites to productive use and reduce associated costs while promoting environmental stewardship.

The Navy's environmental strategy lays out a vision for "Sustaining our Environment, Protecting our Freedom," which links accomplishing the Navy's defense mission with its responsibility to safeguard the natural systems upon which the nation's quality of life depends. The United States Department of Defense issued a green and sustainable remediation (GSR) policy on August 10, 2009, encouraging the services to use strategies that consider all environmental effects of a remedy's implementation and operation, and incorporate options to maximize the overall benefit of cleanup actions. Executive Order 13514, released on October 5, 2009, sets sustainability goals for federal agencies and focuses on making improvements in their environmental, energy, and economic performance. The executive order requires federal agencies to set a 2020 greenhouse gas (GHG) emissions reduction target within 90 days, increase energy efficiency, reduce fleet petroleum consumption, conserve water, reduce waste, support sustainable communities, and leverage federal purchasing power to promote environmentally responsible products and technologies. In 2009, the Navy prepared a *Sustainable Environmental Remediation Fact Sheet* (NAVFAC, 2009), which outlines guidance on incorporating sustainable remediation into the environmental remediation process. Furthermore, regulatory agencies are beginning to request that sustainability be considered during remedy implementation.

Using the approach described in the Navy's fact sheet, sustainable environmental remediation was evaluated under the NCP criteria for IRP Site 74. The eight GSR metrics discussed in the fact sheet are as follows:

1. Energy consumption
2. GHG emissions
3. Criteria pollutant emissions
4. Water impacts
5. Ecological impacts
6. Resource consumption
7. Worker safety
8. Community impacts

Although there is no accepted protocol for implementing GSR technologies, SiteWise Version 2.0 (SiteWise), developed jointly by the Navy, United States Army Corps of Engineers, and Battelle (Battelle, 2011), was used to quantify values for the sustainability metrics. SiteWise uses various emission factors from governmental or nongovernmental research sources to determine the environmental footprint of each activity. SiteWise uses a "cradle to grave" approach to quantify footprints. As a result, some activities such as material production create environmental burdens that do not directly occur onsite but contribute to the overall footprints of the remedial alternative. This is particularly true in the case of GHG emissions, which contribute on a global, long-term scale. The quantitative metrics calculated by the tool include the following:

1. GHG emissions reported as carbon dioxide (CO_2) equivalents, consisting of CO_2, methane, and nitrous oxide
2. Energy use (expressed as British thermal units)
3. Water use (gallons of water)
4. Air emissions of criteria pollutants consisting of nitrogen oxides, sulfur oxides, and particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10})
5. Accident risk (risk of injury and risk of fatality)

Community and ecological impacts were not evaluated using the SiteWise tool because it does not currently quantify these impacts. However, qualitative evaluations of community and ecological impacts were completed. The sustainability metrics are most effectively addressed in the two NCP balancing criteria of (1) long-term effectiveness and permanence and (2) short-term effectiveness. For example, GHG emissions and total energy used, which may contribute to global climate change, are compared under the long-term effectiveness and permanence criterion. Ecological impacts are also compared under the long-term effectiveness and permanence criterion. Other air emissions (PM_{10}, nitrogen oxides, and sulfur oxides) and water use, whose impacts are more localized and short term, are compared under the short-term effectiveness criterion. Worker accident risks and community and ecological impacts are also compared under short-term effectiveness. The input parameters and results from SiteWise are associated with the assumptions linked with the alternative descriptions discussed in the following section. The sustainability assessment, including a comparative analysis for the alternatives are included in Appendix C.

4.2 Description of Alternatives

The descriptions of the remedial alternatives provided herein are conceptual and have been developed to a level of detail sufficient for the purposes of evaluating the alternatives against the NCP criteria, developing cost estimates of plus 50 to minus 30 percent, and comparing the alternatives. The selected alternative will be further developed during the remedial design process, and the specific methodologies and construction sequences used may change based on additional information that is gathered as part of pre-design activities. Table 4-1 presents the major components of each alternative. The following section provides a more detailed description of each alternative.

The following four alternatives are evaluated in the detailed analysis:

- Alternative 1: No action.
- Alternative 2: Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
- Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
- Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

4.2.1 Alternative 1

According to the NCP requirement, the no action alternative is carried through the entire FS process as the baseline condition against which the performance of the remaining alternatives is evaluated. Alternative 1 would not include any active remediation of IRP Site 74 but would include performing 5-year reviews. Additional monitoring and implementation of institutional controls are not included components of this alternative.

4.2.2 Alternative 2

Alternative 2 includes excavation of soil from the upland area and sediment from the wetland area. Approximately 8.1 acres of soil in the upland area and 2 acres of sediment in the wetland area would be removed to a depth of 1 foot. Approximately 13,100 bank cubic yards of soil and 3,230 bank cubic yards of sediment would be removed under this alternative. Figure 8 shows the removal areas in the upland and wetland areas. Standard excavation equipment (e.g., long-reach excavator with an enclosed bucket) would be used to remove the soil and sediment that contain lead, antimony, and PAHs (in soil only) exceeding remediation goals. Remedial activities would not be performed during the nesting period (April through September). Short-term monitoring activities would be performed during construction activities to assess air quality, water quality, and/or disruption of sensitive biological habitat. Physical survey methods (topographic and bathymetric) would be used to ensure the required removal depths were achieved. The assumed duration for implementing Alternative 2 is 2 years, including development of the remedial design and associated documents (e.g., remedial action work plan and health and safety documents) and remedial activities.

The wetland area is a salt marsh that is tidally influenced. The soft-subgrade in the wetland area may not support heavy excavation equipment. For this reason, a long-reach excavator, stationed at Case Road (adjacent to the wetland removal area) would be used to remove as much sediment as possible with the long-reach arm. For the remaining sediment removal areas that are unreachable with the long-reach excavator (e.g., sediment sample locations 74G37-03 and 74G26-03, shown on Figure 8), crane mats (or equivalent material) may be used to support the heavy equipment to these areas. Prior to remedial activities, sheet piles would be installed around the perimeter of the sediment excavation area. Sheet piling would help control and divert water away from the excavation area during remedial activities to facilitate dewatering of the sediments in place. A silt curtain would also be installed around the perimeter of the sediment excavation area. Sheet piling and the silt curtain would also help to mitigate re-suspension and/or release of contaminants outside of the remediation areas.

A staging and dewatering area would be constructed in the upland area or area adjacent to the site. Sediment drying beds would be constructed in the staging area to passively dewater the excavated sediment to reduce the weight and volume of the material prior to offsite transportation and disposal. Excavated sediment from the wetland area would be transported to sediment drying beds for dewatering. The sediment dewater water would be collected in a holding tank and sampled for lead and antimony prior to discharge back to the wetland or sanitary sewer, if available. Offsite disposal of the dewater water may be necessary, depending on the analytical results. For cost estimating purposes, it was conservatively assumed that the dewater water would be disposed of offsite as nonhazardous waste.

The excavated soil from the upland area and dewatered sediment from the drying beds would be stockpiled in the staging area. Prior to loading for offsite transport, the excavated soil and dewatered sediment would be chemically analyzed to determine treatment and disposal requirements. The soil and sediment would be transported by truck to a treatment and disposal facility where they would be solidified or stabilized and disposed of at a permitted landfill. Ex situ treatment of contaminated soil and sediment by solidification/stabilization is described in Table 3-2. For cost estimating purposes, it is assumed that 30 percent of the excavated soil and sediment would be transported to a Class II nonhazardous waste landfill (Kettleman Hills Landfill in Kettleman City, California), and the remaining 70 percent would be transported to a Class I hazardous waste landfill (Kettleman Hills Landfill in Kettleman City, California) as non-RCRA hazardous waste and require solidification/stabilization. The excavated areas would be backfilled with imported soil and re-vegetated to achieve pre-removal elevations and site conditions. Confirmation soil and sediment samples would be collected to ensure remediation goals were achieved.

4.2.3 Alternative 3

Under Alternative 3, 8.1 acres of contaminated soil in the upland area and 2.3 acres of sediment in the wetland area (Figure 8) would be capped with low permeability materials. The additional 0.3 acre of wetland that will be capped (compared to Alternative 2) accounts for areas between the removal areas. For cost estimating purposes, it is assumed the low permeability cap in the soil upland area would consist of approximately 12-inch low-permeability soil cover, geosynthetic clay liner, composite drainage net, and 12 inches of topsoil for a vegetative layer. The low-permeability cap in the sediment wetland area would consist of a 6-inch low-permeability clay and polymer material, such as Aquablok, and topped with a substrate with seed mix for wetland vegetation. The cap would act as an effective physical, hydraulic, and chemical environmental barrier when installed over the contaminated sediments in the wetland area. Once applied, the material will hydrate, coalesce, and transform into a continuous soft body of material.

Placement of the caps would be achieved using standard excavation equipment for the upland area and amphibious excavation equipment in the wetland area. Prior to capping activities in the wetland area, a barrier such as a silt curtain would be installed around the perimeter of the capping area to help mitigate the potential for re-suspension or release of contaminated sediment or capping materials outside of the remediation areas during construction activities. The capping activities would not take place during the nesting season (April through September). The assumed duration for implementing Alternative 3 is 2 years, including development of the remedial design and associated documents (e.g., remedial action work plan, geotechnical analysis, and health and safety documents).

Short-term monitoring activities would be implemented to monitor air quality, water quality, and/or disruption of sensitive habits during construction activities. Physical survey methods (topographic and bathymetric) would be performed to characterize the soil and sediment elevations prior to and following cap placement.

Implementation of institutional controls would be required to limit the future disruption of the cap. Long-term monitoring would be performed to evaluate cap effectiveness. Long-term monitoring activities to evaluate cap performance may include physical surveys of cap thickness, and collection of soil, sediment, or surface water samples. Maintenance of cap materials would be performed as needed. As required by the USEPA, 5-year reviews would also be conducted.

The capping of 2.3 acres of wetland under this alternative may result in the loss of wetland habitat because it is uncertain whether the restored wetland area will be of the same quality and able to provide the endangered species habitat that is present at the site prior to remediation. To offset this loss, a 2.5-acre wetland (2.3 acres of lost wetland plus an additional 10 percent) would be constructed at another location within NAVWPNSTA Seal Beach. The new wetland would be monitored for a period of 5 years after completion.

4.2.4 Alternative 4

Alternative 4 contains the same components as Alternative 2, except sediment in the wetland area would be removed using amphibious excavation equipment instead of standard excavation equipment. Marsh buggies would be used to excavate sediment inside the wetlands under this alternative. A marsh buggy is a construction vehicle equipped with an amphibious undercarriage that allows it to float on water. It is capable of operating on land and in water. Because the wetlands at IRP Site 74 are tidally influenced, the water depth in the areas of the excavation can range from a few inches to more than 8 feet deep. Marsh buggies are operable in environments with a range of water depths. Marsh buggies are available from a number of vendors in the United States and could be transported to the site. A marsh buggy would be assembled as an excavator and another as a cargo buggy to transport the excavated sediment to the staging/dewatering area. Prior to remedial activities in the wetland area, a silt curtain would be installed around the perimeter of the excavation area to help control release of suspended sediment outside of the remediation area during construction activities. Because the amphibious excavation equipment is operable in a saturated environment, sheet piling is not necessary to control or divert water away from the sediment excavation area as part of this alternative. As a result, for cost estimating purposes, it is assumed that the excavated sediment would contain a higher water content that would need dewatering than excavated sediment under Alternative 2. If sheet piling was ultimately used as part of Alternative 4 in order to reduce sediment water content and thus decrease sediment dewatering time in the drying bed the cost for Alternative 4 would increase by approximately $360,000. The assumed duration for implementing Alternative 4 is 2 years, including development of the remedial design and associated documents (e.g., remedial action work plan and health and safety documents) and remedial activities.

4.3 Detailed Analysis of Alternatives

Table 4-2 presents the detailed analysis of the alternatives against the NCP criteria defined in Section 4.1. Table 4-2 includes the net present worth costs for comparison purposes, and Appendix B contains the detailed cost estimates.

4.4 Comparative Analysis of Alternatives

Alternatives 2 through 4 meet the two threshold criteria (protection of human health and the environment and compliance with ARARs) and are carried forward to the comparative analysis. The following sections explain the relative performance of alternatives against five of the seven balancing criteria as described in the NCP. Two of the modifying criteria (state and community acceptance) are evaluated in the ROD. A sustainability criteria evaluation is folded into the comparative analysis for long-term effectiveness and permanence and short-term effectiveness.

Alternative 1, the no action alternative, does not meet the first threshold criterion (overall protection of health and the environment) but is retained for comparison as required by the NCP. The remaining alternatives (Alternatives 2, 3, and 4) meet both threshold criteria. Table 4-3 also summarizes the comparative analysis and presents each remedial alternative with rankings of its relative performance to each of the five balancing criteria.

4.4.1 Overall Protection of Human Health and the Environment

Alternative 1 would not provide overall protection of human health and the environment and would not achieve the RAOs for IRP Site 74. Contaminated soil and sediment would remain onsite and would continue to pose potential risk to human health and the environment.

Alternatives 2, 3, and 4 would provide protection to human health and the environment. Alternatives 2, 3, and 4 would meet the RAOs upon completion of the remedy and would effectively mitigate long-term exposure to COCs at IRP Site 74 because the contaminated soil and sediment would be removed or capped. The cap would prevent exposure of contaminated soil and sediment to human and ecological receptors, thereby reducing the risk from exposure to COCs.

4.4.2 Compliance with ARARs

There is no need to identify ARARs for the no action alternative because ARARs apply to "any removal or remedial action conducted entirely onsite" and "no action" is not a removal or remedial action. Alternatives 2, 3, and 4 would be designed to comply with ARARs.

4.4.3 Long-term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness or permanence because exposures to COCs in soil and sediment would not be removed or controlled by being capped. Alternatives 2 and 4 would result in comparable reduction of the risk to ecological and human receptors because both of these alternatives include permanent removal of contaminated soil and sediment from IRP Site 74. Long-term monitoring under these alternatives would not be required because the contamination would be effectively removed. Alternative 3 would also result in risk reduction comparable to that of Alternatives 2 and 4 because cap placement is an effective and accepted approach for reducing risk from direct contact. However, unlike Alternatives 2 and 4, Alternative 3 would rely on adequacy and reliability of institutional controls because untreated waste would remain onsite.

Capping contaminated soil and sediment would provide long-term effectiveness provided that the provisions codified in the institutional controls are enforced to prevent disruption of the cap and appropriate long-term cap monitoring and maintenance plans are implemented. The potential for minor breaches to the cap exist, and although regular monitoring would identify necessary repairs, the long-term permanence for Alternative 3 is less certain. Alternatives 2 and 4 provide the highest degree of long-term effectiveness and permanence at IRP Site 74 because soil and sediment posing unacceptable risk would be permanently removed from the site. Alternative 3 is rated lower than Alternatives 2 and 4 because the long-term effectiveness and permanence are less certain as a result of the reliance on controls. Additionally, Alternative 3 would be ranked lower than Alternatives 2 and 4 because of the destruction to the wetland and habitat loss from capping in the long term. Alternatives 2 and 4 are ranked higher because the removal of contaminated sediment in the wetland area will ultimately improve the quality of salt marsh habitat. Alternative 4 is ranked higher than Alternative 2 because the use of amphibious equipment to remove contaminated sediment in the wetland area will result in less destruction to the wetland area during the removal activities.

Alternative 1 would not result in GHG emissions. Alternative 3 would result in fewer GHG emissions than Alternatives 2 and 4 as a result of the residual handling (waste transportation), transportation of personnel, and use of equipment. Alternatives 2 and 4 have similar overall footprints because the alternatives are almost identical. Alternative 4 has a slightly lower overall footprint than Alternative 2 because of slightly decreased equipment use in that sheet piles would not be installed during that alternative. Approximately half of the GHG emissions generated by Alternatives 2 and 4 would be generated during residual handling (offsite transport of wastes). The other half would be generated during backfill operations.

4.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 would not reduce the toxicity, mobility, or volume of constituents in soil and sediment through treatment. Alternatives 2 and 4 would reduce mobility of contaminants through treatment by solidification/stabilization, and both alternatives are rated equally high among the alternatives. Alternative 3 would only include capping the contaminated soil and sediment in place without treatment; therefore, it does not meet this criterion.

4.4.5 Short-term Effectiveness

Alternative 1 is rated high because the environment, surrounding community, and workers would not be affected by remediation activities because there would be no action. Alternatives 2, 3, and 4 have comparable short-term risks to workers and the surrounding community during implementation. Accident risks in both injury and fatality categories were similar among all of the alternatives using SiteWise. The transport of soil or sediment to offsite disposal facilities would entail some potential risks to the community because of the large number of truck trips traveling to and from IRP Site 74. Construction of the cap in the upland area could result in fugitive dust emissions, although implementation of dust control measures would largely mitigate this risk.

All alternatives have the potential for uncontrolled releases of contamination to surface water (in the wetland area). Mitigation of these potential impacts would be addressed by physical barriers (e.g. silt curtains) and monitoring air quality, water quality, and biological resources during construction.

Alternative 3 is rated the lowest for short-term impacts because it would result in the most short-term risk to the environment since a greater area of habitat in the wetland portion of the site would be temporarily destroyed. Capping may result in loss of habitat for the Belding’s savannah sparrow (upland) and the light-footed clapper rail (wetland) if the post-remediation habitat is not of the same quality. The new wetland that would be created to mitigate for the wetland loss would take approximately 2 years to create and up to an additional 30 years to reach full maturity. Furthermore, the new wetland may not provide suitable habitat for the light-footed clapper rail.

Excavating the upland area under Alternatives 2 and 4 would remove the existing vegetation making this area temporarily unsuitable as foraging, breeding, and nesting habitat during the remedial action and the subsequent recovery period. Due to the type of existing habitat and local atmospheric conditions, assuming a linear recovery curve, the recovery period to reach full maturity following excavation and revegetation of the upland area would be approximately 5 years. Areas adjacent to IRP Site 74 with suitable habitat present for the Belding's savannah sparrow would likely provide refugia during remediation activities and allow for recolonization after completion of the remediation.

Alternative 4 is rated higher than Alternative 2 because the use of amphibious excavation equipment would result in less impact to the wetland habitat during removal as compared to the traditional excavation equipment. Excavating the wetland area would remove the existing vegetation making this area temporarily unsuitable as foraging, breeding, and nesting habitat during the remedial action and subsequent recovery period. Due to the type of existing habitat and local atmospheric conditions, assuming a linear recovery curve, the recovery period to reach full maturity following excavation of the wetland area could take from 5 to 30 years (Strange et al., 2002). Areas adjacent to IRP Site 74 provide suitable habitat for the light-footed clapper rail and would likely provide refugia during remediation activities if necessary. Once recovered, the area would provide full ecological services thereafter.

Alternatives 2 and 4 ranked least favorably in five of the eight GSR evaluation factors. Alternative 3 ranked least favorably in three of eight evaluation factors (Appendix C). The greatest overall impacts for Alternatives 2 and 4 are related to residual handling and transportation, and the manufacturing of the consumables required (primarily for GHG and energy use). Additional sustainability metrics considered by SiteWise include nonhazardous waste landfill space used, hazardous waste landfill space used, topsoil consumption, and lost hours resulting from injury of site workers. Comparison of the alternatives, with respect to these additional sustainability metrics, indicates that Alternatives 2 and 4 would require the same volume of nonhazardous and hazardous waste landfill space, while Alternatives 1 and 3 would not require landfill space. Alternatives 2, 3, and 4 would require the use of topsoil for backfilling operations, although Alternative 3 would require less topsoil than Alternatives 2 and 4. Alternative 1 would not require topsoil for backfill material. Alternative 3 would result in slightly more lost time because of injury than Alternatives 2 and 4. Alternative 1 would not result in lost time because of injury.

4.4.6 Implementability

Alternative 1 is considered to be readily implementable because no remedial actions would be performed; however, this alternative would not be administratively feasible because it would not meet the RAOs for the site.

A high level of care and caution would need to be taken to keep disturbance to wildlife in the area to a minimum during implementation of Alternatives 2 through 4. Because of the nesting period at the site, the remedial activities would be performed between October and

March. Nevertheless, these constraints on implementation of the remedial action can be mitigated.

Alternatives 2 and 4 are considered readily implementable because excavation is a mature technology and uses established procedures. Excavation of contaminated soil at IRP Site 74 would be relatively simple; no special techniques, equipment, materials, or labor would be required for excavation. Many contractors have the appropriate skill and experience to perform the work in the upland area. However, the excavation of contaminated sediment in the wetland area would be more complex. The excavation of sediment under Alternatives 2 and 4 would be complicated by water levels and the soft subgrade in the wetland area. Under Alternative 2, many contractors have the appropriate skills and experience to excavate the sediment in the wetland area using standard excavation equipment, install sheet piling, use crane mats, construct sediment drying beds, and dewater the excavated sediment. Amphibious equipment is not as readily available in Southern California as standard excavation equipment is, but amphibious equipment is reasonably available in other regions of the United States (e.g., southeast region) and could be transported to the NAVWPNSTA Seal Beach for the project. Many contractors have the appropriate skill and experience to use the amphibious equipment, and training is available from the vendors.

Implementation of Alternative 3 will be slightly more difficult than implementation of Alternatives 2 and 4. Capping is a mature technology for upland application, and the equipment, materials, and contractors needed to implement Alternative 3 are considered readily available. Capping in the wetland and aquatic environment is more complex. Successful placement of the cap in the wetland area would likely be more challenging than in the upland area because of the staging of equipment and application of the material relative to the tidal action in the wetland. A new wetland would need to be constructed to offset the loss of habitat in the capped portion of the wetland. There may be fewer contractors who have significant experience in new wetland construction.

4.4.7 Cost

Table 4-2 presents a comparative summary of the estimated costs for each alternative. The cost estimates are subdivided into capital, O&M, and net present value costs. Appendix B provides a detailed cost estimate for each alternative. For each alternative, a period of operation has been assumed. The net present value cost was calculated based on the duration of the alternative and the associated real discount rate for this period, per the per the Office of Management and Budget (OMB) Circular A-94 Appendix C, revised December 2011. According to the OMB Circular, real discount rates of 2.0 percent per year for Alternative 3 (30 years) and zero percent per year for Alternatives 2 and 4 (3 years) were used.

The cost estimates shown in Table 4-2 have been prepared to compare the relative cost of the various alternatives from the information available at the time of the estimate. The emphasis in preparing these cost estimates was not the absolute cost of each alternative but the relative cost differences among the alternatives. The final cost of the project will depend on actual labor and material costs, competitive market conditions, implementation schedule, and field conditions. As a result, the final project costs will vary from the estimates presented herein. Based on estimated total costs, Alternative 2 ($11.9 million) would be the least expensive, followed in order by Alternatives 3 ($12.7 million) and 4 ($12.7 million).

5.0 Recommendation

Based on the evaluation of the remedial alternatives against the NCP criteria, Alternative 4 is recommended for addressing contaminated soil and sediments at IRP Site 74.The comparative analysis of the alternatives in Section 4.0 shows Alternative 4 as ranking the highest compared to the other alternatives. The ranking reflects the advantages and disadvantages of each alternative compared to the others. Although Alternative 4 is not the lowest ranked in terms of cost, Alternative 4 would result in the least impact to habitat while providing long-term effectiveness and addressing the statutory preference for using treatment technologies that permanently reduce toxicity, mobility, or volume of hazardous substances. The Navy will ultimately present whichever alternative it proposes to implement to the public in a Proposed Plan, at which time regulatory agencies and the general public will have the opportunity to review the Proposed Plan and submit comments. After receipt and consideration of any comments received, the Navy will either document its remedy selection in a ROD or, if appropriate, issue a revised Proposed Plan.

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Tables

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TABLE 2-1

Preliminary Remediation Goals for Ecological Receptors at IRP Site 74

Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Receptor	Dietary Exposure-Based PRGs[a]			Tissue Exposure-Based PRGs			
	Sediment/Soil PRG for Antimony (mg/kg)	Sediment/Soil PRG for Lead (mg/kg)	PRG for Lead as Shot (mg/kg)	Sediment PRG for Lead (mg/kg)	Soil PRG for Lead (mg/kg)	Sediment/soil PRG for Lead (mg/kg)	Background Lead Concentration (mg/kg)
Sediment Invertebrates	282	33,100	NA	NA	NA	NA	35.7
Soil Invertebrates	115	3,500	NA	NA	NA	NA	35.7
California Vole	61	626	NA	NA	7,787	NA	35.7
Ornate Shrew	59/59	435/368	NA	NA	NA	1,191	35.7
Light-footed Clapper Rail	NA	174[a] 342[b]	164	NA	NA	NA	35.7
Mallard	NA	534	442	11318	NA	NA	35.7
Belding's Savannah Sparrow	NA	140/68[a] 294/211[b]	285/285	NA	NA	NA	35.7
Western Meadowlark	NA	3,945	2,420	NA	NA	NA	35.7

Notes:

[a] All values are based on LOECs or LOAELs unless otherwise note

[b] Preliminary RGs for the clapper rail and sparrow are shown based on the NOAE

[c] Preliminary RGs for the clapper rail and sparrow are shown based on the LOAE

LOAEL = lowest observed adverse effect level

LOEC = lowest observed effect concentration

mg/kg = milligrams per kilogram

NA = not applicable

NOAEL = no observed adverse effect level

PRG = preliminary remeditation goal

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TABLE 2-2
Overall Residual Ecological Risk for Lead - Belding's Savannah Sparrow
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Remediation Area Scenario	Upland Arithmetic Mean Lead Concentration (mg/kg)	Wetland Arithmetic Mean Lead Concentration (mg/kg)	Area-weighted[a] Arithmetic Mean Lead Concentration (mg/kg)	Residual Risk Based on NOAEL			Residual Risk Based on LOAEL		
				Upland NOAEL-based Sparrow HQ	Wetland NOAEL-based Sparrow HQ	Sitewide Area-weighted[a] Average NOAEL-based Sparrow HQ	Upland LOAEL-based Sparrow HQ	Wetland LOAEL-based Sparrow HQ	Sitewide Area-weighted[a] Average LOAEL-based Sparrow HQ
Remediation Goals (mg/kg)				**68**	**140**	**92**	**211**	**294**	**246**
Removal Area[b]	32.1	149.3	97.2	0.47	1.1	0.80	0.15	0.5	0.35

Notes:
[a] Sitewide area-weighted average values were determined using an upland area of 10.4 acres and a wetland area of 13 acres in the equation: (((upland mean or HQ*10.4)+(wetland mean or HQ*13))/23.4).
[b] Remediation Area includes 8.1 acres of soil in upland area and 2 acres of sediment in wetland area (including sediment locations 74G38-00, 74G38-03, 74G04-00, 74G04-03, 74G05-00, 74G05-03, 74G36-00, 74G36-03, 74G12-00, 74G02-00, 74G03-00, 74G13-00, 74G26-03, 74G37-03).

Background (35.7 mg/kg) used to represent lead concentrations in excavated areas.
HQ = hazard quotient
LOAEL = lowest observed adverse effect level (3.26 mg/kg/day)
mg/kg = milligram per kilogram
NOAEL = no observed adverse effect level (1.63 mg/kg/day)

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TABLE 2-3
Overall Residual Ecological Risk for Lead Shot - Belding's Savannah Sparrow
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

				Residual Risk Based on Annualized LD50		
Remediation Area Scenario	**Upland Arithmetic Mean Lead Shot Concentration (mg/kg)**	**Wetland Arithmetic Mean Lead Shot Concentration (mg/kg)**	**Area-weighted[a] Arithmetic Mean Lead Shot Concentration (mg/kg)**	**Upland Sparrow HQ**	**Wetland Sparrow HQ**	**Sitewide Area-weighted[a] Average Sparrow HQ**
Remediation Goals (mg/kg)				**285**	**285**	**285**
Remediation Area[b]	41.0	29.8	34.8	0.14	0.10	0.12

Notes:
[a] Area-weighted values were determined using an upland area of 10.4 acres and a wetland area of 13 acres in the equation: (((upland mean or HQ*10.4)+(wetland mean or HQ*13))/23.4).
[b] Remediation Area includes 8.1 acres of soil in upland area and 2 acres of sediment in wetland area (including sediment locations 74G38-00, 74G38-03, 74G04-00, 74G04-03, 74G05-00, 74G05-03, 74G36-00, 74G36-03, 74G12-00, 74G02-00, 74G03-00, 74G13-00, 74G26-03, 74G37-03).
Background (35.7 mg/kg) used to represent lead concentrations in excavated areas.
Annualized LD50 = Annualized Lethal Dose 50% (1.46 mg/kg/day)
HQ = hazard quotient
mg/kg = milligram per kilogram

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TABLE 3-1
General Response Actions
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Action	Description/Examples
No Action	Provides a baseline against which other remedial technologies are evaluated. The site is considered unchanged and represents the existing site conditions (i.e., no remedial activities would be implemented).
Institutional Controls	Administrative or legal controls (e.g., such as site access restrictions and environmental easements) are implemented. The measures are intended to prevent or reduce human exposure to on-site contaminants by eliminating the amount of direct or indirect contact with contaminated soil and/or sediments.
Monitored Natural Recovery	Monitoried natural recovery (MNR) involves leaving the contaminated sediment in place and allowing natural processes (physical, chemical and/or biological) to contain, destroy, alter, or reduce contaminant concentrations in soil and/or sediment. Long-term monitoring is often a component of MNR. Monitoring may include sampling and analysis of sediment, soil, groundwater, surface water, groundwater/surface water interface, fish tissue, toxicity tests, and/or bioaccumulation tests.
Monitoring	Monitoring may applied in the short-term or long-term. Short-term monitoring includes sampling and analysis of soil and/or sediment (e.g., dust and air quality, water quality, turbidity, noise) during the construction phase to protect human health and the environment. Following implementation of remedial actions, long-term monitoring includes routine sampling and analysis of soil and/or sediment at selected locations to evaluate site conditions and contamination levels to determine the remedy was effective.
Containment	Containment involves the installation of a cap to isolate exposure to impacted soil and/or sediment and to reduce the amount of contaminant flux to the environment. Long-term monitoring and maintenance activities are needed as part of this response action. Additionally, institutional controls may also be implemented.
In situ Treatment	In situ treatment (e.g., bioremediation, stabilization) involves treating contaminated soil and/or sediment in place by applying various physical or chemical methods to contain chemical concentrations, mobility, or bioavailability.
Ex situ Treatment	Ex-situ treatments (e.g., thermal treatment, physical/chemical treatment) can be performed onsite or at an offsite treatment facility. The treatments are usually applied to meet final disposal requirements, reduce costs by generating material with less stringent disposal requirements, and/or create a beneficial use product.
Removal	This response action involves removal of impacted soil and/or sediment (e.g., excavation, dredging) for treatment and/or onsite or offsite disposal. Factors that influence removal of soil and/or sediment include site conditions, water depth, soil and sediment characteristics (including water content), volumes to be removed, and accessibility. Removed soil and sediment requires transport (e.g., barge, truck, and/or rail) for treatment and disposal.
Disposal	Removed soil and sediment from the site is disposed of in a landfill, in-water confined aquatic disposal (CAD) facility, and/or at a confined disposal facility (CDF).

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TABLE 3-2
Technology Screening Evaluation Using Established Criteria
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

General Response Action	Remedial Technology Type	Process Option	Description	Effectiveness[a]	Implementability[b]	Cost[c]	Retained for Further Evaluation (Yes/No)	Screening Comments
No Action	None	Not Applicable	Remedial actions would not be implemented. No action assumes the site would be unchanged.	none	none	none	Yes	No action is retained for further evaluation as a baseline for comparison with other alternatives in accordance with the NCP.
Institutional Controls	None	Deed Notices, Negative Easements, Ordinances	Institutional controls are administrative or legal mechanisms used to implement site access restrictions and environmental easements. Institutional controls are typically used in conjunction with other remedy components and not as a stand-alone remedy.	medium	high	low	Yes	Institutional controls alone would not be an effective technology at IRP Site 74. Institutional controls can be used to limit human exposures to contaminants, and they can be readily combined with various technologies (e.g., capping) to enhance the overall effectiveness of a remedy. Institutional controls are readily implemented, have low costs, and would consist primarily of administrative actions. Institutional controls are retained for further evaluation.
Monitored Natural Recovery	MNR	MNR	MNR involves leaving contaminated sediments in place and allowing natural processes (physical, chemical and/or biological) to contain, destroy, alter or reduce contaminant concentrations. Recovery can reduce chemical mobility through sorption processes and through chemical or biological transformation to less toxic forms. MNR is not appropriate for sites that pose imminent risk. Long-term monitoring of the natural recovery process to ensure compliance with the RAOs is a component of MNR.	low	high	low-high	No	MNR would not be effective for addressing contaminated sediment because of the high contaminant (metals) concentrations and the amount of time it would take for natural processes to reduce the concentrations of contaminants at IRP Site 74 to meet the RAOs. MNR could be effective in some areas at IRP Site 74 if it can be shown that there are positive sedimentation rates and consolidated subsurface sediments with a low potential to erode. MNR would be easy to implement. Costs for MNR are low in comparison to other technologies, but costs can be significant if monitoring is required over a large area and for a long duration. MNR is not retained for further evaluation.
Monitoring	Monitoring	Long-term Monitoring	Routine long-term sampling and analysis of soil and/or sediment at selected locations to evaluate site conditions and contamination levels.	medium	high	low-high	Yes	Long-term monitoring alone would not be effective for addressing contaminated soil and sediment. However, it can be a useful approach when combined with various technologies (e.g., capping) to evaluate remedy effectiveness. Long-term monitoring is easy to implement, and the costs can be low to high, depending on whether monitoring is required over a large area and for a long duration. Long-term monitoring is retained for further evaluation.
		Short-term Monitoring	Short-term sampling and analysis (e.g., dust and air quality, water quality, turbidity, noise) during the construction phase to protect human health and the environment.	medium	high	low	Yes	Short-term monitoring alone would not be effective for addressing contaminated soil and sediment. However, it can be useful to protect human health and the environment during the construction-related activities associated with the remedial action. Short-term monitoring is easy to implement, and the costs are relatively low. Short-term monitoring is retained for further evaluation.
Containment	Capping	Low Permeability Cap	Low permeability capping includes the placement of one or more layers of clean material over the soil and /or sediments to isolate contaminated soil/sediments and reduce the amount of contaminant flux to the environment. Low permeability cap materials may include HDPE, geosynthetic clay liners, clay mineral based materials (e.g., Aquablok) and specialty amendments. Pilot testing may be required to determine the most suitable cap placement methods based on the site-specific characteristics. Long-term monitoring and maintenance activities are required to ensure the long-term effectiveness of this remedial technology. Additionally, institutional controls may be required.	high	medium	medium	Yes	Low permeability capping may be effective for addressing contaminated soil and sediment because it physically isolates or immobilizes contaminated soil/sediment. Placement of the cap would be relatively easy to implement although it would require skilled labor and specialized knowledge. The costs would be moderate depending on the cap design and materials. Low permeability capping is retained for further evaluation.
	Capping	Asphalt/Concrete Cap	Asphalt/concrete caps include placement of clean asphalt or concrete on areas that are currently unpaved to prevent exposure to chemicals in soil and/or sediment. Long-term monitoring and maintenance activities are required to ensure the long-term effectiveness of this remedial technology. Additionally, institutional controls may be required.	high	medium	medium	Yes	An asphalt or concrete cap may be effective for addressing contaminated soil and sediment because it physically isolates or immobilizes contaminated soil/sediment. Placement of the cap would be relatively easy to implement although it would require skilled labor and specialized knowledge. The costs would be moderate depending on the cap design and materials. Asphalt/concrete capping is retained for further evaluation.

TABLE 3-2
Technology Screening Evaluation Using Established Criteria
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

General Response Action	Remedial Technology Type	Process Option	Description	Effectiveness[a]	Implementability[b]	Cost[c]	Retained for Further Evaluation (Yes/No)	Screening Comments
	Capping	Armored Cap	Armored caps are used to stabilize cap materials. They generally consist of the placement of stone, gravel, or riprap over the primary capping material. Long-term monitoring and maintenance activities are required to ensure the long-term effectiveness of this remedial technology. Additionally, institutional controls may be required.	high	medium	medium	Yes	Cap armoring may be effective for protecting other cap materials from hydrodynamic forces in the wetland area. Placement of the cap would be relatively easy to implement although it would require skilled labor and specialized knowledge. The costs would be moderate depending on the cap design and materials. Armored capping is retained for further evaluation.
	Capping	Reactive/ Adsorptive Cap	Reactive capping involves placement of a layer of reactive material on top of contaminated soil and/or sediments to isolate the contaminants while reducing contaminant concentrations as the contaminants pass through the reactive material. Reactive/adsorptive cap examples include engineered clay aggregate materials, and reactive / adsorptive materials (e.g., activated carbon, apatite, coke, organoclay [CETCO reactive core mats/oleophilic clay], zero-valent iron, and zeolite). A pilot or full-scale study would be necessary to determine the effectiveness of this technology and cap placement methods. Long-term monitoring and maintenance activities are required to ensure the long-term effectiveness of this remedial technology. Additionally, institutional controls may be employed.	medium	medium	medium-high	No	The effectiveness of reactive/adsorptive caps for treating or immobilizing contaminants in soil and/or sediment is uncertain. Placement of the cap would be relatively easy to implement although it would require skilled labor and specialized knowledge. The costs would be moderate to high depending on the cap design and materials. Reactive/adsorptive capping is not retained for further evaluation.
In Situ Treatment	Bioremediation	Enhanced Biological Oxidation/ Reduction	Bioremediation uses natural microbiological processes to degrade or transform organic chemicals in the soil and/or sediment environment. Nutrients and potential electron donors/acceptors are provided while controlling temperature and pH to stimulate existing microorganisms to grow and use chemicals as a source of food and energy. Limnofix is an example bioremediation technology in which the Limnofix reagent is injected into sediment to degrade organic contaminants (e.g., PAHs). A pilot or full-scale study would be necessary to determine the effectiveness of this technology.	low	medium	medium	No	Bioremediation may be effective for addressing soil contaminated with PAHs, but it would not be effective for treatment of metal-contaminated soil that is collocated with the PAHs. Bioremediation would not be effective for treating the sediment eontaminated with metals. Bioremediation would be moderately difficult to implement and would require skilled labor and specialized knowledge. The cost would be moderate compared with other in situ technologies (e.g., thermal treatment). Bioremediation is not retained for further evaluation.
	Stabilization	Chemical Treatment	This technology involves immobilizing contaminants by physically binding or enclosing the soil and/or sediments within a stabilized mass, or chemically treating the contaminants. Portland cement, lime, or other additive (e.g., iron or phosphate amendments) is mixed with the soil/sediments in situ to encapsulate the material and/or reduce the solubility, mobility, and toxicity of the contaminants. Activated carbon may be used to treat hydrophobic organics (e.g., PCBs, PAHs, and pesticides). Stabilizing agents can alter the redox conditions in the soil and/or sediment environment which may increase the solubility or mobility of certain constituents. A pilot or full-scale study would be necessary to determine the effectiveness of this technology.	low	medium	medium	No	The effectiveness of chemical treatment is uncertain for the treatment of contaminated soil and sediment at IRP Site 74. Implementation of in situ chemical treatment of soils would be moderately difficult to implement and would require skilled labor and specialized knowledge. In situ chemical treatment has limited effectiveness in sediment environments. Implementation methods for in situ chemical treatment of sediments are not thoroughly developed. The cost would be moderate compared with other in situ technologies (e.g., thermal treatment). Chemical treatment is not retained for further evaluation.

General Response Action	Remedial Technology Type	Process Option	Description	Effectiveness[a]	Implementability[b]	Cost[c]	Retained for Further Evaluation (Yes/No)	Screening Comments
	Destruction	Chemical Destruction/ Oxidation	Chemical oxidants are injected into the subsurface soil and/or sediments to oxidize organic contaminants. A pilot or full-scale study would be necessary to determine the effectiveness of this technology.	low	medium	high	No	The effectiveness of chemical destruction/oxidation is uncertain for addressing soil and sediment contaminated with PAHs. It would not be effective for treatment of metal-contaminated soil that is collocated with PAHs and sediment contaminated with metals. Implementation of this technology would be moderately difficult to implement and would require skilled labor and specialized knowledge. Implementation methods for in situ chemical destruction of metals in sediments are not thoroughly developed. The cost would be high compared to other in situ technologies (e.g., thermal treatment). Chemical destruction/oxidation is not retained for further evaluation.
	Destruction/ Stabilization	Thermal Treatment	In situ vitrification uses heat or electric current to melt soil and convert the soil containing metals into a vitrified mass. A pilot or full-scale study would be necessary to determine the effectiveness of this technology.	low	medium	high	No	In situ vitrification may be effective for addressing contaminated soil, but it is not suitable for saturated environments (sediment). The availability of equipment and skilled personnel limits implementation of this technology. The cost for this technology is expensive to implement and is typically used for only very toxic contaminants (e.g., radioactive constituents). In situ vitrification is not retained for further evaluation.
Removal	Excavation	Mechanical Excavation	Excavation using mechanical equipment can be performed as dry excavation. This includes the removal of soil and/or sediment using earthmoving equipment (e.g., excavator, backhoe). For the removal of sediment, the excavation area must first be dewatered. Temporary barriers (e.g., sheet piling, aquadam) may be installed to isolate and allow the sediment excavation area to dry through evaporation, or barriers may be placed at low tide to mitigate potential resuspension of contaminants into the water column and release of contaminants downsteam during excavation. Crane mats would likely be required to support heavy equipment in areas with soft subgrade (i.e., wetland area).	high	medium	medium	Yes	Dry excavation is an effective technology for removal of contaminated soil and sediment. Implementation of this technology would be relatively easy in the upland area (soil) based on its extensive use. It would be moderately difficult to implement in the wetland area (sediment) because the soft subgrade would need to be supported to allow for heavy equipment. It is assumed that the majority of contaminated sediment in the wetland area could be handled using long-reach excavators that can excavate sediment from Case Road. The area would also need to be dewatered. The cost for excavation is expected to be comparable to the cost for dredging technologies. However, costs for managing post-excavated sediment can be substantially lower than for dredging because excavation is conducted under relatively dry conditions, the volumes of removed contaminated sediment for re-handling are smaller, and costs for dewatering and water treatment efforts are much lower Dry excavation is retained for further evaluation.
	Excavation	Amphibious Equipment	Excavation includes removal of sediment using an amphibious vehicle (e.g., marsh buggy) that is capable of operating in land and water at a range of water depths. Excavated material may be transported by a cargo buggy to a staging area. Amphibious equipment may be used in a way that causes minimum disturbance to wetland areas. Temporary barriers (e.g., sheet piling, aquadam) may be installed to mitigate potential resuspension of contaminants into the water column and release of contaminants downstream during excavation. Because the equipment can operate on land and in water, the excavated sediment from the wetland can be transported to a staging area on land. Dewatering the removed sediment would be needed to support the operation.	high	medium	medium-high	Yes	Amphibious equipment would be an effective removal technology for addressing contaminated sediment in the wetland area, but it is not necessary to address soil in the upland area. The technology would be moderately difficult to implement and would require skilled labor and specialized skills. The equipment would be able to operate under the range of water depths determined by tidal fluctuations in the wetland. The cost for this technology is moderate to high compared with other removal technologies (e.g., dredging). Amphibious equipment is retained for further evaluation.

General Response Action	Remedial Technology Type	Process Option	Description	Effectiveness[a]	Implementability[b]	Cost[c]	Retained for Further Evaluation (Yes/No)	Screening Comments
	Dredging	Mechanical or Hydraulic Dredging	Mechanical dredging removes sediment using buckets (e.g., environmental, clamshell) either suspended by cables from a crane or attached to a backhoe. The equipment is mounted on a floatable barge and the dredged sediments are typically placed in a scow for transport. Hydraulic dredging removes sediments with hydraulic suction. The sediments are then pumped through a pipeline to a staging area (e.g., dewatering site). Common hydraulic dredges include cutterhead, horizontal augers, plain suction, pneumatic submersible pumps, specialty dredge heads, and diver-assisted hand-held hydraulic suctions. Dewatering the removed sediment would be needed to support dredging operations.	medium	low	high	Yes	Dredging may be effective for addressing contaminated sediment, but it would not be applicable to soil in the upland area. Implementation of this technology would be very difficult because of tidal fluctuations in the wetland (shallow water depths), the soft subgrade, and the distance of the wetland area from the harbor. Implementation of dredging would require accessing the wetland from the harbor using floatable equipment (e.g., dredge equipment mounted on flexi-floats and floatable barges for dredge material transport). Water depths between 2 and 4 feet are needed to achieve this. Dredging could only be implemented during optimal tide. The costs associated with dredging would be high compared with other removal technologies (e.g., dry excavation). Dredging is retained for further evaluation.
	Vacuum Removal	Guzzler	A high-capacity vacuum/guzzler recover technology uses high-velocity air suction to remove sediment, and the sediment is pumped to a staging area. The material is then placed in roll-off containers where the solids are allowed to settle. The liquid is removed and treated, and the roll-off containers are transported offsite to a disposal facility. Testing may be needed to determine the applicability based on site-specific characteristics.	low	medium	medium-high	No	Vacuum removal would not be effective for removing contaminated sediment and lead shot on the marsh surface in the wetland area because of the large volume of sediment requiring removal, the presence of vegetation, and the limited pumping distance from a staging area. The technology is not typically recommended for use during large-scale wetland removals; it is commonly used for cleanout of storm drain systems. It would be difficult to implement because wetland vegetation and sediment slurry may cause blockages in the vacuum line, complicating sediment removal. Testing would be needed to determine the technology's effectiveness for vacuuming (e.g., vegetation, blockages, pumping distance) sediment in the wetland area. The cost for this technology is moderate to high based on the increased material handling and disposal costs. Vacuum removal is not retained for further evaluation.
Ex Situ Treatment	Biological Treatment	Landfarming	Landfarming involves mixing removed soil and/or sediment contaminated with organic chemicals with nutrients, water, and amendments and placing the mixture in an engineered treatment unit.	low	low	medium	No	Landfarming would not be effective for treating metal concentrations in excavated soil and sediment. The implementation would be relatively difficult because it requires a large amount of available land space, which is unavailable at the site. The cost would be moderate compared with other ex situ treatment technologies (e.g., thermal treatment). Landfarming is not retained for further evaluation.
	Physical/ Chemical Treatment	Stabilization and Solidification (Ex situ)	Cementing or stabilization agents are mixed with contaminated soil and/or sediments to immobilize contaminants by fixing the chemicals by physical or chemical reactions. The process may be used to reduce the moisture content of excavated soil/sediment and prepare them for disposal in an offsite treatment facility (e.g., a thermal desorption unit) or disposal facility (landfill). The process would not reduce contaminant concentrations but would reduce the leachability of some contaminants.	high	medium	medium	Yes	S/S techniques would be effective for treating excavated soil and sediments prior to disposal. The implementation would be relatively easy based on its extensive use. The cost would be moderate compared with other ex situ technologies (e.g., thermal treatment). S/S is retained for further evaluation.
	Thermal Treatment	Thermal Destruction	Thermal destruction technologies (e.g., pyrolysis, incineration) destroy organic contaminants by heating the waste at very high temperatures. Inorganic chemicals are concentrated in the ash generated during the incineration process and would require additional treatment and disposal. Beneficial use products may result from the thermal process (e.g., cement replacement or as a partial replacement for sand in concrete, electricity production). Dewatering the removed sediment would be needed to support thermal destruction.	low	medium	high	No	Thermal destruction technology may be effective for addressing soil contaminated with PAHs, but it would not be effective for treating soil and sediment contaminated with metals. This technology would be relatively difficult to implement because of offgas treatment requirements and the moisture content in sediments. The costs are high compared with other ex situ technologies (e.g., thermal treatment). Thermal destruction is not retained for further evaluation.

TABLE 3-2
Technology Screening Evaluation Using Established Criteria
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

General Response Action	Remedial Technology Type	Process Option	Description	Effectiveness[a]	Implementability[b]	Cost[c]	Retained for Further Evaluation (Yes/No)	Screening Comments
	Thermal Treatment	Thermal Desorption	Thermal desorption technologies heat the soil/sediment to high temperatures and organic contaminants are condensed and collected as a liquid, captured on activated carbon, and/or destroyed in an afterburner.	low	medium	high	No	Thermal desorption technology may be effective for addressing soil contaminated with PAHs, but it would not be effective for treating soil and sediment contaminated with metals. This technology would be relatively difficult to implement because of offgas treatment requirements and the moisture content in sediments. The costs are high compared with other ex situ technologies (e.g., thermal treatment). Thermal desorption is not retained for further evaluation.
	Dewatering	Passive or Mechanical Dewatering and/or Dewatering Additives	Dewatering can be accomplished by passive or mechanical means. Passive dewatering uses passive drainage and evaporation to dry sediments. Common passive dewatering methods include dewatering beds and geotextile tubes. Mechanical systems such as belt presses and filter presses can be used to accelerate the dewatering process. Dewatering additives (e.g., polymers, hydrated lime, and ferric sulfate) can be added to the excavated or dredged sediments after removal to aid in the dewatering process.	high	medium	medium	Yes	Dewatering would be effective for removing water from sediment excavated from the wetland prior to treatment and/or transport. Passive dewatering (e.g., geotextile tubes, drying beds) and use of dewatering additives would be relatively easy to implement at the site, based on an available staging area. Mechanical dewatering technologies would not be as easy to implement because the mechanical systems would need to be constructed onsite. The costs for passive dewatering and use of dewatering additives are moderate compared to mechanical dewatering methods. Passive dewatering and dewatering additives are retained for further evaluation.
	Separation	Sediment or Soil Washing	Soil and sediment washing is achieved by ex situ physical separation of fine and bulk sediment particles (e.g., sifting) followed by chemical washing using a solvent to remove chemicals from soil/sediment. It is assumed that chemicals sorb to the finer particles, which generally contain high levels of total organic carbon. The washed soil/sediment may be transported offsite, and the ammunition fragments are recycled. A pilot study may be needed to determine the volume of contaminants removed from soil and the characteristics of remaining soil/sediment.	low	medium	medium	No	The effectiveness of sediment/soil washing for reducing contaminant concentrations in soil and sediment at the site is uncertain and would require testing. Based on initial sampling efforts at the site, the shot fragments were so small that sifting prior to laboratory analysis did not result in lead concentrations that were considered nonhazardous. The spent shot fragments are very degraded and bound to the soil/sediment particles. The implementation of this technology would also be difficult because soil/sediment contaminated with both metals and PAHs make formulating a single, suitable washing solution difficult. Sequential washing using different formulations would be required. Also, a large volume of wastewater generated from the process would need to be treated. The cost to implement this technology would be moderate compared with other ex situ technologies (e.g., thermal treatment). Sediment/soil washing is not retained for further evaluation.
Disposal	Onsite Disposal	Confined Aquatic Disposal	CAD cells are in-water disposal units that isolate contaminated sediments by placing them into a geochemically stable environment that limits the mobility of the contaminants. The CAD cell is capped after it is filled. Long-term monitoring and maintenance activities are required to ensure the long-term effectiveness of this remedial technology. Additionally, institutional controls may be required.	high	low	high	No	A CAD would be an effective disposal unit for excavated soil and sediment from the site. However, implementation of this technology would be difficult based on the lack of nearby CAD cells; therefore, a new CAD would need to be constructed. The costs to construct a CAD would be relatively high. CAD disposal is not retained for further evaluation.
	Offsite Disposal	Landfill	Disposal of contaminated soil and sediments at an offsite landfill removes the chemicals of concern from the site. The removed soil/sediments would be evaluated prior to disposal to indentify the type of landfill that will accept the material. Disposal may be in a nonhazardous or hazardous waste landfill based on the waste characteristics. Sediments require dewatering prior to offsite transportation and disposal.	high	medium	medium-high	Yes	Disposal of excavated soil/sediments at an offsite, permitted disposal facility would be effective for reducing the risk posed to human and ecological receptors by removing the soil/sediment from the site. Implementation of this technology is relatively easy, once a disposal facility in the area is identified to accept the removed soil/sediment. The cost would be moderate to high depending on the classification and volume of the waste to be disposed. Landfill disposal is retained for further evaluation.

TABLE 3-2
Technology Screening Evaluation Using Established Criteria
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

General Response Action	Remedial Technology Type	Process Option	Description	Effectiveness[a]	Implementability[b]	Cost[c]	Retained for Further Evaluation (Yes/No)	Screening Comments
	Offsite Disposal	Confined Disposal Facility	A CDF is an extension of land or an island area designed for containment of contaminated dredged sediments that provides control of potential releases of contaminants to the environment. Dikes or other structures may be used to isolate the dredged materials placed in a CDF. Existing CDFs are typically owned and operated by USACE. Long-term monitoring and maintenance activities are required to ensure the long-term effectiveness of this remedial technology. Additionally, institutional controls may be required.	high	low	high	No	A CDF would be an effective disposal unit for excavated soil and sediment from the site. However, implementation of this technology would be difficult based on the lack of CDFs in the area; therefore, a new CDF would need to be constructed. The cost to construct a CDF would be relatively high. CDF disposal is not retained for further evaluation.
	Transportation	Truck, and/or Rail	Excavated or dredged soil and sediment may be transported to a staging area. From there, the soil/sediment may need further transport by truck and/or rail for further treatment. Sediment would require dewatering/stabilization prior to transport by truck or rail. Sediments may require treatment prior to disposal.	high	medium	medium	Yes	Truck and/or rail transport of excavated soil and sediment would be effective for transporting material to a landfill or treatment facility. Implementation of rail transport is not possible because railroad lines from the site no longer exist. Truck transport is relatively easy to implement. The costs would be moderate to high depending on the distance to the treatment/disposal facility; however, truck transport is the standard mode of transportation. Truck and/or rail transport is retained for further evaluation.

Notes:

Gray shading indicates that the technology was not retained for further evaluation.
[a] Effectiveness is the ability to perform as part of an overall alternative that can meet the objective under conditions and limitations that exist onsite.
[b] Implementability is the likelihood that the process could be implemented as part of the remedial action plan under the physical, regulatory, technical, and schedule constraints.
[c] Relative cost is for comparative purposes only, and it is judged relative to the other processes and technologies that perform similar functions.

CAD = Confined Aquatic Disposal
CDF = Confined Disposal Facility
ENR = Enhanced Natural Recovery
HDPE = high-density polyethylene
IRP = Installation Restoration Program
MNR = Monitored Natural Recovery
NCP = National Oil and Hazardous Substances Pollution Contingency Plan [Title 40 Code of Federal Regulations Section 300.430(e)]
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
RAO = Remedial Action Objective
S/S = Stabilization and Solidification
USACE = United States Army Corps of Engineers

TABLE 4-1
Summary of Remedial Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

	Alternative 1 **No Action**	**Alternative 2** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**Alternative 3** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**Alternative 4** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Major Components	No remedial actions would be implemented under this alternative. There would be no provisions made for potential exposure to surface soil and sediment. There would be no provisions made to maintain a cap, and no land use restrictions would be implemented.	• Excavation of contaminated soil in the upland area (8.1 acres, 1 foot bgs) and sediment in the wetland area (2 acres, 1 foot bss). • Contaminated soil and sediment would be removed using standard excavation equipment (e.g., long-reach excavators). • Temporary barriers (e.g., sheet piles) would be installed in the wetland area to divert and control water away from the sediment excavation area and mitigate the release of resuspended sediment and contaminants outside of the removal area during remediation activities • Crane mats may be used to support heavy equipment (e.g., excavator) in soft subgrade areas. • Short-term monitoring would be implemented during construction activities for soil and sediment. • Excavated sediment would be dewatered onsite using passive dewatering methods (e.g., sediment drying bed). • The sediment decant water would be collected in a holding tank and sampled for lead and antimony prior to discharge back to the wetland or sanitary sewer, if available. The discharge would need to meet ARARs. Depending on the analytical results of the decant water, the water may be transported and disposed. • Excavated soil and excavated/dewatered sediment would be transported by truck to an offsite treatment/disposal facility. It was assumed the material would be solidified/stabilized offsite prior to disposal in a permitted landfill. • The soil and sediment excavation areas would be backfilled with a clean layer of material to pre existing grade and revegetated. • Confirmation soil and sediment samples would be collected to ensure cleanup goals were met.	• Contaminated soil in the upland area would be capped (8.1 acres) with a low-permeability cover (e.g., approximately 12-inch low-permeability soil cover, geosynthetic clay liner, composite drainage net, and 12 inches of topsoil for a vegetative layer). • Contaminated sediment in the wetland area would be capped (2.3 acres) with a low-permeability cover (approximately 6 inches with substrate on top to allow for revegetation). • Temporary barriers (e.g., silt curtain) would be installed in the wetland area to mitigate release of resuspended sediment, capping material, and contaminants outside of the capping area during capping activities. • Short-term monitoring would be implemented during construction activities. • Institutional controls would be implemented. • Long-term monitoring would be performed to ensure cap integrity. Long-term monitoring may include physical surveys to evaluate cap thickness, and collection of soil, sediment, and/or surface water samples to evaluate cap performance. Cap repairs would be performed as needed. • Wetland creation would be implemented to offset the loss in the wetland area as a result of capping. A 2.5-acre (2.3 acres of lost wetland plus an additional 10 percent) engineered wetland would be constructed at NAVWPNSTA Seal Beach.	• The remedy for soil in the upland area would be the same as the remedy described under Alternative 2. • The excavation of sediment in the wetland area (2 acres, 1 foot bss) would be achieved using amphibious equipment (e.g., marsh buggy/cargo buggy). • Temporary barriers (e.g., silt curtain) would be installed in the wetland area to control/mitigate release of resuspended sediment and contaminants outside of the removal area during remediation activities. • Short-term monitoring would be implemented during construction activities. • Excavated sediment would be dewatered onsite using passive dewatering methods (e.g., sediment drying bed). • The sediment decant water would be collected in a holding tank and sampled for lead and antimony prior to discharge back to the wetland or sanitary sewer, if available. The discharge would need to meet ARARs. Depending on the analytical results of the decant water, the water may be transported, treated, and disposed offsite as nonhazardous waste. • Excavated soil and excavated/dewatered sediment would be transported by truck to an offsite treatment/disposal facility. It was assumed the material would be solidified/stabilized offsite prior to disposal in a permitted landfill. • The sediment excavation areas would be backfilled with a clean layer of material and revegetated. • Confirmation soil and sediment samples would be collected to ensure cleanup goals were met.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
bgs = below ground surface
bss = below sediment surface
NAVWPNSTA = Naval Weapons Station

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TABLE 4-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	**Alternative 1** **No Action**	**Alternative 2** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**Alternative 3** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**Alternative 4** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Overall protection of human health and the environment				
Overall protection of human health and the environment	Alternative will not provide protection of human health and the environment: • RAOs would not be achieved. • Human health and ecological risks associated with contaminated soil and sediment would not be reduced or eliminated. • Contaminant concentrations in soil and sediment would not be reduced.	Alternative will provide protection of human health and the environment: • RAOs would be achieved upon completion of the remedy, which is estimated to be less than 1 year after the start of construction. • Removal of contaminated soil and sediment would eliminate long-term risks.	Alternative will provide protection of human health and the environment. • RAOs would be achieved upon completion of the remedy, which is estimated to be less than 1 year after the start of construction. • Capping of soil and sediment would reduce and control long-term risk. Placement of a cap would control risks associated with remaining soil and sediment by preventing wildlife and human receptors from exposure to COCs. • Loss of habitat would result from capping of the wetland area.	Same as Alternative 2. However, the use of amphibious equipment would reduce the destruction of sensitive habitat in the wetland area during the remedial activities.
Compliance with ARARs				
Chemical-specific ARARs	Not applicable because no remedial action is taken.	Alternative would be designed to comply with substantive requirements of the ARARs.	Same as Alternative 2.	Same as Alternative 2.
Location-specific ARARs	Not applicable because no remedial action is taken.	Alternative would be designed to comply with substantive requirements of the ARARs.	Same as Alternative 2.	Same as Alternative 2.
Action-specific ARARs	Not applicable because no remedial action is taken.	Alternative would be designed to comply with substantive requirements of the ARARs.	Same as Alternative 2.	Same as Alternative 2.
Long-term effectiveness and performance				
Magnitude and type of residual risk	Contaminated soil and sediment remain onsite. The long-term residual risk will be similar to the baseline risk, as contaminant concentrations in sediment and/or soil.	Soil and sediment with contaminant concentrations that exceed the cleanup goals would be removed and transferred offsite. The risks associated with contaminated soil and sediments at the site would be eliminated.	Soil and sediment with contaminant concentrations that exceed the cleanup goals would be capped. The risks associated with contaminated soil and sediment at the site would be reduced.	Same as Alternative 2.

TABLE 4-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	**<u>Alternative 1</u>** **No Action**	**<u>Alternative 2</u>** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**<u>Alternative 3</u>** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**<u>Alternative 4</u>** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Adequacy and reliability of controls	Does not include any controls for exposures or long-term management measures. Institutional controls/land use restrictions would not be implemented.	Provides adequate control because constituents would be removed from the site. Excavation is an established technology and would meet the performance specifications for the removal component of the alternative. Physical surveys would be conducted to confirm that removal depths were achieved. Confirmation soil and sediment samples would be collected to confirm that cleanup goals were met. The offsite treatment/disposal facility provides adequate long-term controls for the excavated soil and sediment.	Provides adequate control as long as the institutional controls are enforced through maintenance of the soil and sediment caps and long-term monitoring and reporting. Long-term management of the caps and performance specifications would be provided by an O&M Plan. Monitoring would be performed to determine whether the cap must be repaired or replaced. Capping is an established technology and would be designed to meet the performance specifications of the alternative, provided that effective source controls have been implemented, and the cap is constructed and maintained in accordance with the design specifications established for long-term isolation of the contaminated soil and sediments. Long-term monitoring and periodic maintenance would be required to ensure cap integrity. The O&M plan developed during the remedial design would determine the monitoring and maintenance frequencies required to ensure and maintain cap integrity based on site-specific factors: • Physical surveys and the collection of samples on a defined grid would be needed to assess cap layer thickness, cap performance and integrity, contaminant movement, and/or recontamination concerns. Samples for chemical analysis should also be collected at regular predetermined intervals. • The long-term monitoring plan should also specify monitoring requirements after severe storm events to assess cap integrity. • Cap repairs would be performed as needed. • Component failures (i.e., cap failure) could potentially result in the release of contaminants and exposure to ecological or human receptors; however, catastrophic failure of the cap is unlikely if appropriate long-term O&M plans are implemented.	Same as Alternative 2.

TABLE 4-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	**<u>Alternative 1</u>** **No Action**	**<u>Alternative 2</u>** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**<u>Alternative 3</u>** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**<u>Alternative 4</u>** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Reduction of toxicity, mobility, or volume through treatment[a]				
Treatment process and remedy	No treatment process is included.	No onsite treatment process is included. Treatment of excavated soil and sediment would be transferred to the treatment/disposal facility. Excavated sediment would be dewatered onsite using a drying bed. It is assumed that the water resulting from dewatering activities will be of a quality that can be returned to the wetland or sanitary sewer (if available) without additional treatment. However, if analytical results of the water resulting from dewatering activities indicate that it does not meet discharge requirements the water will be transported to the treatment/disposal facility.	No onsite treatment process for soil and sediment is included.	Same as Alternative 2.
Amount of hazardous material destroyed or treated	None. Contaminated soil and sediment remain onsite.	None. Contaminated soil and sediment will be transported offsite for treatment and disposal.	None. Contaminated soil and sediment remain onsite.	Same as Alternative 2.
Reduction in toxicity, mobility, or volume through treatment	Provides no reduction in toxicity, mobility, or volume of constituents in soil and sediment through treatment.	The volume of contaminated soil and sediment is reduced or eliminated at the site through excavation. Excavated soil/sediment would be solidified/stabilized offsite prior to disposal in a permitted landfill. The volume and toxicity would not be affected, but contaminant mobility would be reduced. Overall reduction of toxicity, mobility, or volume would be transferred to the offsite treatment and disposal facility.	The volume of soil and sediment and intrinsic toxicity of the constituents that are physically and chemically bound in the soil and sediment is not changed. Mobility of constituents in soil and sediment are expected to be reduced through capping and maintenance of the cap.	Same as Alternative 2.
Irreversibility of treatment	None. No treatment process is included.	Offsite solidification/stabilization is irreversible.	Not applicable. No onsite treatment process is included.	Same as Alternative 2.
Type and quantity of treatment residuals and associated risks	Not applicable.	Offsite treatment and disposal would not result in treatment residuals other than solidified/stabilized soil and sediment that would be disposed into a landfill. Residual risk at IRP Site 74 would be low because material is disposed offsite.	Not applicable.	Same as Alternative 2.
Statutory preference for treatment as a principal element	Not applicable.	Meets the statutory preference.	Same as Alternative 2.	Same as Alternative 2.
Short-term effectiveness				
Protection of community during remedial action	No construction activities are performed; therefore, this alternative would not have any adverse short- term effects that could pose risk to the community, workers, or environment.	Potential risks to the community may include increased levels of traffic, dust, noise, and odors during the excavation and handling of contaminated soil and sediment. There is an increased chance for exposure through inhalation or dermal contact. Engineering controls and best management practices can mitigate most potential risks: • Access to the active work and support zones would be prohibited.	Potential risks to the community may include increased dust, noise, and odors during the placement of the caps. There is an increased chance for exposure through inhalation or dermal contact. Engineering controls and best management practices can mitigate most potential risks: • Access to the active work and support zones would be prohibited. • Dust and noise levels would be monitored.	Same as Alternative 2.

TABLE 4-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	**Alternative 1** **No Action**	**Alternative 2** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**Alternative 3** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**Alternative 4** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
		• Noise levels would be monitored. • Work periods may be restricted to specific time frames for especially noisy operations (e.g., sheet pile installation). • Traffic effects can be managed by a haul plan that uses less-traveled routes. • Trucks used to transport contaminated materials will be decontaminated and/or covered to prevent the spread of contamination along haul routes. • Staging areas would be established in an area zoned for industrial use. • Dust emissions and odors may result from excavation activities. Air quality monitoring may be performed.	• Work periods may be restricted to specific time frames for especially noisy operations. • Staging areas would be established in an area zoned for industrial use. • Traffic effects can be managed by designing a haul plan that uses less-traveled routes. • Dust emissions and odors may result from capping activities. Air quality monitoring may be performed.	
Protection of workers during remedial actions	No construction activities are performed; therefore, there is no risk to workers.	Potential risks to workers would include physical hazards associated with general construction, potential exposure to and direct contact with contaminated soil and sediment, noise, odors, dust, and vapors. These would be mitigated through the following: • Engineering controls and best management practices. • Compliance with appropriate health and safety plans, construction procedures, and site management plans. • Use of appropriate personal protective equipment.	Same as Alternative 2.	Same as Alternative 2.

TABLE 4-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	**Alternative 1** **No Action**	**Alternative 2** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**Alternative 3** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**Alternative 4** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
Environmental impacts	No construction activities are performed; therefore, no adverse environmental impacts are anticipated.	• Excavation of soil and sediment would temporarily disrupt sensitive habitats at the site during the activities. • Construction traffic would increase during soil and sediment remedial activities. Trucks used to transport materials would be decontaminated and/or covered. Trucks will follow designated haul routes designed to follow less travelled routes. • Dust emissions and odors would be controlled by air monitoring. • An erosion control plan would be developed for stockpiling excavated soil and sediment. Plastic sheeting would be used for stockpiles in the staging area. • Excavation of sediment in the wetland may resuspend and/or release contaminants from the excavation area. Temporary barriers (e.g., sheet pile, silt curtain) would help control suspension and release of contaminants from the excavation area. • Excavated and dewatered sediment would be contained in the drying bed in the staging area. The water collected as a result of dewatering activities would be sampled for lead and antimony prior to discharge back into the wetland or sanitary sewer, if applicable. However, if the water resulting from dewatering activities does not meet discharge requirements, it will be transported offsite for treatment and disposal. • Greenhouse gases would be generated as a result of offsite transport of wastes and during backfill operations.	• Capping of soil and sediment would disrupt sensitive habitats present at the site. A new wetland would be constructed to offset the loss of wetland area. • Dust emissions and odors would be controlled by air monitoring. • Cap delivery methods may disturb and resuspend contaminated sediment. Temporary barriers (e.g., silt curtains) would help control turbidity, suspension, and release of contaminants from the capping area. • Greenhouse gases would be generated as a result of the manufacture and transportation of capping materials, and also as a result of transportation of personnel and use of equipment.	Same as Alternative 2. The use of amphibious equipment would reduce the disruption to sensitive habitat in the wetland area during the remedial activities. Temporary barriers (e.g., silt curtain) would help control turbidity, suspension, and release of contaminants from the excavation area.
Time until RAOs are achieved	RAOs are not achieved under Alternative 1.	The duration of the short-term risks would be the time required for construction, which is estimated to be less than 1 year.	The duration of the short-term risks would be the time required for construction, which is estimated to be less than 1 year. Institutional controls and long-term monitoring and maintenance would be implemented thereafter for a period of 30 years.	Same as Alternative 2.
Implementability				
Ability to construct and operate the technology	Not applicable. No actions are taken under this alternative.	Excavation is technically implementable and is an established standard construction practice. Excavation would be performed with standard excavation equipment. Dewatering of removed sediment by using a drying bed is an established technology. Short-term monitoring requirements can be performed using standard practices and technologies. Site-specific features may complicate excavation of soil and sediment (e.g., vegetation such as tall grass and shrubs in the upland area and marsh vegetation in the wetland; sensitive	Capping is technically implementable and is an established technology. Placement of caps is a standard construction practice. Pilot testing may be required to determine the most suitable cap placement methods based on site-specific soil and sediment characteristics. The short-term and long-term monitoring requirements can be performed using standard practices and technologies. Construction of a new wetland area would follow established guidance and regulations.	Same as Alternative 2, except excavation of sediment in the wetland area would be done using amphibious equipment. Many contractors have the appropriate skill and experience to use amphibious equipment, and training is available from the vendors.

Criteria	**<u>Alternative 1</u>** **No Action**	**<u>Alternative 2</u>** - **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	**<u>Alternative 3</u>** - **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	**<u>Alternative 4</u>** - **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
		wildlife including threatened and endangered species; and tidal fluctuations in the wetland).		
		Vegetation may be removed prior to excavation activities, if necessary. Construction activities would not take place during breeding/nesting seasons (April through September). The excavation area in the wetland would be dewatered prior to excavation activities using sheet pile or another similar technology. Crane mats would be used to support the heavy equipment in soft subgrade, if necessary. It is assumed that the majority of sediment in the wetland area can be removed using long-reach excavators stationed on Case Road.		
Reliability of the technology	Not applicable. No actions are taken under this alternative.	Excavation and disposal are reliable technologies for removing contaminated soil and sediment from the site.	Capping is a reliable technology to minimize exposure to soil and sediment when maintained over time. Institutional controls and long-term monitoring are implemented for reliability of the cap. The cap may require replacement/repair if material is disturbed.	Same as Alternative 2.
Ease of undertaking additional remedial action	Not applicable. No actions are taken under this alternative.	Additional action is implementable, but materials placed during site restoration (clean backfill) would need to be removed.	Additional action is implementable, but the cap would need to be removed.	Same as Alternative 2.
Monitoring considerations	Not applicable. No actions are taken under this alternative.	Short-term monitoring (e.g., air quality) would be performed during construction activities. Confirmation soil and sediment sampling would be conducted following the excavation activities to determine effectiveness of the remedial action. Physical surveys of the soil and sediment would be performed prior to the remedial action and following placement of clean backfill to determine whether the site was restored to original elevations.	Short-term monitoring (e.g., air quality) would be performed during construction activities. Institutional controls would be enforced through long-term monitoring to determine the condition of the caps. Analytical samples may be collected to determine effectiveness of the caps. Physical surveys of the cap would be performed to ensure cap thicknesses are achieved.	Same as Alternative 2.
Coordination with other agencies	Not applicable. No actions are taken under this alternative.	This alternative will require coordination with regulatory agencies (DTSC, RWQCB Santa Ana Region, USFWS, and CDFG). Permits may be required prior to excavation and site restoration (placement of clean backfill) activities. Waste profiling is required prior to disposal.	This alternative will require coordination with regulatory agencies (DTSC, RWQCB Santa Ana Region, USFWS, and CDFG). Operation and maintenance plans for the caps would be reviewed by regulatory agencies to ensure adequate future monitoring and controls. Regulatory agencies would be involved in implementation and enforcement of institutional controls.	Same as Alternative 2.
Availability of treatment, storage capacity, and disposal services	Not applicable. No actions are taken under this alternative.	Excavated material will be stored onsite in a designated staging area until it is transported offsite for treatment and disposal. Offsite treatment and disposal facilities are available.	Not applicable. Soil and sediment will not be removed from the site and, therefore, would not require storage, treatment, and disposal.	Same as Alternative 2.
Availability of necessary equipment and specialists	Not applicable. No actions are taken under this alternative.	• Equipment, materials, and specialists required for the sheet piling and silt curtain installation, excavation, transportation, treatment / disposal, placement of backfill, and physical surveys would be commercially available.	• Equipment, materials, and specialists required for the physical surveys and cap placement would be commercially available.	Same as Alternative 2, except for sheet piling installation. Many contractors have the appropriate skill and experience to use the amphibious equipment, and training is available from the vendors.

TABLE 4-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	Alternative 1 **No Action**	Alternative 2	Alternative 3	Alternative 4
		- **Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**	- **Capping contaminated soil in upland area and sediment in wetland area** - **Short-term monitoring during construction activities** - **Institutional controls** - **Long-term monitoring** - **Wetland mitigation**	- **Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment** - **Short-term monitoring during construction activities** - **Onsite dewatering of sediment** - **Transportation of soil and sediment offsite** - **Physical/chemical treatment of soil and sediment** - **Offsite disposal of soil and sediment** - **Site restoration in soil upland and sediment wetland areas**
		• Landfill capacity for contaminated soil and sediments within the geography may be limited. Available landfill facilities and associated capacities will need to be identified during the remedy selection process. • Treatability testing would be needed to determine the final waste characterization of solidified/stabilized soil and sediment. • Equipment, materials, and specialists required for the dewatering of excavated sediment would be commercially available.	• Pilot testing may be needed to determine the suitability of cap materials to address site-specific soil and sediment characteristics at the site. • There may be few contractors who have significant experience in new wetland construction.	
Cost				
Capital cost	$0	$9,758,000	$5,896,000	$10,426,000
Operating and maintenance cost	$0	$193,000	$5,516,000	$193,000
Net present value[b]	$0	$11,946,000	$12,725,000	$12,747,000

Notes:

a For the purposes of the evaluation in this Feasibility Study, it was assumed that solidification/stabilization would occur offsite at the treatment/disposal facility. However, during the remedial design process onsite solidification/stabilization may be chosen.
b The net present value of future cash flows was calculated on the basis of a real discount rate of 1.1 percent per year based on a 30-year duration for Alternative 3, and on the basis of a real discount rate of negative 1.4 (-1.4) percent per year based on a 2-year duration for Alternatives 2 and 4 (using real discount rates [adjusted for inflation] from Office of Management and Budget [OMB] Circular A-94 Appendix C, December 2012) (OMB, 2012). See Appendix B for additional cost detail for each alternative.
ARAR = Applicable or Appropriate and Relevant Requirement
CDFG = California Department of Fish and Game
COC = constituent of concern
DTSC = California Department of Toxic Substances Control
O&M = operations and maintenance
RAO = remedial action objective
RWQCB = Regional Water Quality Control Board
USFWS = United States Fish and Wildlife Service

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TABLE 4-3
Comparative Analysis of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

	Threshold Criteria[a]		**Balancing Criteria**				
Alternative	**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[b]**
Alternative 1 No Action	○	○	○	○	●	●	**$0**
Alternative 2 Removal of contaminated soil in upland area and sediment in wetland area Short-term monitoring during construction activities Onsite dewatering of sediment Offsite transportation of soil and sediment Physical/chemical treatment of soil and sediment Offsite disposal of soil and sediment Site restoration in soil upland and sediment wetland areas	●	●	●	●	◕	●	**$11,946,000**
Alternative 3 Capping contaminated soil in upland area and sediment in wetland area Short-term monitoring during construction activities Institutional controls Long-term monitoring Wetland mitigation	●	●	◐	○	◐	◕	**$12,725,000**
Alternative 4 Removal of contaminated soil in upland area and sediment in wetland area Short-term monitoring during construction activities Onsite dewatering of sediment Offsite transportation of soil and sediment Physical/chemical treatment of soil and sediment Offsite disposal of soil and sediment	●	●	●	●	●	●	**$12,747,000**

Notes:

[a] Threshold Criteria (Overall protection of human health and the environment and compliance with ARARs) are evaluated as either meeting or not meeting these criteria.
[b] Net Present Value – See Appendix B for additional cost detail.

Modifying Criteria (State Acceptance and Community Acceptance) will be evaluated in the Record of Decision based on comments on the Proposed Plan.
ARARs = Applicable or Relevant and Appropriate Requirements

Legend:

Balancing Criteria:

○ Does not satisfy criterion

● Satisfies criterion

Threshold Criteria:

○ Low

◔ Low to Moderate

◐ Moderate

◕ Moderate to High

● High

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Figures

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TABLE 4-2
Detailed Evaluation of Alternatives
Feasibility Study Report IRP Site 74, NAVWPNSTA Seal Beach, CA

Criteria	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
		- Removal of contaminated soil in upland area and sediment in wetland area using standard excavation equipment - Short-term monitoring during construction activities - Onsite dewatering of sediment - Transportation of soil and sediment offsite - Physical/chemical treatment of soil and sediment - Offsite disposal of soil and sediment - Site restoration in soil upland and sediment wetland areas	**- Capping contaminated soil in upland area and sediment in wetland area - Short-term monitoring during construction activities - Institutional controls - Long-term monitoring - Wetland mitigation**	**- Removal of contaminated soil in upland area using standard excavation equipment and sediment in wetland area using amphibious excavation equipment - Short-term monitoring during construction activities - Onsite dewatering of sediment - Transportation of soil and sediment offsite - Physical/chemical treatment of soil and sediment - Offsite disposal of soil and sediment - Site restoration in soil upland and sediment wetland areas**
		• Landfill capacity for contaminated soil and sediments within the geography may be limited. Available landfill facilities and associated capacities will need to be identified during the remedy selection process. • Treatability testing would be needed to determine the final waste characterization of solidified/stabilized soil and sediment. • Equipment, materials, and specialists required for the dewatering of excavated sediment would be commercially available.	• Pilot testing may be needed to determine the suitability of cap materials to address site-specific soil and sediment characteristics at the site. • There may be few contractors who have significant experience in new wetland construction.	
Cost				
Capital cost	$0	$9,758,000	$5,896,000	$10,426,000
Operating and maintenance cost	$0	$193,000	$5,516,000	$193,000
Net present value[b]	$0	$11,946,000	$12,725,000	$12,747,000

Notes:

a For the purposes of the evaluation in this Feasibility Study, it was assumed that solidification/stabilization would occur offsite at the treatment/disposal facility. However, during the remedial design process onsite solidification/stabilization may be chosen.
b The net present value of future cash flows was calculated on the basis of a real discount rate of 1.1 percent per year based on a 30-year duration for Alternative 3, and on the basis of a real discount rate of negative 1.4 (-1.4) percent per year based on a 2-year duration for Alternatives 2 and 4 (using real discount rates [adjusted for inflation] from Office of Management and Budget [OMB] Circular A-94 Appendix C, December 2012) (OMB, 2012). See Appendix B for additional cost detail for each alternative.
ARAR = Applicable or Appropriate and Relevant Requirement
CDFG = California Department of Fish and Game
COC = constituent of concern
DTSC = California Department of Toxic Substances Control
O&M = operations and maintenance
RAO = remedial action objective
RWQCB = Regional Water Quality Control Board
USFWS = United States Fish and Wildlife Service

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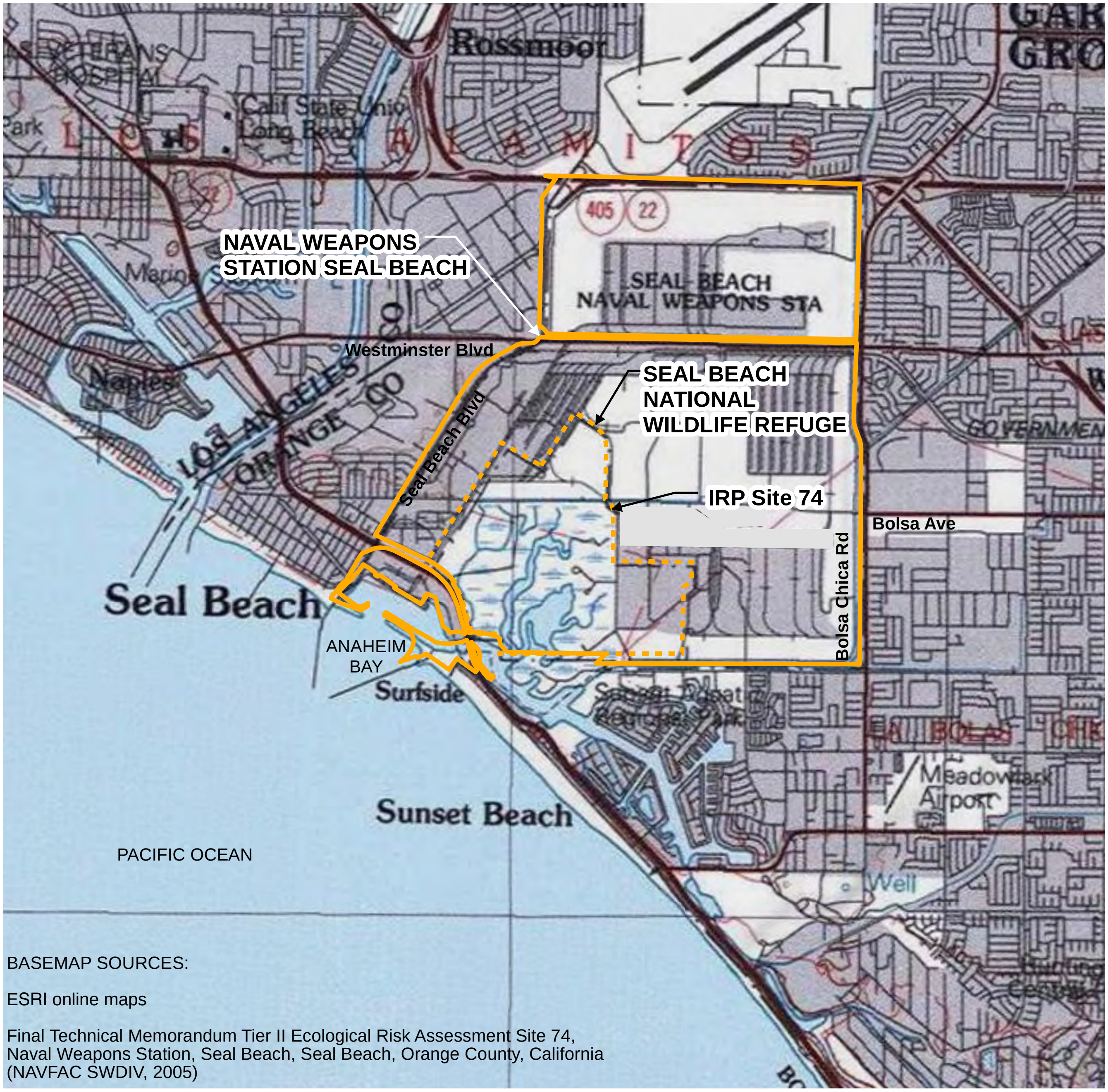
Name: 047L0921 User: PDan Date: 9/19/2012



BASEMAP SOURCES:

ESRI online maps

Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 0.5 1 2
Miles

Site Location Map

Feasibility Study Report
Installation Restoration Program Site 74
Naval Weapons Station Seal Beach
Seal Beach, California

N

FIGURE

1

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INSET VIEW, LOOKING WEST OF IRP SITE 74, THE OLD SKEET RANGE

LEGEND

- APPROXIMATE INSTALLATION RESTORATION PROGRAM SITE 74 BOUNDARY
- SEAL BEACH NATIONAL WILDLIFE BOUNDARY

AERIAL SOURCE:

ESRI online maps

PHOTO SOURCE:

Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 100 200 400 Feet

Site Plan

Feasibility Study Report IRP Site 74
Naval Weapons Station Seal Beach, California

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FIGURE

2

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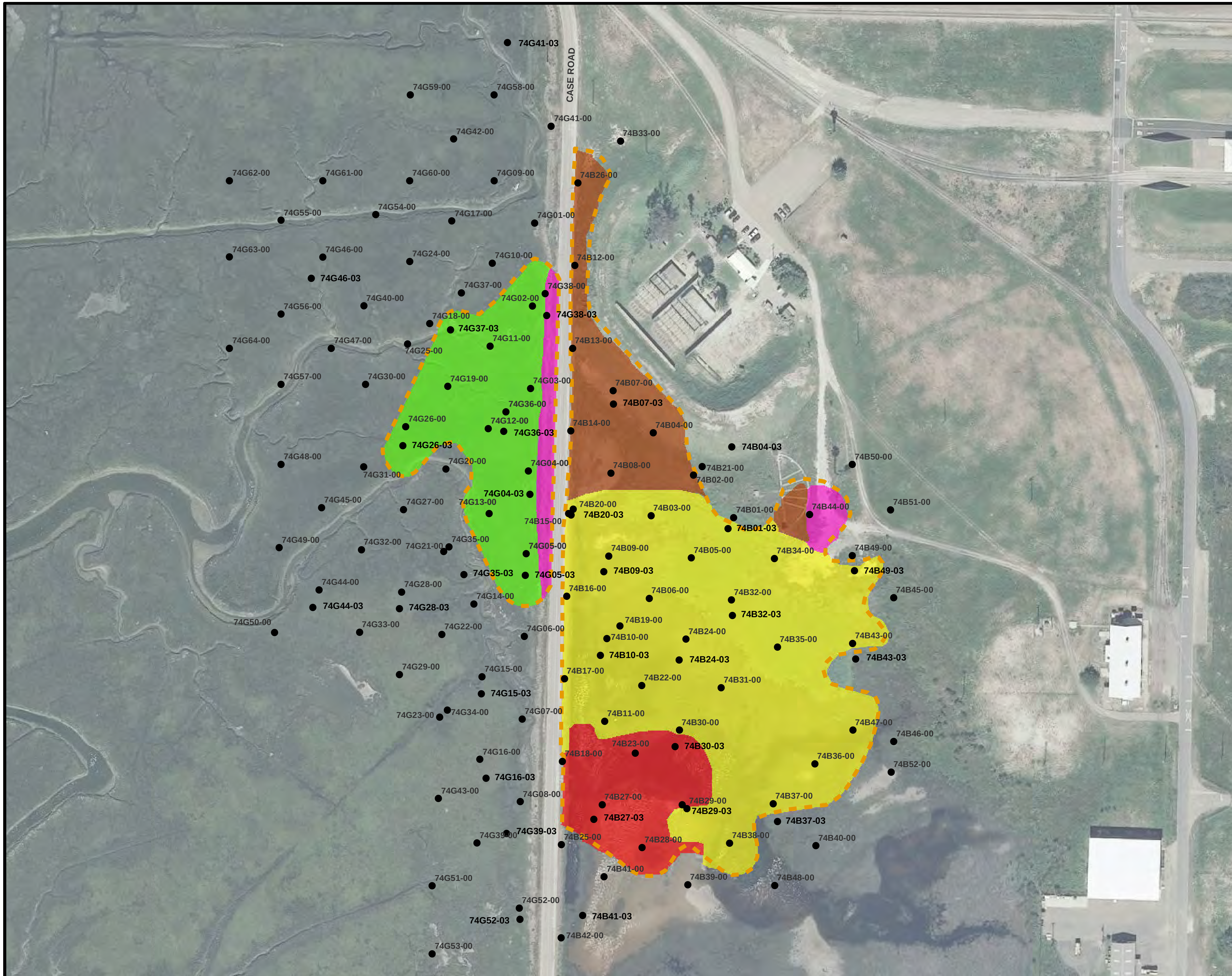

Legend

- ● Soil or Sediment Sample Locations From 2000 and 2003
- Habitat A - Annual Grassland
- Habitat B - Upper Salt Marsh
- Habitat C - Open Mud Flat
- Habitat D - Middle Salt Marsh
- Habitat E - Disturbed
- Boundary of Habitat Evaluation

SOURCES:
1) ESRI online maps
2) Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 80 160 320
Feet

Soil and Sediment Sample Locations

Feasibility Study Report
Installation Restoration Program Site 74
Naval Weapons Station Seal Beach
Seal Beach, California

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FIGURE
3

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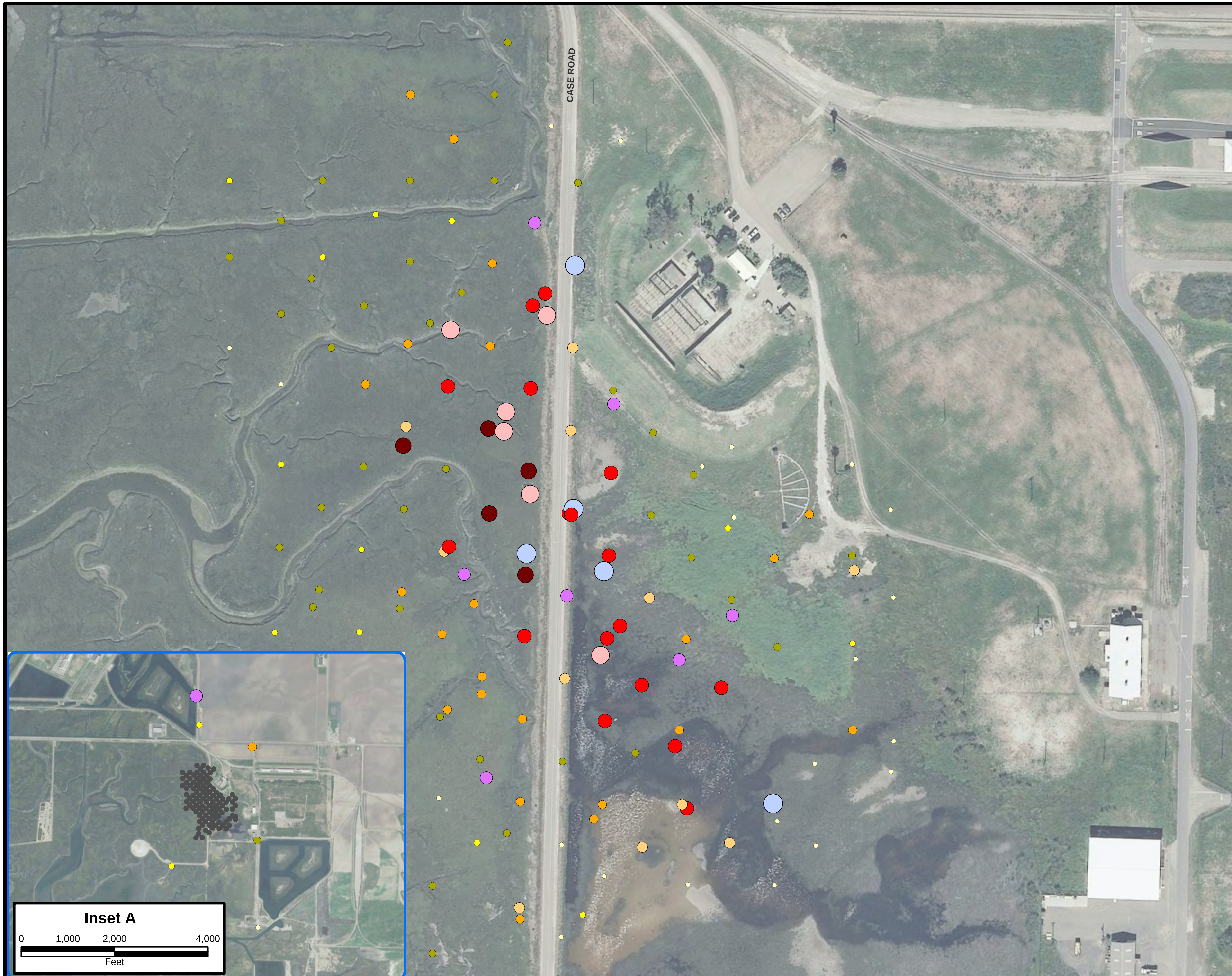
Date: 10/11/2012 User: PDan Name: 047H0924



Legend

Lead (mg/kg)

- <=35.7
- 35.7 - 50
- 50 - 100
- 100 - 200
- 200 - 500
- 500 - 1000
- 1000 - 5000
- 5000 - 10000
- 10000 - 50000
- 50000 - 154000

NOTE:
Includes 2000 and 2003 data.

SOURCES:
1) ESRI online maps
2) Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 80 160 320
Feet

Lead Concentrations in Soil and Sediment

Feasibility Study Report
Installation Restoration Program Site 74
Naval Weapons Station Seal Beach
Seal Beach, California

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FIGURE
4

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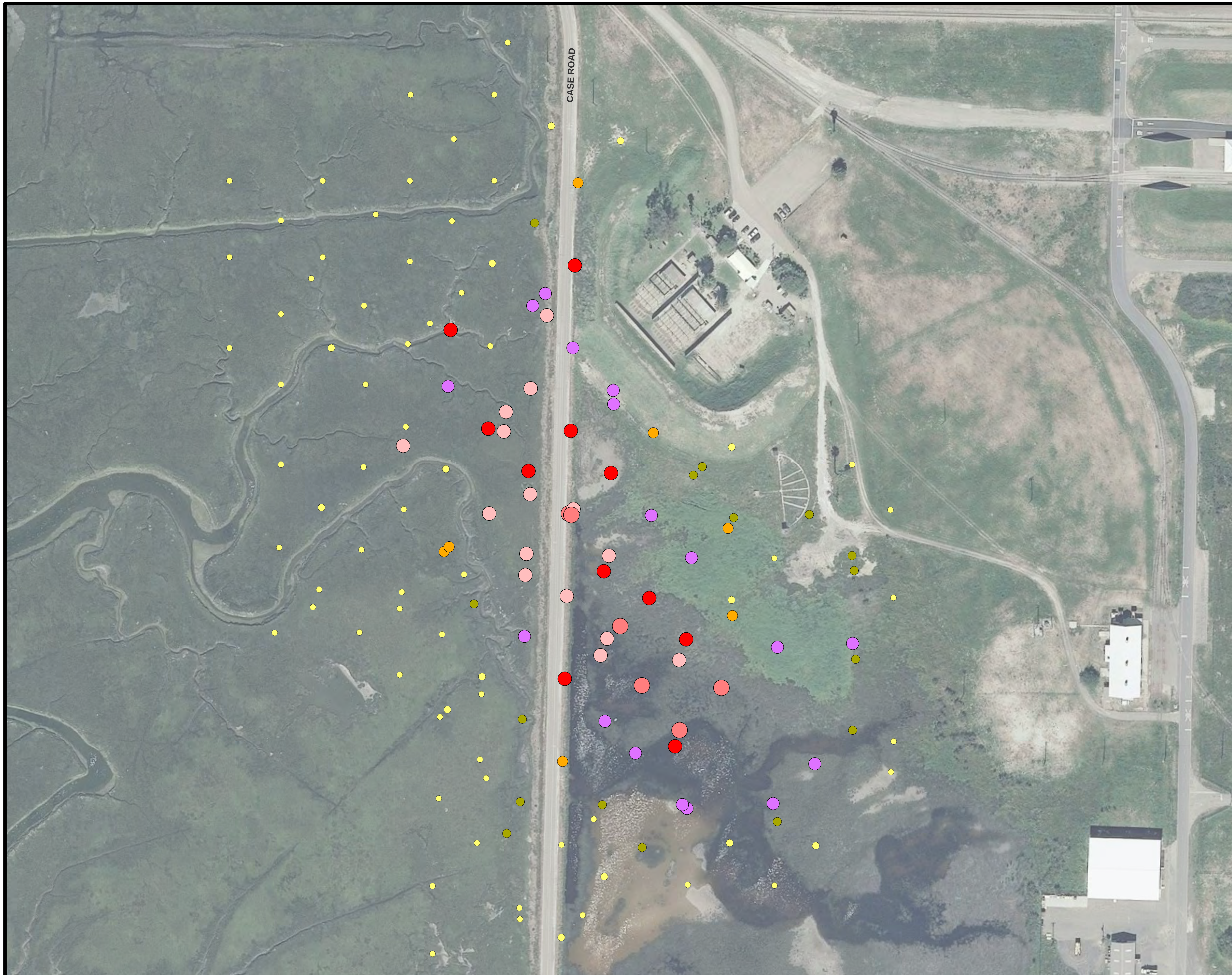
Date: 9/11/2012



Legend

Number of Shot/kg soil or sediment

- 0
- 0 - 1
- 1 - 5
- 5 - 10
- 10 - 50
- 50 - 100
- 100 - 200
- >200

NOTES:
Number of shot/kg soil or sediment was not measured in referenced areas.

Includes 2000 and 2003 data.

SOURCES:
1) ESRI online maps
2) Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 80 160 320
Feet

Lead Shot in Soil and Sediment

Feasibility Study Report
Installation Restoration Program Site 74
Naval Weapons Station Seal Beach
Seal Beach, California

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FIGURE
5

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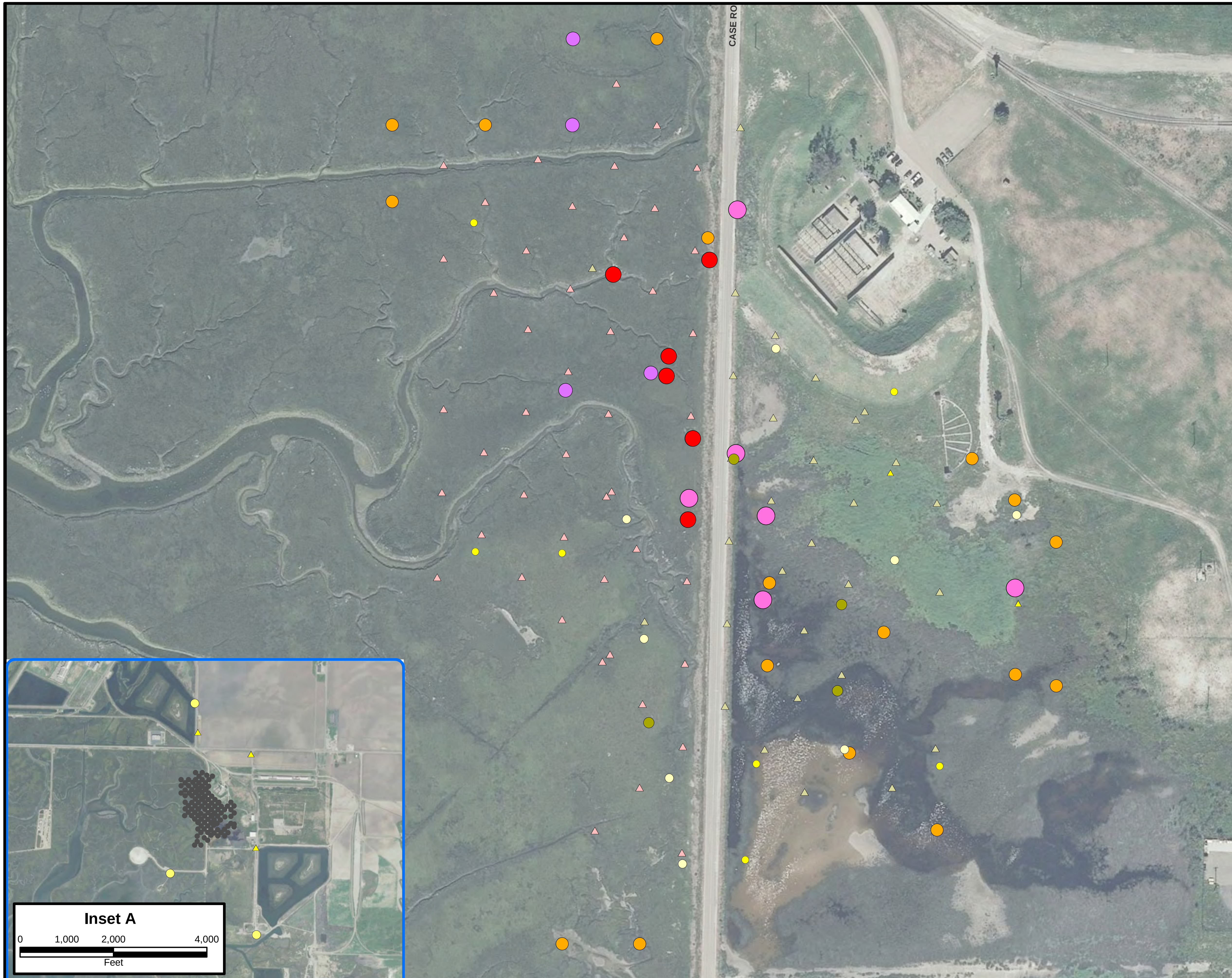

Legend

Antimony (mg/kg) - Detect

- <1
- 1-5
- 5-10
- 10-50
- 50-100
- 100-500
- >1000

Antimony (mg/kg) - Non-detect

- <1
- 10-20
- 20-83

NOTE:
Includes 2000 and 2003 data.

SOURCES:
1) ESRI online maps
2) Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 80 160 320 Feet

Antimony Concentrations in Soil and Sediment

Feasibility Study Report
Installation Restoration Program Site 74
Naval Weapons Station Seal Beach
Seal Beach, California

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FIGURE
6

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VICINITY MAP

Legend

Sediment Sample Locations
- Concentration below Remediation Goal
- Concentration above Remediation Goal
- Location within Remediation Area

Soil Sample Locations
- Concentration below Remediation Goal
- Location within Remediation Area

- Upland Remediation Area
- Wetland Remediation Area

NOTES:
a. Remediation Goal for Lead in Sediment is 140 mg/kg
b. Remediation Goal for Lead in Soil is 68 mg/kg
c. Upland Remediation Area includes 8.1 acres of soil
d. Wetland Remediation Area includes 2 acres of sediment

SOURCE:
a. ESRI ArcGIS Online Imagery Service
b. Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 150 300
Feet

Post Remediation Concentrations of Lead in Soil and Sediment

Feasibility Study Report IRP Site 74
Naval Weapons Station Seal Beach, California

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FIGURE
7

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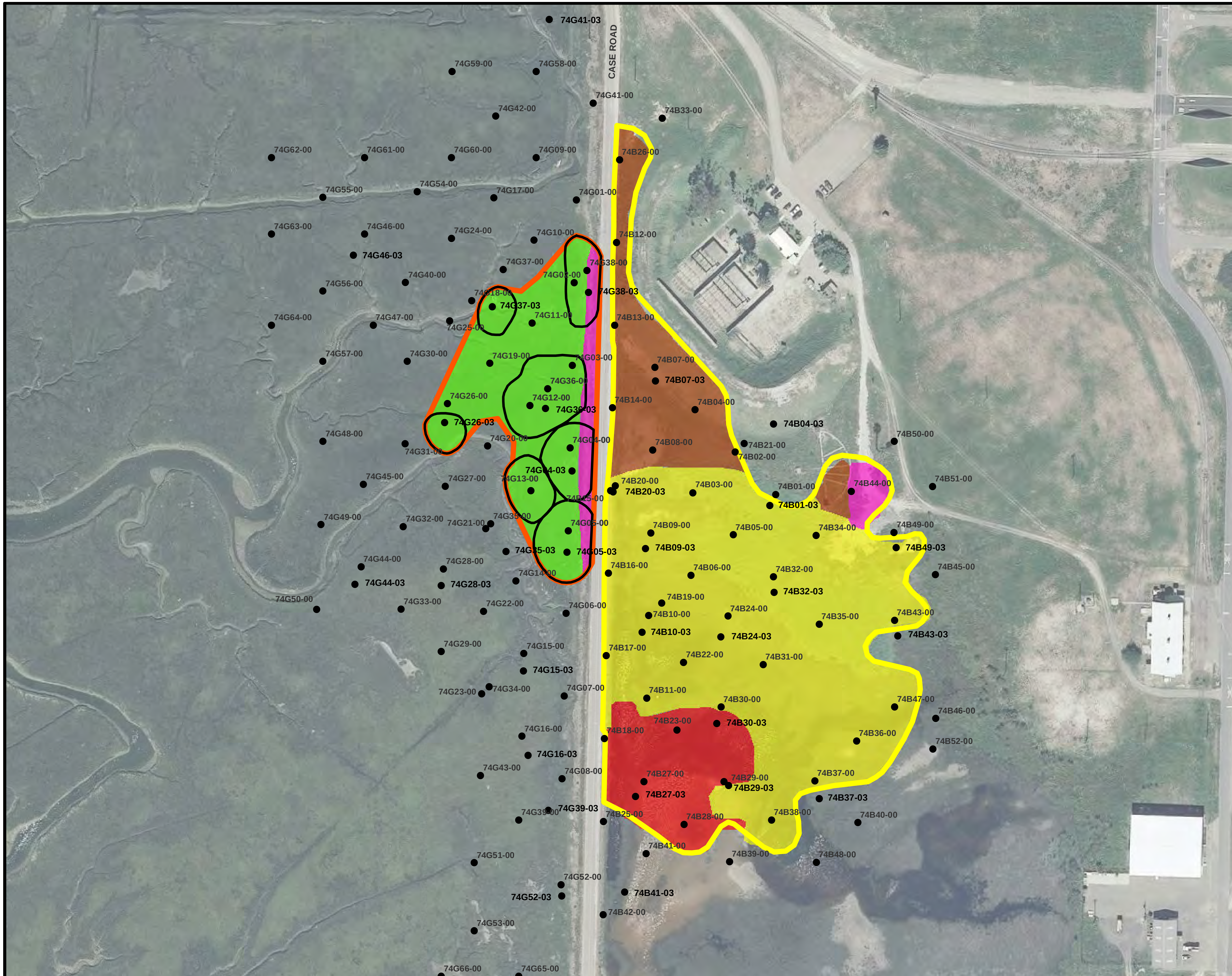

Legend

- Soil or Sediment Sample Locations From 2000 and 2003
- Channels
- Habitat A - Annual Grassland
- Habitat B - Upper Salt Marsh
- Habitat C - Open Mud Flat
- Habitat D - Middle Salt Marsh
- Habitat E - Disturbed
- Wetland Remediation Area - Removal
- Upland Remediation Area - Cap/Removal
- Wetland Remdiation Area - Cap

NOTES:

a. Upland Remediation Area – Cap/Removal includes removal and/or capping of 8.1 acres of soil in the upland area as part of Alternatives 2, 3, and 4.

b. Wetland Remediation Area – Removal includes removal of 2 acres of sediment in the wetland area as part of Alternatives 2 and 4.

c. Wetland Remediation Area – Cap includes capping 2.3 acres of sediment in the wetland area as part of Alternative 3.

SOURCES:

1) ESRI online maps

2) Final Technical Memorandum Tier II Ecological Risk Assessment Site 74, Naval Weapons Station, Seal Beach, Seal Beach, Orange County, California (NAVFAC SWDIV, 2005)

0 80 160 320 Feet

Remediation Areas

Feasibility Study Report
Installation Restoration Program Site 74
Naval Weapons Station Seal Beach
Seal Beach, California

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FIGURE 8

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Appendix A
Potential Applicable or Relevant and Appropriate Requirements

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Appendix A

Applicable or Relevant and Appropriate Requirements

Feasibility Study Report
Installation Restoration Program Site 74

Naval Weapons Station Seal Beach
Seal Beach, California

Contract Number: N62473-09-D-2622
Contract Task Order Number 0047
Document Control Number: KCH-2622-0047-0021

November 2012

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Southwest

Prepared by

CH2M HILL Kleinfelder, A Joint Venture (KCH)
1320 Columbia Street, Suite 310
San Diego, California 92101

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Contents

Tables

Attachments

Acronyms and Abbreviations

ACL	alternative concentration limit
ACOE	Army Corp of Engineers
AM	action memorandum
AOC	area of concern
APCD	Air Pollution Control District
app.	appendix
AQMD	Air Quality Management District
AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
BAAQMD	Bay Area Air Quality Management District
BAT	best available technology
BCPCT	best conventional pollution control technology
BMP	best management practice/Base Master Plan
CAA	Clean Air Act
Cal. Civ. Code	*California Civil Code*
Cal. Code Regs.	*California Code of Regulations*
Cal/EPA	California Environmental Protection Agency
Cal. Fish and Game Code	*California Fish and Game Code*
Cal. Gov’t Code	*California Government Code*
Cal. Health & Safety Code	*California Health and Safety Code*
Cal. Pub. Res. Code	*California Public Resources Code*
Cal. Water Code	*California Water Code*
CAMU	corrective action management unit
CARB	California Air Resources Board
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	*Code of Federal Regulations*
ch.	chapter
cm	centimeter
CMECC	California Military Environmental Coordination Committee
COC	chemical of concern
COPC	chemical of potential concern
CTT	closed, transferred, and transferring
CWA	Clean Water Act
CWC	*California Water Code*
CZMA	Coastal Zone Management Act

DERP	Defense Environmental Restoration Program
DNAPL	dense nonaqueous-phase liquid
DoD	Department of Defense
DON	Department of the Navy
DTSC	(Cal/EPA) Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EIS	environmental impact statement
ER-L	effects range-low
ER-M	effects range-median
ERA	ecological risk assessment
ESA	Endangered Species Act
ESRP	explosives safety remediation plan
ETs	Ecotox Thresholds
FAWQC	Federal Ambient Water Quality Criteria
Fed. Reg.	*Federal Register*
FFA	Federal Facilities Agreement
FFSRA	Federal Facilities Site Remediation Agreement
FML	flexible membrane liner
FR	*Federal Register*
FS	feasibility study
g	gram
gpd	gallons per day
HDPE	high-density polyethylene
HSWA	Hazardous and Solid Waste Amendments
HWCA	Hazardous Waste Control Act
IR	Installation Restoration (Program)
LDR	land disposal restriction
LPC	liquid-phase carbon
LUFT	leaking underground fuel tank
µg/L	micrograms per liter
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg/L	milligrams per liter
MILCON	military construction
mm	millimeter
MNA	monitored natural attenuation
MOJAQMD	Mojave Desert Air Quality Management District
MOU	memorandum of understanding
MPRSA	Marine Protection, Research, and Sanctuaries Act
MTR	minimum technology requirement

NAAQS	National Ambient Air Quality Standards
NAVWPNSTA	Naval Weapons Station
NAWQC	National Ambient Water Quality Criteria
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmosphere Administration
NPDES	National Pollution Discharge Elimination System
NTR	National Toxics Rule
NWR	National Wildlife Refuge
OEW	ordnance or explosive waste
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PA	preliminary assessment
PCB	polychlorinated biphenyl
ppm	parts per million
ppm_w	parts per million by weight
Pub. L.	Public Law
RA	remedial action
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
Res.	Resolution
RI	remedial investigation
R3M	Range Rule Risk Methodology
ROD	record of decision
RTC	response to comments
RWQCB	(California) Regional Water Quality Control Board
SAL	state action level
SARA	Superfund Amendments and Reauthorization Act
SCAQMD	South Coast Air Quality Management District
SDAPCD	San Diego Air Pollution Control District
SDWA	Safe Drinking Water Act
SIP	State Implementation Plan
SMCL	secondary maximum contaminant level
STLC	soluble threshold limit concentration
SWAT	Solid Waste Assessment Test
SWDIV	Southwest Division Naval Facilities Engineering Command
SWRCB	(California) State Water Resource Control Board
T-BACT	best available control technology for toxics
TBC	to be considered

TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
tit.	title
TNT	trinitrotoluene
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and disposal
TTLC	total threshold limit concentration
UIC	underground injection control
U.S.C.	*United States Code*
USDW	underground source of drinking water
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
UTS	Universal Treatment Standards
UXO	unexploded ordnance
VGAC	vapor-phase granular activated carbon
VOC	volatile organic compound
WET	waste extraction test
WQCP	Water Quality Control Plan
WQO	water quality objective
WSR	Wild and Scenic River Act

1.0 Introduction

This appendix identifies and evaluates potential federal and state of California applicable or relevant and appropriate requirements (ARARs) from the universe of regulations, requirements, and guidance and sets forth the Department of the Navy (DON) determinations regarding those potential ARARs for each response action alternative retained for detailed analysis in this feasibility study (FS) for Installation Restoration Program (IRP) Site 74 (also referred to as the Old Skeet Range) at the Naval Weapons Station (NAVWPNSTA) Seal Beach.

This evaluation includes an initial determination of whether the potential ARARs actually qualify as ARARs, and a comparison for stringency between the federal and state regulations to identify the controlling ARARs. The identification of ARARs is an iterative process. The final determination of ARARs will be made by the DON in the record of decision (ROD), after public review, as part of the response action selection process.

1.1 Summary of CERCLA and NCP Requirements

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 *United States Code* [42 U.S.C.] Section [§] 9621[d]), as amended, states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. An applicable federal requirement is an ARAR. An applicable state requirement is an ARAR only if it is more stringent than federal ARARs.

If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations similar to the circumstances of the proposed response action and are well suited to the conditions of the site (U.S. EPA 1988a). A requirement must be determined to be both relevant <u>and</u> appropriate in order to be considered an ARAR.

The criteria for determining relevance and appropriateness are listed in 40 C.F.R. § 300.400(g)(2) and include the following:

- Purpose of both the requirement and the CERCLA action
- Medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site
- Substances regulated by the requirement and the substances found at the CERCLA site
- Actions or activities regulated by the requirement and the response action contemplated at the CERCLA site
- Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site
- Type of place regulated and the type of place affected by the release or CERCLA action
- Type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action
- Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resources at the CERCLA site

According to CERCLA ARARs guidance (U.S. EPA 1988a), a requirement may be "applicable" or "relevant and appropriate," but not both. Identification of ARARs must be done on a site-specific basis and involve a two-part analysis: first, a determination whether a given requirement is applicable; then, if it is not applicable, a determination whether it is nevertheless both relevant and appropriate. It is important to explain that some regulations may be applicable or, if not applicable, may still be relevant and appropriate. When the analysis determines that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable (U.S. EPA 1988a).

Tables included in this appendix present each potential ARAR with an initial determination of ARAR status (i.e., applicable, relevant and appropriate, or not an ARAR). For the determination of relevance and appropriateness, the pertinent criteria were examined to determine whether the requirements addressed problems or situations sufficiently similar to the circumstances of the release or response action contemplated, and whether the requirement was well suited to the site. A negative determination of relevance and appropriateness indicates that the requirement did not meet the pertinent criteria. Negative determinations are documented in the tables of this appendix and are discussed in the text only for specific cases.

To qualify as a state ARAR under CERCLA and the NCP, a state requirement must be:

- A state law or regulation,
- An environmental or facility siting law or regulation,
- Promulgated (of general applicability and legally enforceable),
- Substantive (not procedural or administrative),
- More stringent than federal requirements,
- Identified in a timely manner, and
- Consistently applied.

To constitute an ARAR, a requirement must be substantive. Therefore, only the substantive provisions of requirements identified as ARARs in this analysis are considered to be ARARs. Permits are considered to be procedural or administrative requirements. Provisions of generally relevant federal and state statutes and regulations that were determined to be procedural or nonenvironmental, including permit requirements, are not considered to be ARARs. CERCLA Section 121(e)(1), 42 U.S.C. § 9621(e)(1), states that "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section." The term "on-site" (or onsite) is defined for purposes of this ARARs discussion as "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action" (40 C.F.R. § 300.5).

Nonpromulgated advisories or guidance issued by federal or state governments are not legally binding and do not have the status of ARARs. Such requirements may, however, be useful, and are "to be considered" (TBC). TBC (40 C.F.R. § 300.400[g][3]) requirements complement ARARs but do not override them. They are useful for guiding decisions regarding cleanup levels or methodologies when regulatory standards are not available.

Pursuant to U.S. EPA guidance (U.S. EPA 1988a), ARARs are generally divided into three categories: chemical-specific, location-specific, and action-specific requirements. This classification was developed to aid in the identification of ARARs; some ARARs do not fall precisely into one group or another. ARARs are identified on a site basis for remedial actions where CERCLA authority is the basis for cleanup.

As the lead federal agency, the DON has primary responsibility for identifying federal ARARs for IRP Site 74 at NAVWPNSTA Seal Beach. Potential federal ARARs that have been identified for the IRP Site 74 FS are discussed in Section 1.2.2. Pursuant to the definition of the term onsite in 40 C.F.R. § 300.5, the on-station area that is part of this action is areal extent of contamination at IRP Site 74 and all suitable areas in proximity to the contamination necessary for implementation of the remedial action.

IRP Site 74Identification of potential state ARARs was initiated through DON requests that the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) identify potential state ARARs, an action described in more detail in Section 1.2.3. Potential state ARARs that have been identified for IRP Site 74 are discussed below.

1.2 Methodology Description

The process of identifying and evaluating potential federal and state ARARs is described in this subsection.

1.2.1 General

As the lead federal agency, the DON has primary responsibility for identification of potential ARARs for IRP Site 74. In preparing this ARARs analysis, the DON undertook the following measures, consistent with CERCLA and the NCP:

- Identified federal ARARs for each remedial action alternative addressed in the FS, taking into account site-specific information for IRP Site 74.

- Reviewed potential state ARARs identified by the state to determine whether they satisfy CERCLA and NCP criteria that must be met in order to constitute state ARARs.
- Evaluated and compared federal ARARs and their state counterparts to determine whether state ARARs are more stringent than the federal ARARs or are in addition to the federally required actions.
- Reached a conclusion as to which federal and state ARARs are the most stringent and/or "controlling" ARARs for each alternative.

As outlined in Section 2.1 of this FS report, the remedial action objectives for IRP Site 74 are the following:

- Reduce risk to birds from ingestion of food items and incidental ingestion of soil and sediment containing elevated concentrations of lead and lead shot.
- Reduce risk to mammals from ingestion of food items and incidental ingestion of soil and sediment containing elevated concentrations of lead and antimony.
- Reduce potential future risk to human health from exposure to soil and sediment containing elevated concentrations of lead and antimony.

Remedial action alternatives retained for detailed analysis in this FS are designed to accomplish these remedial action objectives. The IRP Site 74 remedial action alternatives considered for detailed analysis, and for which an ARARs analysis is presented in this appendix, are as follows:

- **Alternative 1:** No action.
- **Alternative 2:** Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
- **Alternative 3:** Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
- **Alternative 4:** Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

1.2.2 Identifying and Evaluating Federal ARARs

The DON is responsible for identifying federal ARARs as the lead federal agency under CERCLA and the NCP. The final determination of federal ARARs will be made when the DON issues the ROD. The federal government implements a number of federal environmental statutes that are the source of potential federal ARARs, either in the form of the statutes or regulations promulgated thereunder. Examples include the Resource Conservation and Recovery Act (RCRA), the Clean Water Act (CWA), the Safe Drinking Water Act, the Toxic Substances Control Act, and their implementing regulations, to name a few. See NCP preamble at 55 *Federal Register* (Fed. Reg.) 8764–8765 (1990) for a more complete listing.

The proposed response action and alternatives were reviewed against all potential federal ARARs, including but not limited to those set forth at 55 Fed. Reg. 8764–8765 (1990), in order to determine if they were applicable or relevant and appropriate utilizing the CERCLA and NCP criteria and procedures for ARARs identification by lead federal agencies.

1.2.3 Identifying and Evaluating State ARARs

The process of identifying and evaluating potential state ARARs by the state and the DON is described in this subsection.

1.2.3.1 Solicitation of State ARARs Under NCP

U.S. EPA guidance (U.S. EPA 1988b) recommends that the lead federal agency consult with the state when identifying state ARARs for remedial actions. In essence, the CERCLA/NCP requirements at 40 C.F.R. § 300.515 for remedial actions provide that the lead federal agency request that the state identify chemical- and location-specific state ARARs upon completion of site characterization. The requirements also provide that the lead federal agency request identification of all categories of state ARARs (chemical-, location-, and action-specific) upon completion of identification of remedial alternatives for detailed analysis. The state must respond within 30 days of receipt of the lead federal agency requests. The remainder of this subsection documents the DON's efforts to date to identify and evaluate state ARARs.

The DON followed the procedures of the process set forth in 40 C.F.R. § 300.515 and Section 7.7 of the Federal Facilities Site Remediation Agreement (FFSRA) for remedial actions in seeking state assistance in identifying state ARARs.

1.2.3.2 Chronology of Efforts to Identify State ARARs

The following chronology summarizes the DON efforts to obtain state assistance in identifying state ARARs for the response action at NAVWPNSTA, Seal Beach. Key correspondence between the DON and the state agencies relating to this effort has been included in the Administrative Record (AR) for this FS.

The DON formally requested state chemical-, location-, and action-specific ARARs for IRP IRP Site 74 in a letter to DTSC on 27 October 2005. Following the DON solicitation for ARARs from DTSC, DTSC requested chemical-, location-, and action-specific ARARs from other state and local agencies.

The DON received a letter from DTSC on 18 January 2006 with a list of potential ARARs identified by the following agencies:

- California Regional Water Quality Control (letter dated 17 January 2006)
- South Coast Air Quality Management District (SCAQMD) (letter dated 13 December 2005)
- California Air Resources Board (letter dated 27 December 2005)
- City of Seal Beach (letter dated 9 December 2005)

As some agencies did not respond to the DON's initial request for ARARs, the DON issued a second and final request for ARARs letter to DTSC on 9 March 2006 for those agencies that did not respond to the original request made in October of 2005. The DON received a letter from DTSC on 26 April 2006 with a list of potential ARARs identified by the California Department of Fish and Game (CDFG).

Pertinent requirements identified by the State from the ARARs solicitation effort are included in this appendix. The ARARs identification letter provided by the agencies for IRP Site 74 is presented in Attachment A-1.

1.3 Other General Issues

General issues identified during the evaluation of ARARs for IRP Site 74 are discussed in the following subsections.

1.3.1 General Approach to Requirements of the Federal Resource Conservation and Recovery Act

The RCRA is a federal statute passed in 1976 to meet four goals: the protection of human health and the environment, the reduction of waste, the conservation of energy and natural resources, and the elimination of the generation of hazardous waste as expeditiously as possible. The Hazardous and Solid Waste Amendments (HSWA) of 1984 significantly expanded the scope of RCRA by adding new corrective action requirements, land disposal restrictions, and technical requirements. RCRA, as amended, contains several provisions that are potential ARARs for CERCLA sites.

Substantive RCRA requirements are applicable to response actions on CERCLA sites if the waste is a RCRA hazardous waste, and either the waste was initially treated, stored, or disposed of after the effective date of the particular RCRA requirement; or the activity at the CERCLA site constitutes treatment, storage, or disposal, as defined by RCRA (U.S. EPA 1988a).

The preamble to the NCP indicates that state regulations that are components of a federally authorized or delegated state program are generally considered federal requirements and potential federal ARARs for the purposes of ARARs analysis (55 Fed. Reg. 8666, 8742 [1990]). The state of California received approval for its base RCRA hazardous waste management program on 23 July 1992 (57 Fed. Reg. 32726 [1992]). The state of California "Environmental Health Standards for the Management of Hazardous Waste," set forth in Title 22 *California Code of Regulations*, Division 4.5 (Cal. Code Regs. tit. 22, div. 4.5), were approved by U.S. EPA as a component of the federally authorized state of California RCRA program. On 26 September 2001, California received final authorization of its revised State Hazardous Waste Management Program by the U.S. EPA (63 Fed. Reg. 49118 [2001]).

The regulations of Cal. Code Regs. tit. 22, div. 4.5 are, therefore, a source of potential federal ARARs for CERCLA response actions. The exception is when a state regulation is "broader in scope" than the corresponding federal RCRA regulations. In that case, such regulations are not considered part of the federally authorized program or potential federal ARARs. Instead, they are purely state law requirements and potential state ARARs.

The U.S. EPA 23 July 1992 notice approving the state of California RCRA program (57 Fed. Reg. 32726 [1992]) specifically indicated that the state regulations addressed certain non-RCRA, state-regulated hazardous wastes that fell outside the scope of federal RCRA requirements. Cal. Code Regs. tit. 22, div. 4.5 requirements would be potential state ARARs for such non-RCRA, state-regulated wastes.

A key threshold question for the ARARs analysis is whether or not the contaminants at IRP Site 74 constitute federal hazardous waste as defined under RCRA. A discussion of waste characterization is included in Section 1.4.

1.4 Waste Characterization

Selection of ARARs involves the characterization of wastes as described below.

1.4.1 RCRA Hazardous Waste Determination

Federal RCRA hazardous waste determination is necessary to determine whether a waste is subject to RCRA requirements at Cal. Code Regs. tit. 22, div. 4.5 and other state requirements at Cal. Code Regs. tit. 23, div. 3, Chapter (ch.) 15. The first step in the RCRA hazardous waste characterization process is to evaluate contaminated media at the site(s) and determine whether the contaminant constitutes a "listed" RCRA waste. The preamble to the NCP states that "… it is often necessary to know the origin of the waste to determine whether it is a listed waste and that, if such documentation is lacking, the lead agency may assume it is not a listed waste" (55 Fed. Reg. 8666, 8758 [1990]).

This approach is confirmed in U.S. EPA guidance for CERCLA compliance with other laws (U.S. EPA 1988a), as follows:

> To determine whether a waste is a listed waste under RCRA, it is often necessary to know the source. However, at many Superfund sites, no information exists on the source of wastes. The lead agency should use available site information, manifests, storage records, and vouchers in an effort to ascertain the nature of these contaminants. When this documentation is not available, the lead agency may assume that the wastes are not listed RCRA hazardous wastes, unless further analysis or information becomes available that allows the lead agency to determine that the wastes are listed RCRA hazardous wastes.

RCRA hazardous wastes that have been assigned U.S. EPA hazardous waste numbers (or codes) are listed in Cal. Code Regs. tit. 22, §§ 66261.30–66261.33. The lists include hazardous waste codes beginning with the letters "F," "K," "P," and "U."

Knowledge of the exact source of a waste is required for source-specific listed wastes ("K" waste codes). Some knowledge of the nature or source of the waste is required even for listed wastes from nonspecific sources, such as spent solvents ("F" waste codes) or commercial chemical products ("P" and "U" waste codes). These listed RCRA hazardous wastes are restricted to commercially pure chemicals used in particular processes such as degreasing.

P and U wastes cover only unused and unmixed commercial chemical products, particularly spilled or off-spec products (U.S. EPA 1991a). Not every waste containing a P or U chemical is a hazardous waste. To determine whether a CERCLA investigation-derived waste contains a P or U waste, there must be direct evidence of product use. In particular, all the following criteria must be met. The chemicals must be:

- discarded (as described in 40 CFR § 261.2[a][2]),
- either off-spec commercial products or a commercially sold grade,
- not used (soil contaminated with spilled unused wastes is a P or U waste), and
- the sole active ingredient in a formulation.

The source of soil and sediment contamination at IRP Site 74 is well known based on the past use of the site as a skeet range. The contaminants are lead and antimony from lead shot (pellets), and PAHs from skeet targets. Thus, listed wastes are not expected to be present at IRP Site 74.

The second step in the RCRA hazardous waste characterization process is to evaluate potential hazardous characteristics of the waste. The evaluation of characteristic waste is described in U.S. EPA guidance as follows (U.S. EPA 1988a):

> Under certain circumstances, although no historical information exists about the waste, it may be possible to identify the waste as RCRA characteristic waste. This is important in the event that (1) remedial alternatives under consideration at the site involve on-site treatment, storage, or disposal, in which case RCRA may be triggered as discussed in this section; or (2) a remedial alternative involves off-site shipment. Since the generator (in this case, the agency or responsible party conducting the Superfund action) is responsible for determining whether the wastes exhibit any of these characteristics (defined in 40 C.F.R. §§ 261.21–261.24), testing may be required. The lead agency must use best professional judgment to determine, on a site-specific basis, if testing for hazardous characteristics is necessary.
>
> In determining whether to test for the toxicity characteristic using the extraction procedures (EP) toxicity test, it may be possible to assume that certain low concentrations of waste are not toxic. For example, if the total waste concentration in soil is 20 times or less the EP toxicity concentration, the waste cannot be characteristic hazardous waste. In such a case, RCRA requirements would not be applicable. In other instances, where it appears that the substances may be characteristic hazardous waste (ignitable, corrosive, reactive, or EP toxic), testing should be performed.

Hazardous waste characteristics, as defined in 40 C.F.R. §§ 261.21–261.24, are commonly referred to as ignitability, corrosivity, reactivity, and toxicity. California environmental health standards for the management of hazardous waste set forth in Cal. Code Regs. tit. 22, div. 4.5 were approved by U.S. EPA as a component of the federally authorized California RCRA program. Therefore, the characterization of RCRA waste is based on the state requirements.

The characteristics of ignitability, corrosivity, reactivity, and toxicity are defined in Cal. Code Regs. tit. 22, §§ 66261.21–66261.24. According to Cal. Code Regs. tit. 22, § 66261.24(a)(1)(A), "A waste that exhibits the characteristic of toxicity pursuant to subsection (a)(1) of this section has the EPA Hazardous Waste Number specified in Table I of this section which corresponds to the toxic contaminant causing it to be hazardous." Table I of Cal. Code Regs. tit. 22, § 66261.24(a)(1)(A) assigns hazardous waste codes beginning with the letter "D" to wastes that exhibit the characteristic of toxicity; D waste codes are limited to "characteristic" hazardous wastes.

According to Cal. Code Regs. tit. 22, § 66261.10, waste characteristics can be measured by an available standardized test method or be reasonably classified by generators of waste based on their knowledge of the waste provided that the waste has already been reliably tested or if there is documentation of chemicals used. Soil and sediment contamination at IRP Site 74 is not ignitable, corrosive, or reactive, as defined in Cal. Code Regs. tit. 22, § 66261.21–66261.23. This determination was based on knowledge of the nature and concentrations of contaminants.

The requirements at Cal. Code Regs. tit. 22, § 66261.24 list the toxic contaminant concentrations that determine the characteristic of toxicity. The concentration limits are in milligrams per liter (mg/L). These units are directly comparable to total concentrations in waste groundwater and surface water. For waste soils, these concentrations apply to the extract or leachate produced by the toxicity characteristic leaching procedure (TCLP).

A waste is considered hazardous if the contaminants in the wastewater or in the soil TCLP extract equal or exceed the TCLP limits. TCLP testing is required only if total contaminant concentrations in soil equal or exceed 20 times the TCLP limits because TCLP uses a 20-to-1 dilution for the extract (U.S. EPA 1988a).

Numerous soil and sediment samples at IRP Site 74 have concentrations that exceed 20 times the TCLP for lead, with some samples having concentrations exceeding the TCLP by a factor greater than 1,000. During the remedial action at IRP Site 74, contaminated soil and sediment will be handled as a RCRA hazardous waste unless additional sampling and analysis indicates that a different designation may be appropriate for some of the excavated material. It should be noted that there are no TCLP limits for antimony or PAHs.

1.4.2 Other California Waste Classifications

For waste discharged after 18 July 1997, solid waste classifications at Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230 are used to determine applicability of waste management requirements. These are summarized below.

A "designated waste" under Cal. Code Regs. tit. 27, § 20210 is defined at Cal. Water Code § 13173. Under Cal. Water Code § 13173, designated waste is hazardous waste that has been granted a variance from hazardous waste management requirements or nonhazardous waste that consists of or contains pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives or that could reasonably be expected to affect beneficial uses of the waters of the state.

A nonhazardous solid waste under Cal. Code Regs. tit. 27, § 20220 is all putrescible and nonputrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, manure, vegetable or animal solid and semisolid wastes, and other discarded waste (whether of solid or semisolid consistency), provided that such wastes do not contain wastes that must be managed as hazardous wastes or wastes that contain soluble pollutants in concentrations that exceed applicable water quality objectives or could cause degradation of waters of the state.

Under Cal. Code Regs. tit. 27, § 20230, inert waste is that subset of solid waste that does not contain hazardous waste or soluble pollutants at concentrations in excess of applicable water quality objectives and does not contain significant quantities of decomposable waste.

Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230 are potentially applicable state ARARs for characterizing waste prior to offsite disposal.

2.0 Chemical-specific ARARs

Chemical-specific ARARs are generally health- or risk-based numerical values or methodologies applied to site-specific conditions that result in the establishment of a cleanup level. Many potential ARARs associated with particular response alternatives (such as closure or discharge) can be characterized as action-specific but include numerical values or methodologies to establish them so they fit in both categories (chemical- and action-specific). To simplify the comparison of numerical values, most action-specific requirements that include numerical values are included in this chemical-specific section and, if repeated in the action-specific section, the discussion refers back to this section.

This section presents ARARs determination conclusions addressing numerical values for groundwater, surface water, soil, sediment, and air, and a summary of the ARARs conclusions and a more detailed discussion of the ARARs for groundwater, surface water, soil, sediment, and air.

Potential federal and state chemical-specific ARARs are summarized in Tables A2-1 and A2-2, respectively, which are at the end of this section.

2.1 Summary of ARARs Conclusions by Medium

Groundwater, surface water, soil, sediment, and air are the environmental media that have been evaluated for chemical-specific ARARs for IRP Site 74. The conclusions for ARARs pertaining to these media are presented in the following sections.

2.1.1 Groundwater ARARs Conclusions

IRP Site 74 contains shallow groundwater that is hydraulically connected to surface water at the wetlands portion of the site. The chemicals of concern (COCs) at IRP Site 74 are neither water soluble nor mobile contaminants in the subsurface. Thus, there is no indication that the COCs at IRP Site 74 have affected groundwater or surface water at the site. Neither groundwater nor surface water is planned for remediation under this IRP Site 74 FS.

No ARARs were identified for groundwater.

2.1.2 Surface-Water ARARs Conclusions

IRP Site 74 contains surface water at the wetlands portion of the site. The surface water is hydraulically connected to shallow groundwater at the site, and therefore has the potential to be a source of contamination for groundwater. The COCs at IRP Site 74, however, are neither water soluble nor mobile contaminants in the subsurface. Therefore, there is no indication that groundwater or surface water at IRP Site 74 has been affected by these COCs. In addition, neither groundwater nor surface water is planned for remediation under the IRP Site 74 FS. It should be noted, however, that surface water could be affected by remedial action conducted under several of the remedial action alternatives for IRP Site 74 (i.e., Alternatives 2, 3, and 4). Although the lead at the site is immobile and not considered water soluble, the CTR for lead at 40 C.F.R. § 131.38 is a potential federal ARAR for the remedial action and the remedial action is expected to be in compliance with it.

The following state ARARs were identified for surface water for potential discharges during the remedial action. And the proposed remedial action is expected to comply with these ARARs:

- Porter-Cologne Water Quality Control Act, Cal. Water Code §§ 13241, 13243, 13263(a), 13269, and 13360 as enabling legislation for the Basin Plan, and SWRCB Res. 88-63 and 68-16
- Water Quality Control Plan Santa Ana River Basin, Chapters 3 beneficial uses and 4 water quality objectives (WQOs) (RWQCB, 1995) for the discharge to surface water from the remedial action
- SWRCB Resolution (Res.) 88-63 to determine whether the surface water is a potential source of drinking water
- SWRCB Res. 68-16 for a new discharge during the remedial action

2.1.3 Soil ARARs Conclusions

Soil excavation is included as a component of some of the remedial action alternatives for IRP Site 74. Previous analytical results indicate that chemical levels in some soil samples at IRP Site 74 are well above the requirements of RCRA hazardous waste. Other samples may need a hazardous waste determination at the time of excavation. The substantive provisions of the following requirements are the most stringent of the potential federal and state chemical-specific ARARs for soil at IRP Site 74:

- RCRA definition of hazardous waste in Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100
- Definitions of designated waste, nonhazardous waste, and inert waste, Cal. Code of Regs. tit. 27, § 20210, 20220, and 20230

2.1.4 Sediment ARARs Conclusions

Sediment excavation is included as a potential component of the remedial action for IRP Site 74. Previous analytical results indicate that chemical levels in some sediment samples at the site are well above the requirements of RCRA hazardous waste. Other samples may need a hazardous waste determination at the time of excavation. There is no indication that the contaminated sediment is affecting the surface water quality at IRP Site 74. The substantive provisions of the following requirements are the most stringent of the potential federal and state chemical-specific ARARs for sediment at IRP Site 74:

- RCRA definition of hazardous waste in Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100
- Definitions of designated waste, nonhazardous waste, and inert waste, Cal. Code of Regs. tit. 27, § 20210, 20220, and 20230

2.1.5 Air ARARs Conclusions

Release of emissions into the atmosphere during excavation must comply with the SCAQMD 401 and 403 prohibitions on visible emissions as potential federal ARARs for remedial alternatives being considered under this action. These rules limit dust emissions that could be caused by the excavation part of the remedial action. These SCAQMD Rules are potentially applicable federal ARARs because they are included in the State Implementation Plan (SIP).

2.2 Detailed Discussion of ARARs by Medium

The following subsections provide a detailed discussion of federal and state ARARs by medium.

2.2.1 Groundwater ARARs

At IRP Site 74, shallow groundwater is expected to be about 3 to 5 feet below ground surface. The underlying shallow groundwater is saline to hypersaline (TDS ranging between 24,000 and 57,000 mg/l) and cannot reasonably be regarded as a potential drinking water source. A connection between the shallow groundwater and the lower aquifer system (deeper main drinking water source) appears to be unlikely.

2.2.1.1 Federal

No federal ARARs have been identified for IRP Site 74.

2.2.1.2 State

The state has identified the following ARARs for the IRP Site 74 remedial action:

- Porter-Cologne Water Quality Control Act, Cal. Water Code §§ 13241, 13243, 13263(a), 13269, and 13360
- Water Quality Control Plan Santa Ana River Basin, Chapters 3 beneficial uses and 4 WQOs (RWQCB, 1995)
- SWRCB Resolution (Res.) 88-63 and RWQCB Res. 89-42
- SWRCB Res. 68-16 and 92-49

Porter-Cologne Water Quality Control Act. The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) became Division 7 of the California Water Code in 1969. The Porter-Cologne Act requires each regional board to formulate and adopt Basin Plans for all areas within the region (Cal. Water Code § 13240). It also requires each regional board to establish WQOs that will protect the beneficial uses of the water basin (Cal. Water Code § 13241 and to prescribe waste discharge requirements that would implement the Basin Plan for any discharge of waste to the waters of the state (Cal. Water Code § 13263[a]).

Other sections of the Porter-Cologne Act include Cal. Water Code § 13243, which allows regional boards to specify conditions or areas where waste discharge is not permitted. Cal. Water Code § 13269 provides the boards authority for waivers for reports or compliance with requirements as long as it is not against the public interest. Cal. Water Code § 13360 specifies circumstances for regional boards to order compliance in a specific manner.

The DON accepts the substantive provisions of Cal. Water Code §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act as enabling legislation as implemented through the beneficial uses, WQOs, waste discharge requirements, promulgated policies of the WQCP for the Santa Ana Region, SWRCB Res. 68-16 and Res. 88-63.

The state also identified Cal. Water Code §§13000 (policy), 13176 (lab accreditation), Chapter 5, Article 1 (enforcement), and Chapter 10, Article 3 (reports). These sections are not substantive requirements meeting the definition of ARARs for this remedial action.

State Water Resources Control Board Res. 88-63, **Adoption of Policy Entitled "Sources of Drinking Water."** SWRCB Res. 88-63 establishes criteria to help RWQCBs identify potential sources of drinking water. According to this resolution, all groundwater in California is considered suitable or potentially suitable for domestic or municipal freshwater supply except in cases where any one of the following water quality and production criteria cannot be met:

- TDS exceed 3,000 mg/L (or electrical conductivity is greater than 5,000 micromhos per centimeter) and the RWQCB does not reasonably expect the groundwater to supply a public supply system.
- Groundwater is contaminated, either by natural processes or by human activity unrelated to a specific pollution incident, and cannot reasonably be treated for domestic use either by best management practices (BMPs) or best economically available treatment practices.
- The groundwater does not provide sufficient water to supply a single well capable of producing an average sustained yield of 200 gallons per day.

SWRCB Res. 88-63 has been incorporated by reference into the Basin Plan (RWQCB 1995). The DON has determined that the substantive provisions of this policy are pertinent for determining whether groundwater or surface water are potential sources of drinking water. Although this FS does not address groundwater or surface water, SWRCB Res. 88-63 is a potential ARAR for determining whether surface water is a potential source of drinking water to determine the potential ARARs for potential discharges to surface caused by the remedial action.

Currently, only groundwater in the regional aquifer that is not significantly affected by tidal water is used or likely to be used for drinking water supply or the other beneficial uses assigned by the Basin Plan. Shallow groundwater at NAVWPNSTA Seal Beach typically contains much higher levels of TDS than the Santa Ana Pressure Subbasin and could not be used for most beneficial uses without treatment. By applying the criteria of SWRCB Res. 88-63, an argument could be made that the shallow aquifer beneath NAVWPNSTA Seal Beach is not a potential source of drinking water due to its high TDS content and elevated background concentrations of inorganic constituents such as sodium, chloride, nitrate, and sulfate.

Water Quality Control Plan Santa Ana River Basin (Basin Plan)

The DON accepts the substantive provisions in Chapters 2 and 4 of the Basin Plan, including beneficial use and WQOs as potential ARARs. However, because groundwater is not being addressed by this remedial action and because it is not potentially affected by the remedial action, further discussion of the Basin Plan is included for surface water in Section 2.2.2.2.

2.2.2 Surface-water ARARs

Remediation of surface water is not an element of the remedial action for IRP Site 74. Some remedial action alternatives, however, may affect surface water at the site. Potential federal and state ARARs for surface water are detailed in the following subsections.

2.2.2.1 Federal

Water Quality Standards

On 22 December 1992, U.S. EPA promulgated federal water quality standards under the authority of the federal CWA Section 303(c)(2)(B), 33 U.S.C. ch. 26, § 1313(c)(2)(B), in order to establish water quality standards required by the CWA where the State of California and other states had failed to do so (57 Fed. Reg. 60848 [1992]). These standards have been amended over the years in the *Federal Register*, including amendments of the National Toxics Rule (NTR) (60 Fed. Reg. 22228 [1995]). These water quality standards, as amended, are codified at 40 C.F.R. § 131.36**.**

U.S. EPA promulgated a rule on 18 May 2000 to fill a gap in California's water quality standards. The gap was created in 1994 when a state court overturned the state's water quality control plans (WQCPs) that contained water quality criteria for priority toxic pollutants. The rule, commonly called the California Toxics Rule (CTR), is codified at 40 C.F.R. § 131.38. These federal criteria are legally applicable in the State of California for inland surface waters and enclosed bays and estuaries for all purposes and programs under the CWA.

These standards of the CTR apply to the state's designated uses and "supersede any criteria adopted by the State, except when State regulations contain criteria which are more stringent for a particular use in which case the State's criteria will continue to apply." However, because the surface water is not being remediated as part of this remedial action, these requirements would only be considered for potential discharges to surface water during the remediation. The CTR for lead in salt water are 210 micrograms per liter (ug/L) Criteria Maximum Concentration (CMC), and 8.1 μg/L for CMC. CMC equals the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time without deleterious effects. Criteria Continuous Concentration equals the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effectsThese are potentially applicable for surface water for potential discharges during the remedial action. However, the surface water at the site has been exposed to the lead on site and has not been found to be affected by it. Measures will be taken during the remedial action to ensure that the surface water stays within the identified CTR. The CTR for lead at 40 C.F.R. § 131.38 is a potential federal ARAR for the remedial action.

2.2.2.2 State

SWRCB Res. 88-63, Sources of Drinking Water. SWRCB Res. 88-63 states that water sources that contain TDS exceeding 3,000 mg/L (or having electrical conductivity of greater than 5,000 micromhos per centimeter) or a yield of less than 200 gallons per day are not reasonably expected by the RWQCBs to supply a public water system. The surface water at IRP Site 74 does not meet these criteria, and is therefore not a potential source of drinking water. See Section 2.2.1 for further discussion.

Water Quality Control Plan Santa Ana River Basin (Basin Plan)

The DON accepts the substantive provisions in Chapters 3 and 4 of the Basin Plan, including beneficial use and WQOs as potential ARARs. The uses designated for the Anaheim Bay Seal Beach National Wildlife Refuge are potential ARARs for this FS for potential discharges to the surface water during the remedial action.

The Basin Plan was prepared and implemented by the RWQCB Santa Ana Region to protect and enhance the quality of the waters in the Santa Ana River Basin. The Basin Plan establishes location-specific beneficial uses and WQOs for the surface water and groundwater of the region and is the basis of the RWQCB Santa Ana Region regulatory programs. The Basin Plan includes both numeric and narrative WQOs for specific groundwater subbasins. The WQOs are intended to protect the beneficial uses of the waters of the region and to prevent nuisance.

Beneficial use and reuse of water are key aspects of the Basin Plan. IRP Site 74 is located in part in the Seal Beach National Wildlife Refuge. The Anaheim Bay Seal Beach National Wildlife Refuge has the following beneficial use designations (RWQCB, 1995):

- REC - Water Contact Recreation
- REC - Non-contact Water Recreation
- BIOL - Preservation of Biological Habitats of Special Significance
- WILD - Wildlife Habitat
- RARE - Rare, Threatened or Endangered Species
- SPWN - Spawning, Reproduction and Development
- MAR - Marine Habitat
- EST - Estuarine Habitat

This FS is not to address chemicals of concern in surface water. However, there may be a discharge of sediment during the remedial action. The substantive provisions of the turbidity water quality objective for enclosed bays and estuaries was determined to be potentially applicable for the potential discharge during the remedial action. Increases in turbidity that result from controllable water quality factors shall comply with the following:

Natural Turbidity	Maximum Increase
0-50 NTU	20%
50-100 NTU	10 NTU
Greater than 100 NTU	10%

All enclosed bay and estuaries of the region shall be free of changes in turbidity that adversely affect beneficial uses.

The remedial action will be conducted with controls as necessary to comply with these turbidity requirements.

SWRCB Resolutions 92-49 and 68-16

SWRCB Res. 92-49 (as amended on April 21, 1994, and October 2, 1996) is titled “Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under California Water Code § 13304.” This resolution contains policies and procedures for the regional boards that apply to all investigations and cleanup and abatement activities for all types of discharges subject to Cal. Water Code § 13304.

SWRCB Res. 68-16, "Statement of Policy With Respect to Maintaining High Quality of Waters in California," establishes the policy that high-quality waters of the state "shall be maintained to the maximum extent possible" consistent with the "maximum benefit to the people of the state." It provides that whenever the existing quality of water is better than the required applicable water quality policies, such existing high-quality water will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies. It also states that any activity that produces or may produce a waste or increased volume or concentration of waste and that discharges or proposes to discharge to existing high-quality waters will be required to meet waste-discharge requirements that will result in the best practicable treatment or control of the discharge necessary to assure that (1) pollution or a nuisance will not occur and (2) the highest water quality consistent with maximum benefit to the people of the state will be maintained. Cleanup to below background water quality conditions is not required by SWRCB under the Porter-Cologne Water Quality Control Act. SWRCB Res. 92-49 II.F.1 provides that the regional boards may require cleanup and abatement to "conform to the provisions of the Resolution No. 68-16 of the State Water Board, and the Water Quality Control Plans of the State and Regional Water Quality Control Boards, provided that under no circumstances shall these provisions be interpreted to require cleanup and abatement, which achieves water quality conditions that are better than background conditions."

Navy's Position Regarding SWRCB Resolutions 92-49 and 68-16

The Navy and the State of California have not agreed whether the SWRCB Res. 92-49 is ARAR for the remedial action at IRP Site 74. Therefore, this FS Appendix documents each party's position but does not attempt to resolve the issue. The Navy agrees that SWRCB Res. 68-16 may be a chemical-specific ARAR for discharges to groundwater as identified by the State. However the groundwater is not being addressed by this response action, and the remedial action is not expected to potentially discharge to groundwater.

The substantive provisions of SWRCB Res. 92-49 at Section III.G. state that the Water Board shall "ensure that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality, or the best water quality which is reasonable if background levels of water cannot be restored." Surface water is not a medium of concern addressed by this remedial action at IRP Site 74. Therefore, Res. 92-49 is not a potential ARAR; however, the cleanup levels agreed to by the Navy and oversight Agencies, including the Water Board, are consistent with the requirements of SWRCB Res 92-49.

State of California's Position Regarding SWRCB Resolutions 92-49 and 68-16

The state has identified SWRCB Res. 68-16 for protection of groundwater quality at IRP Site 74. The state has also identified SWRCB Res. 92-49 for the remedial activities at IRP Site 74. The State agrees that the remedial alternatives will comply with SWRCB Res. 92-49 and Res. 68-16.

Whereas the Navy and the State of California have not agreed on whether SWRCB Res. 92-49Is an ARAR for this response action, this FS Report documents each party's position on the resolutions but does not attempt to resolve the issue.

2.2.3 Soil ARARs

The key threshold question for soil ARARs is whether or not the wastes generated from IRP Site 74 remedial action would be classified as hazardous waste. The excavated soil may be classified as a federal hazardous waste as defined by RCRA and the state-authorized program. If the excavated soil is determined to be hazardous waste, the appropriate requirements will apply.

2.2.3.1 Federal

RCRA Hazardous Waste and Groundwater Protection Standards. The federal RCRA requirements at 40 C.F.R. pt. 261 do not apply in California because the state RCRA program is authorized. The authorized state RCRA requirements are therefore considered potential federal ARARs (see Section 1.3.1). The applicability of RCRA requirements depends on whether the waste is a RCRA hazardous waste, whether the waste was initially treated, stored, or disposed after the effective date of the particular RCRA requirement, and whether the activity at the site constitutes treatment, storage, or disposal as defined by RCRA. However, RCRA requirements may be relevant and appropriate even if they are not applicable. Examples include activities that are similar to the definition of RCRA treatment, storage, or disposal for waste that is similar to RCRA hazardous waste.

The determination of whether a waste is an RCRA hazardous waste can be made by comparing the site waste to the definition of RCRA hazardous waste. The RCRA requirements at Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100 are potential ARARs because they define RCRA hazardous waste. A waste can meet the definition of hazardous waste if it has the toxicity characteristic of hazardous waste. This determination is made by using the toxicity characteristic leaching procedure (TCLP). The maximum concentrations allowable for the TCLP listed in § 66261.24(a)(1)(B) are potential federal ARARs for determining whether the site has hazardous waste. Because the site has concentrations exceeding these values, it is determined that some of the waste that may be generated during the remedial action would be a characteristic RCRA hazardous waste (see Section 1.4.1).

2.2.3.2 State

The state identified requirements at Cal. Code of Regs. tit. 27, § 20210, 20220, and 20230. The DON has determine that the definitions of designated waste, nonhazardous waste, and inert waste, Cal. Code of Regs. tit. 27, § 20210, 20220, and 20230, are potential chemical-specific state ARARs for this remedial action to characterize waste prior to offsite disposal.

2.2.4 Sediment ARARs

A threshold question for sediment ARARs is whether or not the sediment excavated from IRP Site 74 would be classified as federal hazardous waste as defined by RCRA when waste is generated during the remedial action. If removed sediments are determined to be hazardous waste, the appropriate RCRA requirements will apply.

2.2.4.1 Federal

RCRA Hazardous Waste. U.S. EPA and the states have been slow to develop criteria for the protection of human or ecological receptors in sediments. While U.S. EPA proposed national sediment criteria in 1998 to set pollution thresholds that sediments could not exceed, those criteria were withdrawn after consultation with the U.S. Army Corps of Engineers. Accordingly, the only federal ARARs for sediments are RCRA hazardous waste and land disposal restrictions and water quality standards and Federal Ambient Water Quality Criteria (FAWQC) under the CWA. The applicability of RCRA requirements depends on whether the sediments contain listed or characteristic RCRA hazardous waste, whether the waste was initially treated, stored, or disposed after the effective date of the particular RCRA requirement, and whether the activity at the site constitutes generation, treatment, storage, or disposal as defined by RCRA. Excavation of sediments containing RCRA hazardous waste constitutes generation of waste, to which RCRA requirements apply. RCRA requirements may also be relevant and appropriate even if they are not applicable. Examples include activities that are similar to the definition of RCRA treatment, storage, and disposal for waste that is similar to RCRA hazardous waste.

The determination of whether a waste is an RCRA hazardous waste can be made by comparing the site waste to the definition of RCRA hazardous waste. The RCRA requirements at Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100 are potential ARARs because they define RCRA hazardous waste. A waste can meet the definition of hazardous waste if it has the toxicity characteristic of hazardous waste. This determination is made by using the TCLP. The maximum concentrations allowable for the TCLP listed in Cal. Code Regs. tit. 22, § 66261.24(a)(1)(B) are potential federal ARARs for determining whether the site has hazardous waste. If the site waste has concentrations exceeding these values it is determined to be a characteristic RCRA hazardous waste. See Section 1.4.1 for a more complete discussion of hazardous waste determination.

National Oceanic and Atmospheric Administration Toxicity-Based Thresholds. The National Oceanic and Atmospheric Administration (NOAA) developed effects range-low (ER-L) and effects range-median (ER-M) toxicity-based thresholds for sediment (Long and Morgan 1991; Long et al. 1995). NOAA derived these values using data from estuarine and marine sediment using modeling techniques, as well as laboratory and field studies. For each chemical, the chemical concentrations associated with observed biological effects were sorted. The ER-L for a given chemical is the concentration associated with the lower 10th percentile in the data. The ER-M is the median concentration. The ER-L and ER-M values may be used to predict the potential for adverse biological effects. Adverse biological effects include mortality or sublethal effects (such as reduced growth or reduced reproductive success). While ER-Ls and ER-Ms have been applied to CERCLA sites, the current trend is away from using them even as screening tools. They are viewed cautiously because they represent only probabilities that reported levels of contaminants can be associated with adverse biological effects. They do not establish any level of contamination that actually causes toxicity to benthic or upper trophic organisms in a given environment. Therefore, while regulatory agencies may still accept ER-Ls and ER-Ms as screening tools, they are inappropriate for determining action levels or remediation goals. NOAA toxicity-based thresholds are not potential ARARs but will be used as guidance where necessary to assist with the risk assessment.

U.S. EPA Ecotox Thresholds. U.S. EPA's Superfund program has initiated a project to develop media-specific benchmark values for contaminants commonly found in surface water and sediment (values for soil are still being developed). These values are referred to as Ecotox Thresholds (ETs), and are defined as media-specific contaminant concentrations above which there is sufficient concern regarding adverse ecological effects to warrant further site investigation. ETs are designed to provide a tool to identify contaminants that may pose a threat to ecological receptors and focus further site activities on those contaminants and the media in which they are found. ETs are meant to be used for **screening purposes only**; they are not regulatory criteria, site-specific cleanup standards, or remediation goals. Although US EPA Ecotox thresholds are not potential ARARs , ETs may be useful as guidance in deriving remediation goals.

An ecological risk assessment (ERA) was conducted for IRP Site 74 (SWDIV, 2005) to determine the risk of the COCs at the site to ecological receptors. The following technical guidance was used:

- U.S. EPA. 1997. ERA Guidance for Superfund: Process for Designing and Conducting ERAs. Interim Final. Washington DC. EPA/540/R-97/006 (U.S. EPA 1997a)
- U.S. EPA. 1998. Guidelines for Ecological Risk Assessment. EPA/630/R-95/002F. Washington DC. (U.S. EPA 1998b)
- PRC. 1998. Development of Toxicity Reference Values for Conducting Ecological Risk Assessments at Naval Facilities in California. Interim Final Technical Memorandum. September. CTO-027, contract number N62474-94-D-7069 (PRC 1998)

2.2.4.2 State

The state identified requirements at Cal. Code of Regs. tit. 27, § 20210, 20220, and 20230. The DON has determine that the definitions of designated waste, nonhazardous waste, and inert waste, Cal. Code of Regs. tit. 27, § 20210, 20220, and 20230, are potential chemical-specific state ARARs for this remedial action to characterize waste prior to offsite disposal.

2.2.5 Air ARARs

Remedial action activities involving excavation will implement standard dust control measures to minimize fugitive dust emissions.

2.2.5.1 Federal

Ambient Air Quality Standards

The Clean Air Act (CAA) establishes the National Ambient Air Quality Standards (NAAQS) in 40 C.F.R. § 50.4–50.12. NAAQS are not enforceable in and of themselves; they are translated into source-specific emissions limitations by the state (U.S. EPA 1990a). Substantive requirements of the SCAQMD rules that have been approved by U.S. EPA as part of the SIP under the CAA are potential federal ARARs for air emissions (CAA Section 110). The SIP includes rules for emissions restrictions for particulates, organic compounds, and hazardous air pollutants, as well as standards of performance for new sources.

SIP Requirements of the SCAQMD

The SCAQMD Rules 401, 403, 404, 405, 407, 431.1, 431.2 and 1166 are all approved into the SIP by the EPA at least partly. Therefore, they are evaluated as potential federal ARARs.

SCAQMD Rule 401 prohibits discharge of any contaminant into the atmosphere for more than three minutes which is:

1) darker in shade as that designated as No. 1 on the Ringelmann chart or
2) of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke which is darker in shade as that designated as No. 1 on the Ringelmann chart

Substantive provisions of SCAQMD Rule 401 are potential federal ARARs for emissions that may be caused by excavation during the remedial action.

SCAQMD Rule 403 prohibits visible emissions of fugitive dust beyond the property line from any active operation, open storage pile, or disturbed surface area. Rule 403 prohibits dust emissions that exceed 20 percent opacity, if the dust emission is the result of movement of a motorized vehicle. Active operations need to utilize the applicable best available control measures. No person shall cause or allow PM_{10} levels to exceed 50 micrograms per cubic meter when determined, by simultaneous sampling, as the difference between upwind and downwind samples. No person shall allow track-out to extend 25 feet or more in cumulative length from the point of origin from an active operation and all track-out from an active operation shall be removed at the conclusion of each workday or evening shift. No person shall conduct an active operation with a disturbed surface area of five or more acres, or with a daily import or export of 100 cubic yards or more of bulk material without utilizing tracking controls described.

Substantive provisions of SCAQMD Rule 403 are potential federal ARARs for emissions that may be caused during the excavation during the remedial action.

The SCAQMD Rules 404, 405, 407, 431.1, 431.2 and 1166, and Regulation XIII were identified by the state but are not potential ARARs because they address equipment that will not be used during the remedial action, contaminants that are not chemicals of concern at IRP Site 74, or actions that are not part of the remedial action.

2.2.5.2 State

SCAQMD Rules 402, 431.3, 1150, 1401, and 1470, and Best Available Control Technology (BACT) Guidelines Document were identified by the state IRP Site 74and are not included as part of the SIP. Rules 431.3, 1150, 1401, and 1470, and the BACT Guidelines Document are not potential ARARs because they address equipment, actions and/or contaminants that are not part of the remedial action for IRP Site 74.

SCAQMD Rule 402 prohibits the discharge to the atmosphere of air contaminants that cause injury, detriment, nuisance, or annoyance to a considerable number of persons. The DON is troubled by the vague, subjective nature of the nuisance rule and the lack of objective standards, as well as the inclusion of subjective nonenvironmental criteria such as “annoyance, repose, and comfort,” and so forth. The requirements of 40 C.F.R. § 300.5 specify that an ARAR must be an environmental or facility siting requirement or limitation. Rule 402 does not fall within the definition of those terms and is therefore not an ARAR. The nature, quantity, and location of identified contaminants at IRP Site 74 should not be of concern. The DON has determined that Rule 402 is not an ARAR for the IRP Site 74 remedial action.

The SCAQMD identified Regulation X, which references the federal National Emission Standards for Hazardous Air Pollutants (NESHAPs). This remedial action does not address any of the pollutants or sources identified in the NESHAPs. Therefore, SCAQMD Regulation X is not a potential ARAR for this remedial action.

The California Air Resources Board (CARB) identified Cal. Code Regs. tit. 17 § 70200 as a potential ARAR. This regulation provides unenforceable ambient air quality standards. These standards may be enforced through other regulations but are not potential ARARs themselves during IRP Site 74 remedial action.

TABLE A2-1
Potential Federal Chemical-specific[a] ARARs By Medium

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
SURFACE WATER				
Clean Water Act, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)[c]				
Water quality standards. National Toxics Rule (NTR) and California Toxics Rules (CTR).	Discharges to waters of the United States.	40 C.F.R. § 131.36(b) and 131.38	Applicable	Not an ARAR for setting surface water cleanup goals because surface water is not addressed directly by the remedial action. Potentially applicable for discharge of water retained in decanted sediment back to wetlands during remedial action.
SOIL and SEDIMENT				
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[c]				
Definition of RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste.	Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether waste soil is hazardous.
AIR				
Clean Air Act (42 U.S.C., ch. 85, §§ 7401–7671)[c]				
NAAQS: Primary and secondary standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare.	40 C.F.R. § 50.4-50.12	Not an ARAR	Not enforceable and therefore not an ARAR. Also, not a TBC because air pollutants covered by NAAQS are not emitted under current conditions.
South Coast Air Quality Management District (SCAQMD)				
Air emission standards	Visible emissions standard that states a person shall not discharge any air contaminant into the atmosphere from any single source of emission for a period or periods aggregating more than 3 minutes in a 60-minute	SCAQMD Regulation IV, Rule 401	Applicable	Substantive provisions are potentially applicable for the excavation if selected as part of the remedial action.

TABLE A2-1
Potential Federal Chemical-specific[a] ARARs By Medium

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
	period, which is (a) as dark or darker in shade as that designated No. 1 on the Ringelmann Chart, or (b) of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in (a).			
South Coast Air Quality Management District (SCAQMD)				
Shall not cause or allow the emissions of fugitive dust such that the presence of such dust remains visible in the atmosphere beyond the property line of the emission source and shall not cause or allow PM_{10} levels to exceed 50 micrograms per cubic meter when determined, by simultaneous sampling, as the difference between upwind and downwind samples. Shall implement best available technology and tracking controls. Prohibits track out of 25 feet or more.	Tracking controls are required when soil disturbance is 5 or more acres or import/export of 100 cubic yards.	SCAQMD Regulation IV, Rule 403	Applicable	Substantive provisions are potentially applicable for the excavation if selected as part of the remedial action.

Notes:

[a] Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.
[b] Only the substantive provisions of the requirements cited in this table are potential ARARs.
[c] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the DON accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only pertinent substantive requirements of the specific citations are considered potential ARARs

ACL – alternative concentration limit
APCD – Air Pollution Control District
ARAR – applicable or relevant and appropriate requirement
BAT – best available technology
BCPCT – best conventional pollution control technology
CAA – Clean Air Act
Cal. Code Regs. – California Code of Regulations
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – Code of Federal Regulations
ch. – chapter
NCP – National Oil and Hazardous Substances Pollution Contingency Plan
NPDES – National Pollutant Discharge Elimination System OU – operable unit
PCB – polychlorinated biphenyl
POC – point of compliance
ppm – parts per million
ppm_w – parts per million by weight
pt. – part
RCRA – Resource Conservation and Recovery Act
subpt. – subpart

Notes (continued):

COC – chemical of concern
DoD – Department of Defense
DON – Department of the Navy
Fed. Reg. – Federal Register
LDR – land disposal restriction
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
NAAQS – National Ambient Air Quality Standards (primary and secondary)
TBC – to be considered
TCLP – toxicity characteristic leaching procedure
tit. – title
TSD – treatment, storage, and disposal
U.S.C. – United States Code
U.S. EPA – United States Environmental Protection Agency
UXO – unexploded ordnance
VOC – volatile organic compound

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TABLE A2-2
Potential State and Local Chemical-specific[a] ARARs

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER, SURFACE WATER, SEDIMENT, OR SOIL				
State and Regional Water Quality Control Boards[c]				
Authorizes the SWRCB and RWQCB to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.		Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Water Quality Control Act)	Applicable	The DON accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial use and WQOs, and promulgated policies of the Basin Plan for the Santa Ana region, as potential ARARs. Other provisions of Porter-Quality Water Quality Control Act are not ARARs.
Describes the water basins in Santa Ana region, establishes beneficial uses of groundwater and surface water, establishes WQOs, including narrative and numerical standards, establishes implementation plans to meet WQOs and protect beneficial uses, and incorporates statewide water quality control plans and policies.		Comprehensive Water Quality Control Plan for the Santa Ana Region Basin Plan (Cal. Water Code § 13240 - 13243), Chapters 3 and 4	Applicable	Not an ARAR for the cleanup goals because surface water and groundwater are not affected at the site. Substantive provisions of beneficial uses and WQOs for turbidity for enclosed bays and estuaries were identified as potentially applicable for the potential discharge to surface water during the remedial action.
Establishes the policy that high-quality waters of the state “shall be maintained to the maximum extent possible” consistent with the “maximum benefit to the people of the State.” It provides that whenever the existing quality of water is better than that required by applicable water quality policies, such existing high-quality water will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies. It also states that any activity that produces or may produce a waste or increased volume or concentration of waste and		Statement of Policy With Respect to Maintaining High Quality of Waters in California, SWRCB Res. 68-16	Applicable	Not an ARAR for the cleanup goals because surface water and groundwater are not affected at the site and are not addressed by the remedial action. Substantive provisions are potentially applicable for the potential discharge to surface water during the remedial action.

TABLE A2-2
Potential State and Local Chemical-specific[a] ARARs

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER, SURFACE WATER, SEDIMENT, OR SOIL				
that discharges or proposes to discharge to existing high-quality waters will be required to meet waste-discharge requirements that will result in the best practicable treatment or control of the discharge.				
Describes requirements for RWQCB oversight of investigation and cleanup and abatement activities resulting from discharges of hazardous substances. RWQCB may decide on cleanup and abatement goals and objectives for the protection of water quality and beneficial uses of water within each region. Establishes criteria for “containment zones” where cleanup to established water-quality goals is not economically or technically practicable.		Policies and procedures for investigation and cleanup and abatement of discharges under Cal. Water Code § 13304. SWRCB Res. 92-49	Not an ARAR	There is no indication that the COCs at IRP Site 74 have affected groundwater or surface water at the site or that the contaminants being addressed threaten the groundwater or surface water.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the TDS is greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either BMPs or best economically achievable treatment practices.		SWRCB Res. 88-63 (Sources of Drinking Water Policy) RWQCB Resolution 89-42	Applicable	Not an ARAR for the cleanup goals because surface water and groundwater are not affected at the site. Substantive provisions are potentially applicable for the potential discharge of the surface water during the remedial action. The surface water does not meet the criteria for drinking water because it is tidally influenced and has high TDS as part of the estuary.
Definitions of designated waste, nonhazardous waste, and inert waste.		Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230	Applicable	Substantive provisions are potentially applicable characterizing waste generated during the remedial action.

TABLE A2-2
Potential State and Local Chemical-specific[a] ARARs

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER, SURFACE WATER, SEDIMENT, OR SOIL				
South Coast Air Quality Management District (SCAQMD)				
Prohibits the discharge of any air contaminant or other material (including odorous compounds) that causes injury or annoyance to the public, endangers the comfort, response, health or safety of the public or causes damage to business or property. In general, a notice of violation may be issued upon receipt of six verified complaints or for any property damage or personal injury (Ref. Health and Safety Code 41700).		SCAQMD Regulation IV, Rule 402	Not an ARAR	Not an ARAR. The requirements of 40 C.F.R. § 300.5 specify that an ARAR must be an environmental or facility siting requirement or limitation. Rule 402 does not fall within the definition of those terms and is therefore not an ARAR. See Section 2.2.5.2.

Notes:

[a] Many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables.
[b] Only the substantive provisions of the requirements cited in this table are potential ARARs.
[c] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the DON accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only pertinent substantive requirements of specific citations are considered potential ARARs.

ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – California Code of Regulations
Cal/EPA – California Environmental Protection Agency
Cal. Water Code – California Water Code
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
COC – Chemical of Concern
Div. – Division
DON – Department of the Navy
gpd – gallons per day
MCL – maximum contaminant level
NPDES – National Pollutant Discharge Elimination System
OU – operable unit
ppm – parts per million
RCRA – Resource Conservation and Recovery Act
Res. – Resolution
RWQCB – (California) Regional Water Quality Control Board
§ – section
SIP – State Implementation Plan
SWRCB – (California) State Water Resources Control Board
TDS – total dissolved solids
tit. – title
WQO – water quality objective

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3.0 Location-specific ARARs

Potential location-specific ARARs are identified and discussed in this section. The discussions are presented based on various attributes of the site location, such as whether it is within a floodplain. Additional surveys will be performed in connection with the response action design and response action to confirm location-specific ARARs where inadequate siting information currently exists, or in the event of changes to planned facility locations.

3.1 Summary of Location-specific ARARs

Wetlands protection, floodplain management, hydrologic resources, biological resources, coastal resources, other natural resources, and geologic characteristics are the resource categories relating to location-specific requirements potentially affected by the IRP Site 74 response actions. The conclusions for ARARs pertaining to these resources are presented in the following sections.

3.1.1 Cultural Resources ARARs Conclusions

The areas to be disturbed during the remedial action at IRP Site 74 do not have any associated cultural ARARs based on the findings of a cultural resources reconnaissance of IRP Site 74 (Clevanger, 1997).

3.1.2 Wetlands Protection and Floodplain Management Conclusions

IRP Site 74 is located within a potential floodplain and a portion of the site is located within a wetland; therefore, Executive Order No. 11990 and 11988 have been determined to be potentially relevant and appropriate for the IRP Site 74 remedial action. The substantive provisions of CWA, Section 404, 33 U.S.C. § 1344 are potentially applicable and are further evaluated in Section 4 as action-specific requirements. The substantive provisions at Cal. Code Regs. tit. 22, § 66264.18(b) that require construction to prevent washout form a 100-year flood are potentially relevant and appropriate for the capping alternative.

3.1.3 Hydrologic Resources Conclusions

The substantive provisions of 16 U.S.C. §§ 661–666c for prevention, mitigation, and compensation are potentially applicable for remedial action alternatives that include work in the wetlands.

3.1.4 Biological Resources Conclusions

A portion of IRP Site 74 is located within a National Wildlife Refuge area. The remedial action could potentially disturb endangered species and breeding of migratory birds. Several bird species known to be residents or migrants at NAVWPNSTA Seal Beach are listed by federal or state agencies, or both, as threatened or endangered. They include the light-footed clapper rail (Rallus longirostris levipes), western snowy plover (*Charadrius alexandrinus nivosus*), California least tern (*Sterna antillarum browni*), green sea turtle (Chelonia mydas), southern sea otter (Enhydra lutris nereis), and Belding's savannah sparrow (*Passerculus sandwichensis beldingi*). Because of the rapidly disappearing habitat on the coast of Southern California, two species of federally listed endangered birds, the California least tern and the light-footed clapper rail, rely on the Seal Beach NWR tidal salt marsh habitat for their nesting grounds.

Overall, the remedial action is expected to mitigate potential threats to endangered species. Potential federal ARARs include the following:

- Endangered Species Act of 1973 (16 U.S.C. §§ 1531-1543)
- Migratory Bird Treaty Act of 1972 (16 U.S.C. § 703)
- National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. §§ 668dd-668ee)

Potential state ARARs include the following:

- California Fish and Game § 2080 and §2081(b) for endangered and threatened species; §1908 for rare and endangered native plant species; §3511 for fully protected birds; and §5650(a) and (b) prohibitions of deleterious substances placement where passing to waters is a potential.
- The DON will coordinate with CDFG through DTSC and USFWS during the planning and implementation of the remedial action.

3.1.5 Coastal Resources Conclusions

Although IRP Site 74 is within a coastal zone area, the DON does not view the procedure of preparing a formal coastal consistency document and seeking California Coastal Commission concurrence as a valid ARAR. This is based on the Federal Consistency Branch of the California Coastal Commission advisory that federal "land" be exempt from obtaining a "consistency determination."Therefore, neither the Coastal Zone Management Act (16 U.S.C. §§ 1451-1464) nor the California Coastal Act of 1976 (Cal. Pub. Res. Code §§ 30000-30900; Cal. Code Regs. tit. 14, §§ 13001-13666.4) is a potential ARAR for IRP Site 74.

3.1.6 Geologic Characteristics Conclusions

The areas to be disturbed during the remedial action at IRP Site 74 do not have any associated geologic characteristic ARARs.

3.2 Detailed Discussion of ARARs

The following subsections provide a detailed discussion of federal and state ARARs by location-specific resources. Pertinent and substantive provisions of the potential ARARs listed and described below were reviewed to determine whether they are potential federal or state ARARs for the IRP Site 74 soil and sediment FS.

Requirements that are determined to be ARARs or TBCs are identified in Table A3-1 (federal) and Table A3-2 (state) at the end of this section. ARARs determinations are presented in the column denoted by the heading ARAR Determination. Determinations of status for location-specific ARARs were generally based on consultation of maps or lists included in the regulation or prepared by the administering agency. References to the document or agency consulted are provided in the Comments column and may be provided in footnotes to the table. Specific issues concerning some of the requirements are discussed in the following sections.

3.2.1 Cultural Resources ARARs

The areas to be disturbed during the remedial action at IRP Site 74 do not have any associated cultural ARARs based on the findings of a cultural resources reconnaissance of IRP Site 74 (Clevanger, 1997).

3.2.1.1 National Historic Preservation Act of 1966, as Amended

Pursuant to Sections 106 and 110(f) of the National Historic Preservation Act (NHPA) (16 U.S.C. §§ 470–470x-6, and its implementing regulations [36 C.F.R. pt. 800]), as amended, CERCLA remedial actions are required to take into account the effects of remedial activities on any historic properties included on or eligible for inclusion on the National Register of Historic Places (National Register). The National Register is a list of districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. Section 110(f) of the National Historic Preservation Act of 1966, as amended, requires that before approval of any federal undertaking that may directly and adversely affect any National Historic Landmark, the head of the responsible federal agency will, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to the landmark, and will afford the Advisory Council a reasonable opportunity to comment on the undertaking.

The National Historic Preservation Act requires federally funded projects to identify and mitigate impacts of project activities on properties included in or eligible for the National Register of Historic Places. No areas in IRP Site 74 are potentially eligible for the National Register of Historic Places. Therefore, the National Historic Preservation Act is not a potential ARAR.

3.2.1.2 Archaeological and Historic Preservation Act

The Archaeological and Historic Preservation Act, 16 U.S.C. § 469–469c-1, provides for the preservation of historical and archaeological data that might otherwise be lost as a result of dam construction or alterations of the terrain. If activities in connection with any federal construction project or federally approved project may cause irreparable loss to significant scientific, prehistorical, or archaeological data, the act requires the agency undertaking that project to preserve the data or request the Department of the Interior (DOI) to do so. This act differs from the NHPA in that it encompasses a broader range of resources than those listed on the National Register and mandates only the preservation of the data (including analysis and publication).

The Archaeological and Historic Preservation Act requires that for federally approved projects that may cause irreparable loss to significant scientific, prehistoric, historic, or archaeological data, the data must be preserved by the agency undertaking the project or the agency undertaking the project may request DOI to do so. The DON performed a site-specific archaeological resources survey in 1997 and no significant findings were reported for IRP Site 74 (Clevanger, 1997). Therefore, the Archaeological and Historic Preservation Act is not a potential ARAR for this remedial action.

3.2.1.3 Historic Sites, Buildings, and Antiquities Act of 1935

The purpose of the Historic Sites, Buildings, and Antiquities Act (16 U.S.C. §§ 461–467) and its implementing regulations (40 C.F.R. § 6.301[a]) is to encourage the long-term preservation of nationally significant properties that illustrate or commemorate the history and prehistory of the United States, including historic landmarks (36 C.F.R. § 65) and natural landmarks (36 C.F.R. § 62). Properties designated as National Historic Landmarks in California are listed in the National Register. Natural landmarks are nationally significant examples of a full range of ecological and geological features that constitute the nation's natural heritage. In conducting an environmental review of a proposed action, the responsible official shall consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 36 C.F.R. § 62.6(d) to avoid undesirable impacts on such landmarks. These requirements are not substantive and are not potential ARARs. However, if it is determined that areas to be disturbed during the response action are potentially eligible for the National Natural Historic Landmark Program, the State Historic Preservation Officer should be contacted.

The areas to be disturbed during the remedial action at IRP Site 74 are not potentially eligible for the National Register of Historic Places. Therefore, the Historic Sites, Buildings and Antiquities Act is not a potential ARAR for this remedial action.

3.2.1.4 Archaeological Resources Protection Act of 1979

Public Law (Pub. L. No.) 96-95 (16 U.S.C. § 470aa–470mm) was enacted in 1979 and amended in 1988 and applies to all lands to which the fee title is held by the United States. The purpose of this statute is to provide for the protection of archaeological resources on federal and Indian lands. The act prohibits unauthorized excavation, removal, damage, alteration, or defacement of archaeological resources located on public lands unless such activity is pursuant to a permit issued under Section 470cc.

The DON performed a site-specific archaeological resources survey in 1997 and no significant findings were reported for IRP Site 74 (Clevanger, 1997). Therefore, the Archaeological Resources Protection Act of 1979 is not a potential ARAR for this remedial action.

3.2.2 Wetlands Protection and Floodplains Management ARARs

The area in IRP Site 74 is within a potential floodplain. Remedial action alternatives that restore the site to its original condition will not adversely affect the location. Other alternatives may have the potential to affect the site. A portion of the site is located within a wetland; therefore, the remediation contractor will include the substantive requirements of typical ACOE 404 permits in their construction activities to prevent degradation or damage to the adjacent wetland areas.

An evaluation of the following requirements has been conducted for IRP Site 74:

- Executive Order No. 11990, Protection of Wetlands
- Executive Order No. 11988, Floodplain Management
- CWA, Section 404, 33 U.S.C. § 1344
- RCRA (42 U.S.C. §§ 6901–6991[i]), Cal. Code Regs. tit. 22, § 66264.18(b)

3.2.2.1 Federal

Protection of Wetlands, Executive Order No. 11990

Exec. Order No. 11990 requires that federal agencies minimize the destruction, loss, or degradation of wetlands; preserve and enhance the natural and beneficial value of wetlands; and avoid support of new construction in wetlands if a practicable alternative exists.

Portions of IRP Site 74 meet the definition of "wetland." Substantive provisions of Exec. Order No. 11990 are potentially relevant and appropriate requirements for this remedial action.

Floodplain Management, Executive Order No. 11988

Executive Order 11988 requires federal agencies to evaluate the potential effects of action they may take in a floodplain; avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain.; and, implement acceptable floodproofing and other flood protection measures for the construction of new structures or facilities in a floodplain.

The area in IRP Site 74 is located within a potential floodplain. Substantive provisions of Executive Order No. 11988 are potentially relevant and appropriate requirements for this remedial action. The capping alternative will need to be constructed to comply with the floodplain management substantive provisions.

Clean Water Act (33 U.S.C. § 1344)

Section 404 of the CWA of 1977 governs the discharge of dredged and fill material into waters of the United States, including adjacent wetlands. Wetlands are areas that are inundated by water frequently enough to support vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mudflats, natural ponds and similar areas. Both the U.S. EPA and the U.S. Army Corps of Engineers have jurisdiction over wetlands. U.S. EPA's Section 404 guidelines are promulgated in 40 C.F.R. § 230, and the U.S. Army Corps of Engineers' guidelines are promulgated in 33 C.F.R. § 320.

Discharge of dredged or fill material to a wetland is included in some remedial action alternatives for IRP Site 74. The substantive provisions at 33 U.S.C. § 1344 are potentially applicable for the IRP Site 74 remedial action. Further discussion of the 40 C.F.R. §230 and 33 C.F.R. §320 requirements are included in the action-specific ARARs discussion in Section 4.

Resource Conservation and Recovery Act (33 U.S.C. §§ 6901–6991[i])

Under Cal. Code Regs. tit. 22, § 66264.18(b), any hazardous waste facility located in a 100-year floodplain or within the maximum high tide must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood or maximum high tide, unless the owner or operator can demonstrate that procedures are in effect that will cause the waste to be removed safely, before flood or tidewater can reach the facility.

The IRP Site 74 remedial action includes construction of a cap as one of the alternatives. The substantive provisions at Cal. Code Regs. tit. 22, § 66264.18(b) are potentially relevant and appropriate for the capping alternative.

3.2.2.2 State

The state RCRA requirements for floodplains are evaluated above as potential federal ARARs.

Fish and Game Commission Wetlands Policy

California Fish and Game Commission Wetland Policy (adopted 1987) included in Cal. Fish and Game Code Addenda was included in the state's identification of ARARs as discussed in Section 1.2.3. However, the Fish and Game Commission Wetlands Policy is not a regulation and was suggested as a TBC requirement. Because adequate ARARs have been identified for the protection of wetlands, no TBC requirement is necessary for this remedial action.

3.2.3 Hydrologic Resources ARARs

For some remedial action alternatives, there is the potential to affect hydrologic resources at the site. In addition to the wetland ARARs discussed in Section 3.1.2, there are potential hydrologic ARARs for IRP Site 74.

An evaluation of the following requirements has been conducted:

- Wild and Scenic Rivers Act (substantive provisions of 16 U.S.C. §§ 1271-1287
- Fish and Wildlife Coordination Act (substantive provisions of 16 U.S.C. §§ 661-666c and/or
- Rivers and Harbor Act of 1989 (substantive provisions of 33 U.S.C. §§ 401-413

3.2.3.1 Federal

Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act (WSRA) (16 U.S.C. §§ 1271–1287) establishes requirements applicable to water resource projects affecting wild, scenic, or recreational rivers within the National Wild and Scenic Rivers System, as well as rivers designated on the National Rivers Inventory to be studied for inclusion on the national system. In accordance with Section 7 of the act, a federal agency may not assist, through grant, loan, license, or otherwise, the construction of a water resources project that would have a direct and adverse effect on the free-flowing, scenic, and natural values for which a river on the national system or a study river on the National Rivers Inventory was established. The act also covers indirect effects from construction of water resources projects below or above rivers or their tributaries that are in the national system or under study on the National Rivers Inventory, such as a dam on a tributary and construction or development on adjacent shorelines. Adverse impacts must be mitigated, and coordination may be required with the National Park Service and Department of Agriculture.

No wild, scenic, or recreational rivers are located at or in the vicinity of IRP Site 74.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 U.S.C. §§ 661–666c) was enacted to protect fish and wildlife when federal actions result in the control or structural modification of a natural stream or body of water. The statute requires federal agencies to take into consideration the effect a water-related project would have on fish and wildlife and take action to prevent loss or damage to these resources.

Some remedial action alternatives for IRP Site 74 may modify a stream or other water body and may affect fish or wildlife. Consultation requirements are procedural and not potential ARARs for CERCLA actions. The substantive provisions of 16 U.S.C. §§ 661–666c for prevention, mitigation, and compensation are potentially applicable for remedial action alternatives that include work in the wetlands.

Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act of 1899 prohibits the creation of any obstruction not authorized by Congress to the navigable capacity of any of the waters of the United States (33 U.S.C. §§ 401–413). It prohibits construction of wharves, piers, booms, weirs, breakwaters, bulkheads, jetties, or other structures in a port unless the construction is approved by the U.S. Army Corps of Engineers. In addition, excavation or filling of any port, harbor, channel, lake, or any navigable water is prohibited without authorization. Section 10 permits are required for these activities. Section 10 permits cover construction, excavation, or deposition of materials in, over, or under navigable waters, or any work that would affect the course, location, condition, or capacity of those waters.

IRP Site 74 is not located on or in the immediate vicinity of navigable waters. Therefore, the Rivers and Harbors Act of 1889 is not a potential ARAR.

3.2.3.2 State

No additional state requirements were identified as state ARARs for hydrologic resources.

3.2.4 Biological Resources ARARs

A portion of IRP Site 74 is located within a National Wildlife Refuge area. The remedial action could potentially disturb endangered species and breeding of migratory birds. Overall, the remedial action is expected to mitigate potential threats to endangered species.

An evaluation of the following requirements was conducted for the site:

- Endangered Species Act of 1973 (substantive provisions of 16 U.S.C. §§ 1531–1543)
- Migratory Bird Treaty Act of 1972 (substantive provisions of 16 U.S.C. §§ 703–712)
- Marine Mammal Protection Act (substantive provisions of 16 U.S.C. §§ 1361–1421h)
- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801–1882)
- National Wildlife Refuge System Administration Act of 1996 (16 U.S.C. § 668dd–668ee, substantive provisions of 50 C.F.R. § 27.11–27.97)

- Wilderness Act (16 U.S.C. §§ 1131–1136, 50 C.F.R. § 35.1–35.14)
- California Endangered Species Act (Cal. Fish and Game Code, ch. 1.5, §§ 2050–2116)

3.2.4.1 Federal

Endangered Species Act of 1973

The Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531–1543) provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction. The ESA defines an endangered species and provides for the designation of critical habitats. Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. Under Section 7(a) of the ESA, federal agencies must carry out conservation programs for listed species. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented. Consultation regulations at 50 C.F.R. § 402 are administrative in nature and are therefore not ARARs. As discussed in Section 2 of the FS, species of birds known to be resident or migrants at NAVWPNSTA Seal Beach that are federally listed, as threatened or endangered include the Western snowy plover (*Charadrius alexandrinus nivosus*) (threatened), the California least tern (*Sterna antillarum browni*) (endangered), and the light-footed clapper rail (*Rallus longirostris obsoletus*) (endangered). Because of the rapidly disappearing habitat on the coast of Southern California, two species of federally listed endangered birds, the California least tern and the light-footed clapper rail, rely on the Seal Beach NWR tidal salt marsh habitat for their nesting grounds.

Because federally listed endangered and threatened species are known to use IRP Site 74, the substantive provisions of the ESA at 16 U.S.C. §§ 1531–1543 are potentially applicable for this FS. The remedial action alternatives are expected to mitigate potential threats to endangered species.

Migratory Bird Treaty Act of 1972

The Migratory Bird Treaty Act (16 U.S.C. §§ 703–712) prohibits at any time, using any means or manner, the pursuit, hunting, capturing, and killing or attempting to take, capture, or kill any migratory bird. This act also prohibits the possession, sale, export, and import of any migratory bird or any part of a migratory bird, as well as nests and eggs. A list of migratory birds for which this requirement applies is found at 50 C.F.R. § 10.13.

It is the DON's position that this act is not legally applicable to DON actions; however, Executive Order No. 13186 (dated 10 January 2001) requires each federal agency taking actions that have or are likely to have a measurable effect on migratory bird populations to develop and implement, within 2 years, a memorandum of understanding (MOU) with the United States Fish and Wildlife Service (USFWS) to promote the conservation of such populations. The DoD and the USFWS are in the process of negotiating this MOU. In the meantime, the Migratory Bird Treaty Act will continue to be evaluated as a potentially relevant and appropriate requirement for DON CERCLA response actions.

Migratory birds have been observed at NAVWPNSTA Seal Beach, and therefore, substantive provisions of the Migratory Bird Treaty Act at 16 U.S.C. § 703 are relevant and appropriate for this remedial action. Measures will be taken to protect migratory birds during the remedial action.

Marine Mammal Protection Act

The Marine Mammal Protection Act (16 U.S.C. §§ 1361–1421h) prohibits the taking of a marine mammal on the high seas or in a harbor or other place under the jurisdiction of the United States. It prohibits the possession, transport, and sale of a mammal or marine mammal product, unless authorized under law. The prohibitions that are potentially pertinent to CERCLA actions are at 16 U.S.C. § 1372(a)(2).

IRP Site 74 is located where marine mammals are not present. Therefore, the Marine mammal Protection Act is not a potential ARAR.

Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended

The purpose of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801–1882) is to conserve and manage the fishery resources found off the coasts of the United States, the anadromous species, and the continental shelf fishery resources of the United States. It establishes a fishery conservation zone within which the United States has exclusive fishery management prerogatives.

IRP Site 74 is located inland. Remedial action will have no impact on potential fisheries.

National Wildlife Refuge System Administration Act of 1966

The National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd–668ee) and its implementing regulations at 50 C.F.R. §§ 25–37 establish wildlife refuges that are maintained for the primary purpose of developing a national program of wildlife and ecological conservation and rehabilitation. These refuges are established for the restoration, preservation, development, and management of wildlife and wild land habitats; protection and preservation of endangered or threatened species and their habitats; and management of wildlife and wild lands to obtain the maximum benefit from these resources.

The National Wildlife Refuge System Administration Act contains the following substantive requirements that are potential ARARs. The act prohibits any person from disturbing, injuring, cutting, burning, removing, destroying, or possessing any property within any area of a wildlife refuge. The act also prohibits the taking or possessing of any fish, bird, mammal or other wild vertebrate or invertebrate animals, or nest or eggs within any refuge area or otherwise occupying any such area unless such activities are done with a permit or permitted by express provision of law. The act also regulates the use of audio equipment as well as motorized vehicles, aircraft, and boats in wildlife refuges. It prohibits construction activities, disposal of waste, and the introduction of plants and animals into any wildlife refuge. The prohibitions under the act are codified at 50 C.F.R. § 27. These prohibited acts are allowed if determined to be compatible with the mission or purpose of the national wildlife refuge. Substantive provisions for determining compatibility are at 50 C.F.R. § 26.41(a)(10) and (c). Compatibility is based on whether a "use" will materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge. The National Wildlife Refuge System mission is the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. A use may be made compatible by a design that adopts appropriate measures to avoid resource impacts and includes provisions to ensure no net loss of habitat quantity and quality. A portion of IRP Site 74 extends into the eastern part of the Seal Beach National Wildlife Refuge. Therefore, the substantive provisions at 50 C.F.R. §§ 25–37 are potentially applicable for the IRP Site 74 Remedial action.

The CERCLA remedial action alternatives that propose entrance and disturbance of the National Wildlife Refuge are consistent (compatible) with the mission of the National Wildlife Refuge System. The remedial action is designed to restore the wildlife resources and their habitats. The remedial action alternatives include measures to avoid resource impacts and provisions to ensure no net loss of habitat quantity and quality.

Wilderness Act

The Wilderness Act (16 U.S.C. § 1131) and its accompanying implementing regulations (50 C.F.R. § 35.1–35.14) create the National Wilderness Preservation System. The intent of the law is to administer and manage units of this system (i.e., wilderness areas) in order to preserve their wilderness character and to leave them unimpaired for future use as wilderness.

NAVWPNSTA Seal Beach and IRP Site 74 are not located in a federally owned wilderness area; therefore, the Wilderness Act is not a potential ARAR.

3.2.4.2 State

The following sections of the Cal. Fish and Game Code and Cal. Code Regs. tit. 14 div. 1 have been identified by the state as potential ARARs:

- Cal. Fish and Game Code §§1908, 2080, 3511, 4700, and 5050
- Cal. Fish and Game Code §§3800, 4002, 4150, 8500 and Cal Code Regs. tit. 14, §40
- Cal. Fish and Game Code 3503.5
- Cal. Fish and Game Code §§3005 and 3503, and Cal. Code Regs. tit. 14, §§460 and 465
- Cal. Fish and Game Code §5650(a), (b), and (f)

Cal. Fish and Game Code §§1908, 2080, 3511, 4700, and 5050

Cal. Fish and Game Code § 4700 states that fully protected mammals or parts thereof may not be taken or possessed at any time. Fully protected mammals include: Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*); bighorn sheep (*Ovis canadensis*), except Nelson bighorn sheep (ss. *Ovis canadensis nelsoni*); northern elephant seal (*Mirounga angustirostris*); Guadalupe fur seal (*Arctocephalus townsendi*); ring-tailed cat (genus *Bassariscus*); Pacific right whale (*Eubalaena sieboldi*); salt-marsh harvest mouse (*Reithrodontomys raviventris*); southern sea otter (*Enhydra lutris nereis*); and wolverine (*Gulo luscus*).

Cal. Fish and Game Code § 5050 states that fully protected reptiles and amphibians or parts thereof may not be taken or possessed at any time. Fully protected reptiles and amphibians include: blunt-nosed leopard lizard (*Crotaphytus wislizenii silus*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*), limestone salamander (*Hydromantes brunus*), and black toad (*Bufo boreas exsul*).

Cal. Fish and Game Code §§4700 and 5050 are not potential ARARs because fully protected mammal and amphibian species are not known or suspected to be present at the site.

As discussed in Section 1.2.8 of the FS, species of birds that are state listed include the western snowy plover (*Charadrius alexandrinus nivosus*) (threatened), the California least tern (*Sterna antillarum browni*) (endangered), the Belding's savannah sparrow *(Passerculus sandwichensis beldingi*) (endangered), the light-footed clapper rail (*Rallus longirostris obsoletus*) (endangered), green sea turtle (Chelonia mydas) (threatened), and southern sea otter (Enhydra lutris nereis) (endangered).

Cal. Fish and Game Code § 1908 states, "No person shall import into this state, or take, possess, or sell within this state, except as incident to the possession or sale of the real property on which the plant is growing, any native plant, or any part or product thereof, that the commission determines to be an endangered native plant or rare native plant." Cal. Fish and Game Code § 1901 defines "native plant" as a plant growing in a wild uncultivated state that is normally found native to the plant life of this state. A species, subspecies, or variety is endangered when its prospects of survival and reproduction are in immediate jeopardy from one or more causes. A species, subspecies, or variety is rare when, although not presently threatened with extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens.

The California Endangered Species Act is set forth in the Cal. Fish and Game Code §§ 2050-2116. The substantive provisions in Cal. Fish and Game Code § 2080 prohibit the "take" of California endangered or threatened species. "Take" is defined in Cal. Fish and Game Code § 86 as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

Cal. Fish and Game Code §2081(b): This section states that the department may authorize, by permit, the take of endangered species, threatened species, and candidate species if the take is incidental to an otherwise lawful activity and the impacts are minimized and fully mitigated. Pursuant to CERCLA Section 121 (e) (42 USC Section 9621 [e]), onsite response actions are exempt from permit requirements. The substantive provisions of this requirement are potentially relevant and appropriate

Cal. Fish and Game Code § 3511: This section states that fully protected birds or parts thereof may not be taken or possessed at any time. The list of fully protected birds includes: American peregrine falcon (*Falco peregrinus anatum*), brown pelican, California black rail (*Laterallus jamaicensis coturniculus*), California clapper rail (*Rallus longirostris obsoletus*), California condor (*Gymnogyps californianus*), California least tern (*Sterna albifrons browni*), golden eagle, greater sandhill crane (*Grus canadensis tabida*), light-footed clapper rail (*Rallus longirostris levipes*), southern bald eagle (*Haliaeetus leucocephalus leucocephalus*), trumpeter swan (*Cygnus buccinator*), white-tailed kite (*Elanus leucurus*), and Yuma clapper rail (*Rallus longirostris yumanensis*).

Cal. Fish and Game Code §§1908, 2080, and 3511, are not applicable because the United States of America has not waived sovereign immunity in the federal Endangered Species Act for this State of California requirement. As discussed above, there are state listed endangered, threatened and fully protected bird species potentially at the site. There are rare native plant species on the base and may also potentially be located at the site. The substantive provisions of Cal. Fish and Game Code §§1908, 2080, and 3511 meet the pertinent NCP criteria under 40 C.F.R. § 300.400(g)(2)(vii) and are “relevant and appropriate” because endangered, threatened, rare and fully protected species may be present at the site and protection of these vulnerable resources allow them to be “used” in the sense that they continue to provide unique value to the State of California.

The DON accepts Fish and Game Code Section §§1908, 2080, and 3511 as a state ARAR subject to the following conditions. The State of California, through DFG-OSPR, concurs that this statute addresses prohibited conduct but does not provide for or prescribe affirmative measures to avoid a "taking." Notwithstanding the absence of specific affirmative measures in the statute, the DON will implement reasonable measures to ensure adequate protection of ecological receptors during response action construction following issuance of a CERCLA decision document pursuant to the DON’s obligations under CERCLA to select removal or remedial actions that are protective of human health and the environment (see Section 121(b)(1) of CERCLA). The DON will coordinate with the State, through DFG-OSPR, prior to implementation of such reasonable measures. The DON understands that the State reserves the right to conduct periodic site visits during removal or remedial activities to confirm implementation of avoidance measures.

Cal. Fish and Game Code §§3800, 4002, 4150, 8500 and Cal Code Regs. Tit. 14, §40

The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR (See Attachment A-2).

Cal. Fish and Game Code 3503.5

Cal. Fish and Game Code § 3503.5 prohibits the take, possession, or destruction of any birds in the orders of Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nests or eggs of such birds. The State has withdrawn its previous identification of this requirement as a state ARAR in light of DON’s identification of the substantive provisions of the Migratory Bird Treaty Act (MBTA) as a ‘relevant and appropriate’ federal ARAR for this action.

Cal. Fish and Game Code §§3005 and 3503, and Cal. Code Regs. Tit. 14, §§460 and 465

Cal. Fish and Game Code §§3005 and 3503, and Cal. Code regs. Tit. 14, §§460 and 465 are not applicable because the United States of America has not waived sovereign immunity in the federal Endangered Species Act for these State of California requirements. Pursuant to 40 C.F.R. § 300.400(g)(2) of the NCP, the Navy has determined that these requirements are not “relevant and appropriate” because they do not address problems or situations sufficiently similar to the circumstances of the release or CERCLA response action and are not well-suited to the site based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP. CERCLA response actions are intended to respond to releases of hazardous substances in order to protect human health and the environment including environmental receptors. In contrast, the purpose of these State requirements are to regulate and set forth conditions for the “taking” of the species addressed by those requirements. Moreover, that purpose is achieved through the regulation of intentional conduct directed at the species as opposed to incidental “take” (or possession, etc.) of species in the course of lawful activity such as CERCLA remedial action. The focus on intentional conduct is not well-suited to the circumstances at CERCLA sites. In summary, the purposes of these State requirements and the actions that they regulate do not include responding to releases of hazardous substances. Therefore, they are not “relevant and appropriate” based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP.

Although these requirements are not ARARs, the Navy will coordinate with other natural resource trustees throughout the CERCLA remedial action process. The DON’s ecological risk assessment process takes into account representative environmental receptors for the site and final remediation/cleanup goals will ensure that they are adequately protected from exposure to CERCLA hazardous stances that present unacceptable risk. In addition, any species that are present and are federal and/or state endangered, threatened, or fully protected species will be addressed by ARARs related to those designations.

For a more detailed explanation of the positions set forth above, see letter in Attachment A-2.

Cal. Fish and Game Code §5650(a), (b), and (f)

IRP Site 74Cal. Fish and Game Code § 5650(a) and (b) prohibit depositing or placing, where it can pass into waters of the state, any petroleum products, factory refuse, sawdust, shavings, slabs or edgings, and any substance deleterious to fish, plant life, or bird life. Section 5650(b) of the Cal. Fish and Game Code states that this section does not apply to a discharge or a release that is expressly authorized pursuant to, and in compliance with, the terms and conditions of a waste discharge requirement pursuant to Cal. Water Code § 13263 or a waiver issued pursuant to Cal. Water Code § 13269, subdiv. (a), issued by the SWRCB or RWQCB after a public hearing, or that is expressly authorized pursuant to, and in compliance with, the terms and conditions of a federal permit for which the SWRCB or RWQCB has, after a public hearing, issued a water quality certification pursuant to Cal. Water Code § 13160.

Cal. Fish and Game Code § 5650(a) and (b) are potentially relevant and appropriate for this FS because there is potential during the remedial action for deleterious substance to be placed where they could pass into the waters. Measures will be taken to prevent such passage.

Cal. Fish and Game Code § 5650(f) is not a substantive provision and is not pertinent to this FS. Therefore, Cal. Fish and Game Code § 5650(f) is not a potential ARAR.

3.2.5 Coastal Resources ARARs

Although IRP Site 74 is located within a coastal zone area, the DON does not view the procedure of preparing a formal coastal consistency document and seeking California Coastal Commission concurrence as a valid ARAR. This is based on the Federal Consistency Branch of the California Coastal Commission advisory that federal “land” be exempt from obtaining a “consistency determination.”

3.2.5.1 Federal

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) (16 U.S.C. §§ 1451–1464) specifically excludes federal lands from the coastal zone (16 U.S.C. § 1453[1]). Therefore, the CZMA is not potentially applicable to IRP Site 74. The CZMA will be evaluated as a potentially relevant and appropriate requirement. Section 1456(a)(1)(A) requires each federal agency activity within or outside the coastal zone that affects any land or water use or natural resource to conduct its activities in a manner that is consistent to the maximum extent practicable with enforceable policies of approved state management policies. A state coastal zone management program is developed under state law guided by the CZMA and its accompanying implementing regulations in 15 C.F.R. § 930. A state program sets forth objectives, policies, and standards to guide public and private uses of lands and water in the coastal zone.

IRP Site 74 is within the Coastal Zone and therefore, the substantive provisions of 16 U.S.C. § 1456(c) and 15 C.F.R. § 930 are potentially relevant and appropriate. This FS documents the equivalent of a consistency determination including a detailed description of the remedial action, its associated facilities and coastal zone effects; a brief statement on how the remedial action, to the maximum extent practicable, is consistent with the state coastal zone management plan; and data to support the determination. The remedial action alternatives have been designed to comply with the ARARs and are consistent with the California Coastal Zone Program to the maximum extent practicable.

3.2.5.2 State

No state requirements were identified for the Coastal Zone as ARARs for this FS.

3.2.6 Geologic Characteristics ARARs

The areas to be disturbed during the remedial action at IRP Site 74 do not have any associated geologic characteristic ARARs.

3.2.6.1 Federal

Resource Conservation and Recovery Act (33 U.S.C. §§ 6901–6991[i])

Hazardous waste facilities must be sited in accordance with the following requirements:

- Seismic considerations (Cal. Code Regs. tit. 22, § 66264.18(a) – portions of new facilities or facilities undergoing substantial modification where transfer, treatment, storage or disposal of hazardous waste will be conducted shall not be located within 61 meters (200 feet) of a fault that has had displacement in Holocene time.

- Salt dome formations, salt bed formations, underground mines and caves (Cal. Code Regs. tit. 22, § 66264.18[c]) – the placement of any noncontainerized or bulk liquid hazardous waste in any salt dome formation, salt bed formation, or underground mine or cave is prohibited.

IRP Site 74 is not located within 61 meters of a Holocene fault and no discharge is proposed to a salt dome formation, salt bed formation, or underground mines or caves. Therefore, the requirements at Cal. Code Regs. tit. 22, § 66264.18(a) and § 66264.18(c) are not potential ARARs for this response action.

3.2.6.2 State

The state location-specific RCRA requirements for geologic characteristics are evaluated above as potential federal ARARs.

TABLE A3-1
Potential Federal Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
National Historic Preservation Act of 1966, as Amended (16 U.S.C. § 470–470x-6)[b]					
Historic project owned or controlled by federal agency	Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	Property included in or eligible for the National Register of Historic Places.	16 U.S.C. § 470–470x-6 36 C.F.R. pt. 800	Not an ARAR	The areas to be disturbed during the response action at IRP Site 74 are not potentially eligible for the National Register of Historic Places. No designated historic sites are located on or adjacent to IRP Site 74 (Clevanger, 1997).
Archaeological and Historic Preservation Act (16 U.S.C. § 469–469c-1)[b]					
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Construction on previously undisturbed land would require an archaeological survey of the area. Data recovery and preservation would be required if significant archaeological or historical data were found onsite. The responsible official or Secretary of the Interior is authorized to undertake data recovery and preservation.	Regulated alteration of terrain caused as a result of a federal construction project or federally licensed activity or program where action may cause irreparable harm, loss, or destruction of significant artifacts.	16 U.S.C. § 469–469c-1)	Not an ARAR	The area of the remedial action is not anticipated to contain any significant, prehistoric, historic, or archaeological data. The DON performed an archaeological resources survey and no significant findings were reported for IRP Site 74 (Clevanger, 1997).
Historic Sites, Buildings, and Antiquities Act of 1935 (16 U.S.C. §§ 461–467)[b]					
Historic sites	Avoid undesirable impacts on landmarks.	Areas designated as historic sites.	16 U.S.C. §§ 461–467	Not an ARAR	The areas to be disturbed during the remedial action are not potentially eligible for the National Register of Historic Places. No designated historic sites are located on or adjacent to IRP Site 74 (Clevanger, 1997).
Archaeological Resources Protection Act of 1979, as Amended (16 U.S.C. § 470aa–470mm)[b]					
Archaeological resources on federal land	Prohibits unauthorized excavation, removal, damage, alteration, or defacement of	Archaeological resources on federal land.	Pub. L. No. 96-95 16 U.S.C. § 470aa–470mm	Not an ARAR	The area of the remedial action is not anticipated to contain any significant, prehistoric, historic, or archaeological data. The DON performed an

TABLE A3-1
Potential Federal Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
	archaeological resources located on public lands unless such action is conducted pursuant to a permit.				archaeological resources survey and no significant findings were reported for IRP Site 74 (Clevanger, 1997).
Exec. Order No. 11990, Protection of Wetlands[b]					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland meeting definition of Section 7.	Exec. Order No. 11990	Relevant and appropriate	A portion of IRP Site 74 is located within wetlands and extends into the Seal Beach National Wildlife Refuge's tidal saltmarsh. Substantive provisions are potentially applicable to the proposed remedial action. Under Section 404 of the CWA, the USACE is responsible for managing wetland resources associated with waters of the United States. To conduct construction activities within jurisdictional wetlands, a permit from USACE is typically required. The limit of USACE jurisdictional authority under Section 404 of the CWA is identified as "waters of the United States." Under the NCP, however, CERCLA remedial actions are only required to comply with the substantive requirements of a regulation (permit conditions); the administrative function of obtaining an actual permit is not required.
Clean Water Act of 1977, as Amended, Section 404 (33 U.S.C. § 1344)[b]					
Wetland	Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Exec. Order No. 11990 Section 7.	33 U.S.C. § 1344	Applicable	Although no permit is required under CERCLA, substantive provisions are potentially applicable for the discharge of dredged or fill material to a wetland. See Section 4 for more discussion of discharge of fill requirements.

TABLE A3-1
Potential Federal Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Exec. Order No. 11988, Floodplain Management[b]					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain (i.e., lowlands) and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	Exec. Order No. 11988	Relevant and appropriate	Potentially relevant and appropriate for action within the floodplain.
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])[b]					
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.18(b)	Relevant and appropriate	Potentially relevant and appropriate for the cap alternative.
Wild and Scenic Rivers Act (16 U.S.C. §§ 1271–1287)[b]					
Within area affecting national wild, scenic, or recreational river	Avoid taking or assisting in action that will have direct adverse effect on scenic river.	Activities that affect or may affect any of the rivers specified in 16 U.S.C. §1276(a).	16 U.S.C. §§ 1271–1287	Not an ARAR	No wild, scenic, or recreational rivers are located at or in the vicinity of IRP Site 74.
Fish and Wildlife Coordination Act (16 U.S.C. §§ 661–666c)[b]					
Area affecting stream or other water body	Action taken should protect fish or wildlife.	Diversion, channeling, or other activity that modifies a stream or other water body and affects fish or wildlife.	16 U.S.C. § 662	Applicable	Substantive provisions to protect fish and wildlife are potentially applicable. Consultation requirements are procedural and not potential ARARs for CERCLA actions. However, regulatory agency (i.e. Fish and Wildlife Service) input is included through the CERCLA document and public review process.
Rivers and Harbors Act of 1899 (33 U.S.C. §§ 401–413)[b]					
Navigable waters	Permits required for structures or work in or affecting navigable waters.	Activities affecting navigable waters.	33 U.S.C. § 403 33 C.F.R. § 322	Not an ARAR	IRP Site 74 is not located on or in the immediate vicinity of navigable waters.

TABLE A3-1
Potential Federal Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Endangered Species Act of 1973 (16 U.S.C. §§ 1531–1543)[b]					
Habitat upon which endangered species or threatened species depend	Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented.	Determination of effect upon endangered or threatened species or its habitat. Critical habitat upon which endangered species or threatened species depend.	16 U.S.C. §§ 1531 - 1543	Applicable	Substantive provisions are potentially applicable for federally-listed endangered species that are known to inhabit NAVWPNSTA Seal Beach, the Seal Beach NWR, and its associated wetlands. The results of past ecological assessments indicate there is a potential threat to endangered species from soil and sediment at IRP Site 74. The remedial action is expected to mitigate potential threats to endangered species.
Migratory Bird Treaty Act of 1972 (16 U.S.C. §§ 703–712)[b]					
Migratory bird area	Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds.	16 U.S.C. § 703	Relevant and appropriate	Not applicable, as the DON does not accept this act as legally applicable to DON actions. Substantive provisions are potentially relevant and appropriate, as migratory birds have been observed at NAVWPNSTA Seal Beach.
Marine Mammal Protection Act (16 U.S.C. §§ 1361–1421h)[b]					
Marine mammal area	Protects any marine mammal in the U.S. except as provided by international treaties from unregulated "take."	Presence of marine mammals.	16 U.S.C. § 1372(a)(2)	Not an ARAR	IRP Site 74 is located inland and, therefore, marine mammals are not present.

TABLE A3-1
Potential Federal Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Magnuson-Stevens Fishery Conservation and Management Act of 1976, as Amended (16 U.S.C. §§ 1801–1882)[b]					
Fishery under management	Provides for conservation and management of specified fisheries within specified fishery conservation zones.	Presence of managed fisheries.	16 U.S.C. §§ 1801–1882	Not an ARAR	The remedial action will have no impact on potential fisheries.
National Wildlife Refuge System Administration Act of 1996 (16 U.S.C. § 668dd–668ee)[b]					
Wildlife refuge	No person shall take any animal or plant on any national wildlife refuge, except as authorized under 50 C.F.R. § 27.51. The disposing or dumping of wastes is prohibited.	Area designated as part of National Wildlife Refuge System.	16 U.S.C § 668dd–668ee Substantive provisions of 50 C.F.R. §§ 25-27	Applicable	Substantive provisions are potentially applicable for the remedial action alternatives that involve work at the wetlands portion of the site, which is located inside the NWR. These alternatives would include disturbance of the NWR. These remedial action alternatives are designed to restore the NWR resources. Restoration of the affected wetlands or construction of new wetlands would be included in these alternatives. These alternatives will be compatible with the mission of the NWR system.
Wilderness Act (16 U.S.C. §§ 1131–1136)[b]					
Wilderness area	Area must be administered in such a manner as will leave it unimpaired as wilderness and preserve its wilderness character.	Federally owned area designated as wilderness area.	16 U.S.C. §§ 1131–1136 50 C.F.R. §§ 35.1–35.14	Not an ARAR	NAVWPNSTA Seal Beach and IRP Site 74 are not located in a federally owned wilderness area.

TABLE A3-1
Potential Federal Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])[b]					
Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage, or disposal of hazardous waste prohibited.	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.18(a)	Not an ARAR	The IRP Site 74 remedial action does not involve construction or substantial modification of a new TSD facility within 61 meters of a fault displaced in Holocene time.
Within salt dome formation, underground mine, or cave	Placement of noncontainerized or bulk liquid hazardous waste prohibited.	RCRA hazardous waste; placement.	Cal. Code Regs. tit. 22, § 66264.18(c)	Not an ARAR	IRP Site 74 contains no salt domes, mines, or caves.
Coastal Zone Management Act (16 U.S.C. §§ 1451–1464)[b]					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs.	Activities affecting the coastal zone including lands thereunder and adjacent shore land.	16 U.S.C. § 1456(c) 15 C.F.R. § 930	Not an ARAR	The Coastal Zone Management Act (Section 307[c] of 16 U.S.C.) and 15 C.F.R. 930 and 923.45, require a federal agency typically to conduct activities within a “coastal zone” in a manner consistent with approved state management programs, in this case the California Coastal Act. However, the Federal Consistency Branch of the California Coastal Commission (CCC) advised that federal “land” is exempt from obtaining a “consistency determination.” This direction is consistent with Section 304 of this Act, which states that, “Excluded from the coastal zone are 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 …” The DON does not view the procedure of preparing a formal coastal consistency document and seeking CCC concurrence as a valid ARAR. As a result of the above information received from the CCC, it is not likely that a consistency determination will be required.

Notes:

[a] Only the substantive provisions of the requirements cited in this table are potential ARARs.

[b] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the DON accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARAR – applicable or relevant and appropriate requirement
CCC – California Coastal Commission
Cal. Code Regs. – California Code of Regulations
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – Code of Federal Regulations
CWA – Clean Water Act
DON – Department of the Navy
Exec. Order No. – executive order number
FEMA – Federal Emergency Management Agency
FS – Feasibility Study
NAVWPNSTA – Naval Weapons Station
NCP – National Contingency Plan
NWR – National Wildlife Refuge
Pub. L. No. – public law number
RCRA – Resource Conservation and Recovery Act
§ – section
TSD – treatment, storage, and disposal
U.S. – United States
USACE – U.S. Army Corps of Engineers
U.S.C. – United States Code
USFWS – U.S. Fish and Wildlife Service

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TABLE A3-2
Potential State and Local Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
California Endangered Species Act (Cal. Fish and Game Code §§ 2050–2116)[b]					
Endangered species habitat	No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	Threatened or endangered species determination on or before 01 January 1985 or a candidate species with proper notification.	Cal. Fish and Game Code § 2080	Relevant and Appropriate	Substantive provisions of this requirement are potentially relevant and appropriate. State-listed endangered or threatened species are known to inhabit NAVWPNSTA Seal Beach, the Seal Beach NWR, and its associated wetlands. The species known in the area are protected under Cal. Fish and Game Code § 2080. The remedial action is expected to mitigate potential threats to endangered species.
Area used by endangered, threatened species	The department may authorize, by permit, the take of endangered species, threatened species, and candidate species if the take is incidental to an otherwise lawful activity and the impacts are minimized and fully mitigated.	Potential for incidental take of endangered, threatened, or candidate species.	Cal. Fish and Game Code §2081(b)	Relevant and appropriate	Pursuant to CERCLA § 121 (e) (42 USC Section 9621 [e]), onsite response actions are exempt from permit requirements. The substantive provisions of this requirement are potentially relevant and appropriate.
California Fish and Game Code[b]					
Aquatic and wildlife species/habitats	Action must be taken if toxic materials are placed where they can enter waters of the State. There can be no releases that would have a deleterious effect on species or habitat.		Cal. Fish and Game Code § 5650 (a) and (b)	Relevant and appropriate	Sediment contaminated with lead and antimony is in contact with surface water at the wetlands portion of IRP Site 74. These metals are not water soluble, and are therefore not expected to be present in the surface water.
Aquatic and wildlife species/habitats	Affirmative defense does not apply when defendant acts willfully.		Cal. Fish and Game Code § 5650(f)	Not an ARAR	Not a substantive requirement that meets definition of potential ARAR.
Wildlife Species	Action must be taken to prohibit the taking of birds and mammals, including the taking by poison.		Cal. Fish and Game Code § 3005	Not an ARAR	The purposes of these State requirements and the actions that they regulate do not include responding to releases of hazardous substances. Therefore, they are not “relevant and appropriate” based upon the pertinent provisions

TABLE A3-2
Potential State and Local Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
					of Subsections 300.400(g)(2)(i) and (iv) of the NCP. Although these requirements are not ARARs, the Navy will coordinate with other natural resource trustees throughout the CERCLA remedial action process. The DON's ecological risk assessment process takes into account representative environmental receptors for the site and final remediation/cleanup goals will ensure that they are adequately protected from exposure to CERCLA hazardous stances that present unacceptable risk. In addition, any species that are present and are federal and/or state endangered, threatened, or fully protected species will be addressed by ARARs related to those designations. See Section 3.2.4.2 for further discussion.
Rare native plants	Action must be taken to conserve native plants, there can be no releases and/or actions that would have a deleterious effect on species or habitat.		Cal. Fish and Game Code § 1908	Relevant and appropriate	Substantive provisions of this requirement are potentially relevant and appropriate. Rare native plants are known to exist within the NWR at the NAVWPNSTA Seal Beach. It is not known whether rare native plants exist within IRP Site 74. If rare native plants are discovered during the remedial action, measures will be taken to conserve them.
California Fish and Game Code[b]					
Fully protected bird species/habitat	Action must be taken to prevent the taking of fully protected birds.		Cal. Fish and Game Code § 3511	Relevant and appropriate	Fully protected bird species are present at IRP Site 74.
Fully protected mammals	Action must be taken to assure that no fully protected mammals are taken or possessed at any time.		Cal. Fish and Game Code § 4700	Not an ARAR	Fully protected mammals are not expected to be present at IRP Site 74.
Fully protected reptiles and amphibians	Actions must be taken to prevent the take or possession of any fully		Cal. Fish and Game Code § 5050	Not an ARAR	Fully protected reptiles and amphibians are not expected to be present at IRP Site 74.

TABLE A3-2
Potential State and Local Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
	protected reptile or amphibian.				
Birds	Action must be taken to avoid the take or destruction of the nest or eggs of any bird.		Cal. Fish and Game Code § 3503	Not an ARAR	The purposes of these State requirements and the actions that they regulate do not include responding to releases of hazardous substances. Therefore, they are not "relevant and appropriate" based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP. Although these requirements are not ARARs, the Navy will coordinate with other natural resource trustees throughout the CERCLA remedial action process. The DON's ecological risk assessment process takes into account representative environmental receptors for the site and final remediation/cleanup goals will ensure that they are adequately protected from exposure to CERCLA hazardous stances that present unacceptable risk. In addition, any species that are present and are federal and/or state endangered, threatened, or fully protected species will be addressed by ARARs related to those designations. See Section 3.2.4.2 for further discussion.
Birds of prey	Action must be taken to prevent the take, possession, or destruction of any birds of prey or their eggs.		Cal. Fish and Game Code § 3503.5	Not an ARAR	The State withdraws its previous identification of this requirement as a potential state ARAR in light of DON's identification of the substantive provisions of the Migratory Bird Treaty Act (MBTA) as a 'relevant and appropriate' federal ARAR for this action.
Furbearing mammals	Action must be taken to avoid take.		Title 14 C.C.R. § 460	Not an ARAR	The purposes of these State requirements and the actions that they regulate do not include responding to releases of hazardous substances. Therefore, they are not "relevant and appropriate" based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP.

TABLE A3-2
Potential State and Local Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
					Although these requirements are not ARARs, the Navy will coordinate with other natural resource trustees throughout the CERCLA remedial action process. The DON's ecological risk assessment process takes into account representative environmental receptors for the site and final remediation/cleanup goals will ensure that they are adequately protected from exposure to CERCLA hazardous stances that present unacceptable risk. In addition, any species that are present and are federal and/or state endangered, threatened, or fully protected species will be addressed by ARARs related to those designations. See Section 3.2.4.2 for further discussion.
Furbearing mammals	Provides methods of take for other furbearing mammals not listed in Title 14 C.C.R. § 460.		Title 14 C.C.R. § 465	Not an ARAR	Other furbearing mammals are not expected to be present at IRP Site 74.
Wetlands	Actions must be taken to assure that there is "no net loss" of wetlands acreage or habitat value. Action must be taken to preserve, protect, restore, and enhance California's wetland acreage and habitat values.		Cal. Fish and Game Commission Wetlands Policy (adopted 1987) included in Fish and Game Code Agenda	Not an ARAR	Not a potential ARAR because it is not a regulation. It was suggested as a TBC. However, there are adequate ARARs identified for wetlands for this remedial action.
California Coastal Act of 1976[b]					
Coast	Regulates activities associated with development to control direct significant impacts on coastal waters and to protect state and national interests in California coastal resources.	Any activity that could affect coastal waters and resources.	Cal. Pub. Res. Code §§ 30000-30900; Cal. Code Regs. tit. 14, §§ 13001–13666.4	Not an ARAR	The California Coastal Act maintains jurisdiction over coastal wetlands and requires activities within such wetlands to be consistent with the Act. The CCC oversees the implementation of the California Coastal Act, and as such typically requires a consistency determination. However, the Federal Consistency Branch of the CCC advised that federal "land" is exempt from obtaining a "consistency determination." This

TABLE A3-2
Potential State and Local Location-specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
					direction is consistent with § 30008 of the Act, which recognizes that certain lands are excluded from the coastal zone by federal law. The DON does not view the procedure of preparing a formal coastal consistency document and seeking CCC concurrence as a valid ARAR. As a result of the above information received from the CCC, it is not likely that a consistency determination will be required.

Note:
[a] Only the substantive provisions of the requirements cited in this table are potential ARARs
[b] Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the DON accepts the entire statutes or policies as potential ARARs; specific potential ARARs follow each general heading; only substantive requirements of the specific citations are considered potential ARARs

ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – California Code of Regulations
Cal. Fish and Game Code – California Fish and Game Code
Cal. Gov't Code – California Government Code
Cal. Pub. Res. Code – California Public Resources Code
CCC – California Coastal Commission
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
COC – chemicals of concern
DON – Department of the Navy
gpd – gallons per day
NAVWPNSTA – Naval Weapons Station
NWR – National Wildlife Refuge
Ppm – parts per million
RWQCB – (California) Regional Water Quality Control Board [Santa Ana]
§ – section
TBC – to be considered
TDS – total dissolved solids
USFWS – U.S. Fish and Wildlife Service

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4.0 Action-specific ARARS

This FS report evaluates remedial action alternatives for IRP Site 74 at NAVWPNSTA Seal Beach. This ARARs analysis is based on four alternatives for the site. Detailed descriptions of the remedial action alternatives are provided in the main text of this FS report (see Section 4).

The IRP Site 74 remedial action alternatives considered for detailed analysis, and for which an ARARs analysis is presented in this appendix, are as follows:

- **Alternative 1:** No action.
- **Alternative 2:** Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
- **Alternative 3:** Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
- **Alternative 4:** Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Tables A4-1 and A4-2 at the end of this section present and evaluate federal and state potential action-specific ARARs for IRP Site 74, respectively. A discussion of the requirements determined to be pertinent to each alternative being evaluated for IRP Site 74 action is presented in this section. A discussion of how the alternative complies with each identified ARAR is also provided.

4.1 Alternative 1

There is no need to identify ARARs for the no action alternative because ARARs apply to “any removal or remedial action conducted entirely on-site” and “no action” is not a removal or remedial action (CERCLA Section 121(e), 42 U.S.C. § 9621[e]). CERCLA § 121 (42 U.S.C. § 9621) cleanup standards for selection of a Superfund remedy, including the requirement to meet ARARs, are not triggered by the no action alternative (U.S. EPA 1991b). Therefore, a discussion of compliance with action-specific ARARs is not appropriate for this alternative.

4.2 Alternative 2

This alternative includes removal of contaminated soil in the upland area and removal of contaminated sediment in the wetland area using standard excavation equipment. The removed soil may be staged or directly hauled off site for treatment and disposal. Saturated sediment removed from the wetland would be dewatered onsite in a sediment drying bed. Once the sediment is dewatered, it will be transported offsite for treatment and disposal. It was assumed the excavated soil and sediment would be solidified/stabilized offsite prior to disposal in a permitted landfill. The excavated areas will be backfilled to pre-existing grade and revegetated.

4.2.1 Excavation and Temporary Storage of Waste

4.2.1.1 Federal ARARs

The following federal ARARs have been identified for the excavation and temporary storage of waste for Alternative 2:

- Onsite waste generation requirements in Cal. Code Regs. tit. 22 §§ 66262.10(a), 66262.11, and 66262.13(a) and (b).
- If, based on the hazardous waste determination described under federal chemical-specific ARARs discussion, wastes are determined to be hazardous under RCRA, substantive requirements of Cal. Code Regs. tit. 22, § 66262.34 (pertaining to hazardous waste accumulation) will be applicable (or relevant and appropriate if waste does not meet the definition of hazardous waste, but is similar to RCRA hazardous waste).
- For storage of hazardous waste in temporary piles, substantive requirements of 40 C.F.R. § 264.554(d)(1)(i-ii)and (d)(2), (e), (f), (h), (i), (j), and (k) are relevant and appropriate. Cal. Code Regs. tit. 22, §66264.258(a (pertaining to the clean closure of staging piles) are relevant and appropriate requirements.
- For the potential use of tanks and piping for dewatering the wetlands, the substantive provisions of the following regulations are relevant and appropriate: Cal. Code Regs. tit. 22, §§ 66264.192(a), (b), (c), (e), (f), and (g) design and installation requirements; 66264.193(b), (c), (d), and (e) and 66264.193(f) for secondary containment of tanks and associated tank systems and ancillary equipment; 66264.194(a) and (b) spill prevention; 66264.195(a), (b), and (c) inspection; 66264.196(b) except (b)(5) and (b)(7) for response to spills and leaks; 66264.197(a) and (b) for closure and postclosure; and 66264.553(b), (d), (e), and (f) as alternatives for temporary systems.
- Cal. Code Regs. tit. 22, § 66264.111(a) and (b) maintenance minimization and Cal. Code Regs. tit. 22, § 66264.114 for clean closure. This alternative is expected to meet the clean closure requirements, which would also minimize maintenance.
- This remedial alternative is expected to involve disturbance of more than 1 acre of soil. Therefore, the substantive provisions of the requirements for storm water plans, BMPs, and effluent limitations reflecting the best practical technology currently available set forth in 40 C.F.R. §122.44(k)(2) and (4) under CWA Sections 402 are potential federal ARARs.

- Substantive provisions at CWA Section 301(b) that require all direct dischargers meet technology-based requirements including the best control technology and the best available technology economically achievable are potentially applicable for the potential discharge to surface water during the remedial action.

4.2.1.2 State ARARs

Many state requirements are identified as federal ARARs in Section 4.4.1.1. Chemcial- and location-specific ARARs that may also be triggered by action are not repeated here.

Pursuant to CERCLA Section 121(e) (42 USC § 9621 [e]), onsite response actions are exempt from permit requirements, including an NPDES Permit. The State of California's General Construction Storm Water Permit (SWRCB Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ) is such a permit. Although not an ARAR in itself, DON will implement the substantive provisions of this permit to comply with federal CWA ARARs and water quality State ARARs for discharge to surface water. The federal and state ARARs require BMPs and a storm water plan to meet the substantive numeric effluent limit and action level requirements. The DON will implement the BMPs and prepare a CERCLA storm water plan that will include monitoring, sampling and analysis, and numeric action level and effluent limit requirements as specified under California's General Construction Storm Water Permit.

4.2.2 Backfill

4.2.2.1 Federal ARARs

Discharge Associated with Backfilling

The backfill will include placement of fill material into the wetlands. For placement of fill material into the wetlands, federal regulations were identified as potential ARARs. Discharge of fill material is defined at 33 C.F.R. § 323.2(f) and includes the placement of fill material that is necessary for the construction of any structure or infrastructure. Substantive provisions of the following requirements regarding discharge of fill material were identified as potential federal ARARs for placement of the cap:

- 33 C.F.R. § 320.4 (general policies for evaluating permit applications).
- 40 C.F.R. § 230.10(a) – requires that the discharge represent the least damaging, practicable alternative.
- 40 C.F.R. § 230.10(c) – requires that discharge of dredged material not result in significant degradation of the aquatic ecosystem.
- 40 C.F.R. § 230.10(d) – requires that all practicable means be utilized to minimize adverse environmental impacts.
- 40 C.F.R. §230.11 (factual determinations).
- 40 C.F.R. §§ 230.20–230.25 (potential impacts on physical and chemical characteristics of the aquatic ecosystem such as substrate, suspended particulate/turbidity, water, current patterns and water circulation, normal water fluctuations, and salinity gradients).

- 40 C.F.R. §§ 230.31 and 230.32 (potential impacts on biological characteristics of the aquatic ecosystem such as fish, crustaceans, mollusks, and other aquatic organisms in the food web; and other wildlife).
- 40 C.F.R. § 230.53 (potential effects on human-use characteristics, such as aesthetics).
- 40 C.F.R. § 230.60 and 230.61 Evaluation and testing. May use the Inland Testing Guidance Manual as TBC for compliance.
- This remedial alternative is expected to involve disturbance of more than 1 acre of soil. Therefore, the substantive provisions of the requirements for stormwater plans, BMPs, and effluent limitations reflecting the best practical technology currently available set forth in 40 C.F.R. §122.44(k)(2) and (4) under CWA Sections 402 are potential federal ARARs.
- Substantive provisions at CWA Section 301(b) that require all direct dischargers meet technology-based requirements including the best control technology and the best available technology economically achievable are potentially applicable for the potential discharge to surface water during the remedial action.

4.2.2.2 State ARARs

No additional state requirements were identified as ARARs for backfilling.

4.3 Alternative 3

This alternative includes capping contaminated soil in the upland and sediment in the wetland areas, institutional controls, monitoring, and wetland mitigation.

4.3.1 Capping

4.3.1.1 Federal ARARs

Federal requirements that are potential ARARs for capping/cover actions are described in the following sections.

RCRA

The RCRA landfill closure requirements in Cal. Code Regs. tit. 22, § 66264.111 are relevant and appropriate for general performance standards that eliminate the need for further maintenance and control and eliminate postclosure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. The grading conducted for the capping/cover options at IRP Site 74 does not constitute placement or disposal under RCRA and, therefore, the generator requirements for hazardous waste determinations contained in Cal. Code Regs. tit. 22, § 66262.10(a) and 66262.11 are not triggered.

Discharge associated with capping

This remedial alternative is expected to involve disturbance of more than 1 acre of soil. Therefore, the substantive provisions of the requirements for storm water plans, BMPs, and effluent limitations reflecting the best practical technology currently available set forth in 40 C.F.R. §122.44(k)(2) and (4) under CWA Sections 402 are potential federal ARARs.

Substantive provisions at CWA Section 301(b) that require all direct dischargers meet technology-based requirements including the best control technology and the best available technology economically achievable are potentially applicable for the potential discharge to surface water during the remedial action.

The capping will include placement of fill material into the wetlands. For placement of fill material into the wetlands, federal regulations were identified as potential ARARs. Discharge of fill material is defined at 33 C.F.R. § 323.2(f) and includes the placement of fill material that is necessary for the construction of any structure or infrastructure. Therefore, substantive provisions of the following requirements regarding discharge of fill material were identified as potential federal ARARs for placement of the cap:

- 33 C.F.R. § 320.4 (general policies for evaluating permit applications).
- 40 C.F.R. § 230.10(a) – requires that the discharge represent the least damaging, practicable alternative.
- 40 C.F.R. § 230.10(c) – requires that discharge of dredged material not result in significant degradation of the aquatic ecosystem.
- 40 C.F.R. § 230.10(d) – requires that all practicable means be utilized to minimize adverse environmental impacts.
- 40 C.F.R. §230.11 (factual determinations).
- 40 C.F.R. §§ 230.20–230.25 (potential impacts on physical and chemical characteristics of the aquatic ecosystem such as substrate, suspended particulate/turbidity, water, current patterns and water circulation, normal water fluctuations, and salinity gradients).
- 40 C.F.R. §§ 230.31 and 230.32 (potential impacts on biological characteristics of the aquatic ecosystem such as fish, crustaceans, mollusks, and other aquatic organisms in the food web; and other wildlife).
- 40 C.F.R. § 230.53 (potential effects on human-use characteristics, such as aesthetics).
- 40 C.F.R. § 230.60 and 230.61 Evaluation and testing. May use the Inland Testing Guidance Manual as TBC for compliance.

4.3.1.2 State ARARs

Many state requirements are identified as federal ARARs in Section 4.3.2.1. Chemcial- and location-specific ARARs that may also be triggered by action are not repeated here. No additional state ARARs were identified for capping.

4.3.2 Institutional Controls

No institutional control ARARs were identified for IRP Site 74. Institutional controls are required to maintain the integrity of the cap at IRP Site 74 by preventing excavations or increased infiltration of surface waters, preventing land use that presents unacceptable risk to human health and ecological receptors due to residual contamination, and preserving access to the site for the DON and the FFSRA signatories. Such institutional controls shall consist of land-use restrictions designed to protect the capping remedy. It is important to note that IRP Site 74 will not be transferred to a nonfederal agency.

The California Military Environmental Coordination Committee (CMECC) has developed the Institutional Control Protocol at Open Bases (CMECC, 1998) for application at active military installations. This protocol is a consensus document that is intended to aid federal and state remedial project managers when incorporating institutional controls into CERCLA response actions. The committee is made up of Cal/EPA, U.S. EPA, and the DON. The DON has agreed that the institutional control protocol for active bases should be followed for sites that require institutional controls as part of their CERCLA response action. Therefore, the Institutional Control Protocol at Open Bases are guidance for IRP Site 74 institutional controls.

The Institutional Control Protocol at Open Bases states that the Base Master Plan (BMP) is typically the best place to record the institutional controls so as to assure their implementation by the DoD installation. The BMP establishes land uses for the DoD installation and requirements similar to zoning. The BMP is used by the installation for evaluating land-use decisions and for project planning. Depending on the installation project planning and project approval process, other documents or more than one document may be required to include the institutional controls to assure adherence to the institutional controls.

4.4 Alternative 4

This alternative is the same as Alternative 2 for the upland area. The alternative is the same for Alternative 2 for the wetland area except less-destructive amphibious equipment would be used instead of standard excavation equipment. No additional ARARs were identified for Alternative 4. The ARARs for Alternative 4 are the same as those for Alternative 2.

TABLE A4-1
Potential Federal Action-specific ARARs

Alternative numbers indicate applicability of a requirement for an individual alternative under ARAR determination:
Alternative 1: No action.
Alternative 2: Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Action	Requirement	Prerequisites	Citation	ARAR Determination			Comments
				A	RA	TBC	
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])*							
Onsite waste generation	Person who generates waste shall determine if that waste is a hazardous waste.	Generator of waste.	Cal. Code Regs. tit. 22, § 66262.10(a), 66262.11	2,4			Applicable for any operation where waste is generated.
	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste.	Cal. Code Regs. tit. 22, § 66262.13(a) and (b)	2,4			Applicable for any operation where waste is generated.
Hazardous waste accumulation	Onsite hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with § 66262.171-178 or in tanks, on drip pads, inside buildings, is labeled and dated, etc.	Accumulate hazardous waste.	Cal. Code Regs. tit. 22, § 66262.34	2,4			Applicable. Substantive requirements are applicable for accumulation of wastes for less than 90 days if the waste is hazardous waste and is stored onsite. Storage of wastes for more than 90 days is not pertinent to the remedial action.
Site closure	Minimize the need for further maintenance controls and minimize or eliminate, to the extent necessary to protect human health and the environment, postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or runoff, or waste decomposition products to groundwater or surface water or to the atmosphere.	Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66264.111(a) and (b)		2,4		Not applicable; no land-based units are planned for waste management. Relevant and appropriate for alternatives involving capping in which wastes would remain in place.
Clean closure	During the partial and final closure periods, all contaminated equipment, structures and soils shall be properly disposed or decontaminated by	Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66264.114		2,4		Not applicable. The remedial action at IRP Site 74 does not include clean closure of a hazardous waste management facility. Relevant and appropriate for Alternatives 2 and 4, which involves clean closure.

TABLE A4-1
Potential Federal Action-specific ARARs

Alternative numbers indicate applicability of a requirement for an individual alternative under ARAR determination:
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Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Action	Requirement	Prerequisites	Citation	ARAR Determination			Comments
				A	RA	TBC	
	removing all hazardous waste and residues.						
Use of tank systems	Requirements for the design and installation of new tank systems including strength, tightness testing, damage control, support, corrosion control, etc.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.192(a), (b), (c), (e), (f), and (g)		2,4		Not applicable; no alternatives include treating hazardous waste. Relevant and appropriate for Alternative 2, which may use tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.
Use of tanks or piping	Requirements for secondary containment of tank systems.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.193(b), (c), (d), and (e)		2,4		Not applicable; no alternatives include treating hazardous waste. Relevant and appropriate for Alternative 2, which may use tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.
	Requirements for secondary containment of ancillary equipment.	Tank systems for transferring, storing or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.193(f)		2,4		Not applicable; no alternatives include treating hazardous waste. Relevant and appropriate for Alternative 2, which may use tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.

TABLE A4-1
Potential Federal Action-specific ARARs

Alternative numbers indicate applicability of a requirement for an individual alternative under ARAR determination:
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Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Action	Requirement	Prerequisites	Citation	ARAR Determination			Comments
				A	RA	TBC	
Use of tank systems	Requirements for operation of tank systems including spill prevention and prohibitions of material that could cause failure.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.194(a) and (b)		2,4		Not applicable; no alternatives include treating hazardous waste. Relevant and appropriate for Alternative 2, which may use tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.
	Requirements for inspection of tank systems including inspection of overflow protection, corrosion, release, detection equipment, and cathodic protection.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.195(a), (b), and (c)		2,4		Not applicable; no alternatives include treating hazardous waste. Relevant and appropriate for Alternative 2, which may use tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.
	Requirements for response to leaks and spills from tank systems including removal of system from use if appropriate, containment, cleanup, emergency procedures, etc.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, § 66264.196(b), except (b)(5) and (b)(7)		2,4		Not applicable; no alternatives include treating hazardous waste. Relevant and appropriate for Alternative 2, which may use tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.
Use of tank systems (continued)	Requirements for closure and postclosure care of tank systems	Tank systems for transferring, storing,	Cal. Code Regs. tit. 22,		2,4		Not applicable; no alternatives include treating hazardous waste. Relevant and appropriate for Alternative 2, which may use

TABLE A4-1
Potential Federal Action-specific ARARs

Alternative numbers indicate applicability of a requirement for an individual alternative under ARAR determination:
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Alternative 2: Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Action	Requirement	Prerequisites	Citation	ARAR Determination			Comments
				A	RA	TBC	
	decontamination, clean closure and leaving waste in place at closure.	or treating hazardous waste.	§ 66264.197(a) and (b)				tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.
	Alternative requirements that are protective of human health or the environment may replace design, operating, or closure standards for temporary tanks and container storage areas.		Cal. Code Regs. tit. 22, § 66264.553(b), (d), (e), and (f)		2,4		Not applicable; no alternatives include treating or storing hazardous waste. Relevant and appropriate for Alternative 2, which may use tanks and piping for dewatering the wetlands prior to excavation of sediment. Relevant and appropriate for Alternative 7, which may use tanks and piping for collection of water associated with the excavation of wet sediment.
Staging pile	Allows generators to accumulate solid remediation waste in a U.S. EPA-designated pile for storage only, up to 2 years, during remedial operations without triggering LDRs.	Hazardous remediation waste temporarily stored in piles.	40 C.F.R. § 264.554(d)(1)(i-ii) and (d)(2), (e), (f), (h), (i), (j), and (k)		2,4		Not applicable; waste piles will not be part of the remedial action. Relevant and appropriate for excavation alternatives, which will generate temporary staging piles.
Closure of staging pile	At closure, owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste. If waste is left onsite, perform postclosure care in accordance with the	Waste pile used to store hazardous waste.	Cal. Code Regs. tit. 22, § 66264.258(a)		2,4		Not applicable; Relevant and appropriate for excavation alternatives, which will generate temporary staging piles and will require disposal of waste liners.

TABLE A4-1
Potential Federal Action-specific ARARs

Alternative numbers indicate applicability of a requirement for an individual alternative under ARAR determination:
Alternative 1: No action.
Alternative 2: Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Action	Requirement	Prerequisites	Citation	ARAR Determination A	ARAR Determination RA	ARAR Determination TBC	Comments
	closure and postclosure care requirements that apply to landfills.						
Clean Water Act, as Amended (33 U.S.C., ch. 26, §§ 1251-1387)*							
Discharge to surface waters	Owners and operators of construction activities must be in compliance with discharge standards, including substantive provisions of the general requirements for storm water plans and BMPs.		CWA Section 402 (33 U.S.C., ch. 26, § 1342)) and 40 C.F.R. § 122.44(k)(2) and (4)	2,3,4			Applicable for the disturbance of one or more acres. BMPs will be documented in a Storm Water Plan and implemented during the construction of the project.
	All direct dischargers meet technology-based requirements including the best control technology and the best available technology economically achievable.		CWA Section 301(b) (33 U.S.C., ch. 26, § 1311)	2,3,4			Applicable for the BMPs for storm water because the storm water discharge from the site may be a direct discharge to the Seal Beach NWR.
Discharge of dredged material	Guidelines for specification of disposal sites for fill material. The discharge must represent the least damaging practicable alternative. The discharge of fill material must not result in significant degradation of the aquatic ecosystem. All practicable means must be utilized to minimize adverse environmental impacts.		40 C.F.R. § 230.10(a), (c) and (d)	2,3,4			Substantive provisions are potentially applicable for alternatives involving placement of fill material into the wetlands portion of the site.
Discharge of dredged material (continued)	Evaluation and testing requirements for discharges of fill material to waters of the United States		40 C.F.R. § 230.60 and 230.61	2,3,4			Substantive provisions are potentially applicable for placement of fill material into the wetlands portion of the site.

TABLE A4-1
Potential Federal Action-specific ARARs

Alternative numbers indicate applicability of a requirement for an individual alternative under ARAR determination:
Alternative 1: No action.
Alternative 2: Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Action	Requirement	Prerequisites	Citation	ARAR Determination			Comments
				A	RA	TBC	
	Guidance to comply with substantive provisions of the 40 C.F.R. § 220-228 criteria. Guidance for dredged material testing necessary to determine compliance with state water quality standards.		Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. (Inland Testing Manual)			2,3,4	Not an ARAR. Substantive provisions may be TBCs.
	U.S. Army Corps of Engineers requirements for permitting discharges of fill material to waters of the United States.	Discharge of dredged material to waters of the United States.	33 C.F.R. § 320.4	2,3,4			Substantive provisions are potentially applicable for placement of fill material into the wetlands portion of the site.

Notes:

* statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that the DON accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of specific citations are considered potential ARARs

A – applicable
AQMD – Air Quality Management District
ARAR – applicable or relevant and appropriate requirement
BACT – best available control technology
BDAT – best demonstrated available technology
CAA – Clean Air Act
Cal. Code Regs. – California Code of Regulations
CAMU – corrective action management unit
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – Code of Federal Regulations
CWA – Clean Water Act
DON – Department of the Navy
DOT – Department of Transportation
FS – Feasibility Study
LDR – land disposal restriction
MCAS – Marine Corps Air Station
MCL – maximum contaminant level
NAAQS – National Ambient Air Quality Standards (primary and secondary)
NPDES – National Pollutant Discharge Elimination System
FS – feasibility study
IR – Installation Restoration (Program)
LAER – lowest achievable emission rate
OU – operable unit
PCB – polychlorinated biphenyl
POC – point of compliance
ppm – parts per million
ppm_w – parts per million by weight
RA – relevant and appropriate
RAO – remedial action objective
RCRA – Resource Conservation and Recovery Act
RI – remedial investigation
§ – section
SCAQMD – South Coast Air Quality Management District
SDAPCD – San Diego Air Pollution Control District
SDWA – Safe Drinking Water Act
SIP – State Implementation Plan
subpt. – subpart
TBC – to be considered
TCE – trichloroethene
tit. – title
TSCA – Toxic Substances Control Act
UIC – underground injection control
U.S.C. – United States Code

Notes: (continued)

USDW – underground source of drinking water
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

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TABLE A4-2
Potential State and Local Action-specific ARARs

Alternative numbers indicate applicability of a requirement for an individual alternative under ARAR determination:

Alternative 1: No action.
Alternative 2: Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
Alternative 3: Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
Alternative 4: Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

Action	Requirement	Prerequisites	Citation	ARAR Determination			Comments
				A	RA	TBC	
State Water Resources Control Board and Regional Water Quality Control Board*							
Construction and Land Disturbance	Permit requirements for minimizing discharges in storm water runoff	One or more acres of soil disturbance	SWRCB Order No. 2009-0009-DWQ (previously 92-08-DWQ, General Construction Activity Storm Water NPDES Permit CAS000002)				Pursuant to CERCLA Section 121 (e) (42 USC Section 9621 [e]), onsite response actions are exempt from permit requirements, including an NPDES Permit. The State of California's General Construction Storm Water Permit (SWRCB Order No. 2009-0009-DWQ) is such a permit. Although not an ARAR in itself, DON will implement the substantive provisions of this permit to comply with federal CWA ARARs and State water quality ARARs for discharge to surface water. The federal and State ARARs require BMPs and a storm water plan. The DON will implement the BMPs and prepare a CERCLA Storm Water Plan that will include monitoring, sampling and analysis, and numeric effluent action levels and effluent limits as required under the State general storm water permit.

Notes:
* statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the DON accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific actions are considered potential ARARs.

A – applicable
APCD – Air Pollution Control District
AQMD – Air Quality Management District
ARAR – applicable or relevant and appropriate requirement
BACT – best available control technology
BAT – best available technology
BPT – best practicable treatment
CAI – closed, abandoned, or inactive
Cal. Code Regs. – California Code of Regulations
Cal/EPA – California Environmental Protection Agency
Cal. Water Code – California Water Code
CAMU – correction action management unit
CEQA – California Environmental Quality Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – Code of Federal Regulations
CWA – Clean Water Act
DON – Department of the Navy
DTSC – (Cal/EPA) Department of Toxic Substances Control
FAWQC – Federal Ambient Water Quality Control
FS – feasibility study
LDR – land disposal restriction
mg/L – micrograms per liter
NPDES – National Pollutant Discharge Elimination System
PM_{10} – particulate matter, less than 10 micrometers in diameter
ppm – parts per million
Prop. – proposition
RA – relevant and appropriate
RAO – removal action objective
RCRA – Resource and Recovery Act
Res. – resolution
RI – remedial investigation

Notes: (continued)
RWQCB – Regional Water Quality Control Board [Santa Ana Region]
§ – section
SCAQMD – South Coast Air Quality Management District
SIP – State Implementation Plan
SWAT – Solid Waste Assessment Test
SWRCB – (California) State Water Resources Control Board
T-BACT – best available control technology for toxics
TBC – to be considered
tit. – title
TPH – total petroleum hydrocarbons
U.S.C. – United States Code
UST – underground storage tank
VOC – volatile organic compound
WQO – water quality objective

5.0 Summary

The substantive provisions of the following requirements were identified as potential ARARs that affected the development of response action activities for this remedial action.

5.1 Chemical-specific ARARs

5.1.1 Federal

Although the lead at the site is immobile and not considered water soluble, the CTR for lead at 40 C.F.R. § 131.38 is a potential federal ARAR for the remedial action and the remedial action is expected to be in compliance with it. Substantive provisions of the following requirements were identified as federal ARARs for characterizing waste generated during the remedial action:

- RCRA definition of hazardous waste in Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100.
- Release of emissions into the atmosphere during excavation must comply with the SCAQMD 401 and 403 prohibitions on visible emissions as potential federal ARARs for remedial alternatives being considered under this action.

5.1.2 State

The following state ARARs were identified for surface water for potential discharges during the remedial action. And the proposed remedial action is expected to comply with these ARARs.

- Porter-Cologne Water Quality Control Act, Cal. Water Code §§ 13241, 13243, 13263(a), 13269, and 13360 as enabling legislation for the Basin Plan, and SWRCB Res. 88-63 and 68-16.
- Water Quality Control Plan Santa Ana River Basin, Chapters 3 beneficial uses and 4 WQOs (RWQCB, 1995) for the discharge to surface water from the remedial action.
- SWRCB Resolution (Res.) 88-63 to determine whether the surface water is a potential source of drinking water.
- SWRCB Res. 68-16 for a new discharge during the remedial action.
- Substantive provisions of the following requirements were identified as State ARARs for characterizing waste generated during the remedial action.
- Definitions of designated waste, nonhazardous waste, and inert waste, Cal. Code of Regs. tit. 27, § 20210, 20220, and 20230.

5.2 Location-specific ARARs

5.2.1 Federal

IRP Site 74 is located within a potential floodplain and a portion of the site is located within a wetland; therefore, Executive Order No. 11990 and 11988 have been determined to be potentially relevant and appropriate for the IRP Site 74 remedial action. The substantive provisions at Cal. Code Regs. tit. 22, § 66264.18(b) that require construction to prevent washout form a 100-year flood are potentially relevant and appropriate for the capping alternative.

Overall, the remedial action is expected to mitigate potential threats to endangered species. Potential federal ARARs include the following:

- Endangered Species Act of 1973 (16 U.S.C. §§ 1531-1543).
- Migratory Bird Treaty Act of 1972 (16 U.S.C. § 703).
- National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. §§ 668dd-668ee).

5.2.2 State

Potential state ARARs include the following:

- California Fish and Game § 2080 and §2081(b) for endangered and threatened species; §1908 for rare and native plant species; §3511 for fully protected birds; and §5650(a) and (b) prohibitions of deleterious substances placement where passing to waters is a potential.

5.3 Action-specific ARARs

5.3.1 Federal

The following federal ARARs have been identified for the excavation and temporary storage of waste for Alternatives 2 and 4:

- Onsite waste generation and determination requirements in Cal. Code Regs. tit. 22 §§ 66262.10(a), 66262.11, and 66262.13(a) and (b).
- Substantive requirements of Cal. Code Regs. tit. 22, § 66262.34 (pertaining to hazardous waste accumulation) will be applicable (or relevant and appropriate if waste does not meet the definition of hazardous waste, but is similar to RCRA hazardous waste).
- For storage of waste in staging piles, substantive requirements of 40 C.F.R. § 264.554(d)(1)(i-ii)and (d)(2), (e), (f), (h), (i), (j), and (k) are relevant and appropriate. Cal. Code Regs. tit. 22, §66264.258(a) (pertaining to the clean closure of staging piles) are relevant and appropriate requirements.
- For the potential use of tanks and piping for dewatering the wetlands or sediment removed from the wetlands, the substantive provisions of the following regulations are relevant and appropriate: Cal. Code Regs. tit. 22, §§ 66264.192(a), (b), (c), (e), (f), and (g) design and installation requirements; 66264.193(b), (c), (d), and (e) and 66264.193(f) for secondary containment of tanks and associated tank systems and ancillary equipment;

66264.194(a) and (b) spill prevention; 66264.195(a), (b), and (c) inspection; 66264.196(b) except (b)(5) and (b)(7) for response to spills and leaks; 66264.197(a) and (b) for closure and postclosure; and 66264.553(b), (d), (e), and (f) as alternatives for temporary systems.

- Cal. Code Regs. tit. 22, § 66264.111(a) and (b) maintenance minimization and Cal. Code Regs. tit. 22, § 66264.114 for clean closure for Alternatives 2 and 4 where contaminated soil and sediment will be removed.
- The substantive provisions of the requirements for storm water plans, BMPs, and effluent limitations reflecting the best practical technology currently available set forth in 40 C.F.R. §122.44(k)(2) and (4) under CWA Sections 402 are potential federal ARARs.
- Substantive provisions at CWA Section 301(b) that require all direct dischargers meet technology-based requirements including the best control technology and the best available technology economically achievable are potentially applicable.

Substantive provisions of the following requirements regarding discharge of fill material were identified as potential federal ARARs for placement of the cap and backfilling (Alternatives 2, 3 and 4) after excavation:

- 33 C.F.R. § 320.4 (general policies for evaluating permit applications).
- 40 C.F.R. § 230.10(a) – requires that the discharge represent the least damaging, practicable alternative.
- 40 C.F.R. § 230.10(c) – requires that discharge of dredged material not result in significant degradation of the aquatic ecosystem.
- 40 C.F.R. § 230.10(d) – requires that all practicable means be utilized to minimize adverse environmental impacts.
- 40 C.F.R. §230.11 (factual determinations).
- 40 C.F.R. §§ 230.20–230.25 (potential impacts on physical and chemical characteristics of the aquatic ecosystem such as substrate, suspended particulate/turbidity, water, current patterns and water circulation, normal water fluctuations, and salinity gradients).
- 40 C.F.R. §§ 230.31 and 230.32 (potential impacts on biological characteristics of the aquatic ecosystem such as fish, crustaceans, mollusks, and other aquatic organisms in the food web; and other wildlife)
- 40 C.F.R. § 230.53 (potential effects on human-use characteristics, such as aesthetics).

The RCRA landfill closure requirements in Cal. Code Regs. tit. 22, § 66264.111 are relevant and appropriate for capping the site (Alternative 3) as general performance standards that eliminate the need for further maintenance and control and eliminate postclosure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products.

5.3.2 State

Although not a potential ARAR, the DON will implement the BMPs and prepare a CERCLA storm water plan that will include monitoring, sampling and analysis, and numeric action level and effluent limit requirements as specified under California's General Construction Storm Water Permit (SWRCB Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ).

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Attachment A-1
States ARARs Response Letter

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Terry Tamminen
Agency Secretary
Cal/EPA

Department of Toxic Substances Control

Maureen F. Gorsen, Director
5796 Corporate Avenue
Cypress, California 90630

Arnold Schwarzenegger
Governor

January 18, 2005

Mr. T. R. Martin
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Coast Highway
San Diego, California 92132-5190

Dear Mr. Martin:

REQUEST FOR IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS: PROPOSED NON-TIME CRITICAL REMOVAL ACTION AT SITE 74 (OLD SKEET RANGE), SEAL BEACH NAVAL WEAPONS STATION (NAVWPNSTA), SEAL BEACH, CALIFORNIA

The California Department of Toxic Substances Control (DTSC) received your letter dated, October 27, 2005 requesting state action-specific, chemical specific and location specific ARARs for IR Site 74 at NAVWPNSTA Seal Beach. According to Federal Facility Site Remediation Agreement (FFSRA) section 7.7 (c), the Navy is required to contact the agencies that failed to respond and again solicit their inputs. Please note that ARARs analysis is an iterative process. At the time of developing Remedial Action Plan (RAP)/ Removal Action Work plan (RAW), additional ARARs may be apparent.

In response to your request, we solicited action-specific, chemical specific and location specific ARARs from the following state and local agencies:

California Coastal Commission;
California Regional Water Quality Control Board, Santa Ana Region;
California Integrated Waste Management Board
California Department of Fish and Game;
Orange County Public Facilities & Resources Department (Environmental Management Agency);
California Department of Transportation (District 12);
South Coast Air Quality Management District;
California Air Resources Board;

California State Lands Commission;
Orange County Sanitation District;
Orange County Water District;
Orange County Health Care Agency;
City of Seal Beach Environmental Quality Control Board; and
City of Seal Beach Planning Department.

We received responses from South Coast Air Quality Management District, California Air Resources Board, California Regional Water Quality Control Board and City of Seal Beach Environmental Quality Control Board. The responses are enclosed as Attachment A.

If you have any questions, please call me at (714) 484-5446.

Sincerely,

Katherine K. Leibel
Remedial Project Manager
Federal Facilities Unit "B"
Office of Military Facilities
Southern California Operations Branch

Enclosures

cc: Mr. Si Le
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Coast Highway
San Diego, California 92132-5190

Ms. Pei-Fen Tamashiro
Naval Weapons Station, Seal Beach, Bldg.110
800 Seal Beach Boulevard
Seal Beach, California 90740-5000

South Coast
Air Quality Management District
AQMD
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 · www.aqmd.gov

December 13, 2005

Department of Toxic Substances Control
Office of Military Facilities
5796 Corporate Avenue
Cypress, CA 90630

Attn: Katherine K. Leibel
Remedial Project Manager

The AQMD appreciates your request for input into compiling Applicable or Relevant and Appropriate Requirements (ARAR) for the Proposed Non-time Critical Removal Action at Site 74 (Old Skeet Range), Seal Beach Naval Weapons Station (NWS), Seal Beach California.

The following AQMD Rules and Regulations, which are available at our website, www.aqmd.gov, should be incorporated in the ARAR.

Regulation IV - Prohibitions

Rule 401 - Visible Emissions
This rule limits any visible emissions from any single source to less than Ringlemann No. 1 or 20 percent opacity for 3 minutes in any hour (Ref. Health and Safety Code 41701).

Rule 402 - Nuisance
This rule prohibits the discharge of any air contaminant or other material (including odorous compounds) that causes injury or annoyance to the public, endangers the comfort, repose, health or safety of the public, or causes damage to business or property. In general, a Notice of Violation may be issued upon receipt of six verified complaints, or for any property damage, or personal injury (Ref. Health and Safety Code 41700).

Rule 403 - Fugitive Dust
This rule limits on-site activities so that the concentrations of fugitive dust at the property line shall not be visible. In addition, PM_{10} levels shall not exceed 50 micrograms per cubic meter as determined by the difference between upwind and downwind samples collected on high volume particulate matter samplers. These requirements do not apply if the wind gusts exceed 25 miles per hour. The rule also requires every reasonable precaution to minimize fugitive dust and the prevention and cleanup of any material accidentally deposited on paved streets. This rule shall not apply during life-threatening situations, or during a declared disaster, or state of emergency.

Rule 404 - Particulate Matter
This rule limits equipment from discharging particulate emissions in excess of 0.01 to 0.196 grain per cubic foot based on a given volumetric (dry standard cubic feet per minute) exhaust gas flow rate averaged over one hour or one cycle of operation. It excludes steam generators or gas turbines.

Rule 405 - Solid Particulate Matter
This rule limits equipment from discharging particulate emissions in excess of 0.99 to 30 pounds per hour based on a given process weight.

Rule 407 - Liquid and Gaseous Air Contaminants
This rule limits equipment from discharging carbon monoxide emissions in excess of 2000 ppm and sulfur dioxide emissions of 500 ppm or greater averaged over 15 minutes. It excludes stationary internal combustion engines, propulsion of mobile equipment or emergency venting.

Rule 408 - Circumvention
This rule prohibits a person from building, erecting, installing or using any equipment, the use of which reduces or conceals an emission which would otherwise constitute a violation of these rules or Chapter 3 (starting with 41700) of Part 4, of Division 26 of the Health and Safety Code.

Rule 409 - Fuel Combustion Contaminants
This rule limits the emissions of particulate matter from the exhaust of a combustion source (such as a gas turbine) to 0.23 grams per cubic meter (0.1 grains per standard cubic foot) at 12 percent CO_2 averaged over 15 minutes. It excludes internal combustion engines.

Rules 431.1, 431.2, 431.3 - Sulfur Content of Gaseous, Liquid or Fossil Fuels
These rules limit sulfur compounds from combustion of gaseous fuels, other than natural gas, not to exceed 40 ppm, 0.05 percent by weight for liquid fuels (15 ppmw for fuels purchased after 6/1/04) and 0.56 pounds of sulfur per million BTU for solid fossil fuels.

Rule 474 - Fuel Burning Equipment-Oxides of Nitrogen
This rule limits the concentration of oxides of nitrogen (as NO_2) averaged over 15 minutes, from any non-mobile fuel burning equipment, to a range of 125 to 300 ppm for gaseous fuels and 225 to 400 ppm for solid and liquid fuels depending on equipment size.

<u>Regulation X - National Emission Standards for Hazardous Air Pollutants</u>

This regulation implements the provisions of Part 61, Chapter I, Title 40 of the Code of Federal Regulations (CFR) under the supervision of the AQMD Executive Officer. It specifies emissions testing, monitoring procedures or handling of hazardous pollutants such as beryllium, benzene, mercury, vinyl chloride and asbestos.

Regulation XI - Source Specific Standards

Rule 1150 - Excavation of Landfill Sites
This rule states that no person shall initiate excavation of an active or inactive landfill without an Excavation Management Plan approved by the Executive Officer of AQMD. The Plan shall provide information regarding the quantity and characteristics of the material to be excavated and transported and shall identify mitigation measures including gas collection and disposal, baling, encapsulating, covering the material and chemical neutralizing.

Rule 1166 - Volatile Organic Compound Emissions from Decontamination of Soil
This rule limits the emissions of volatile organic compounds (VOCs) from contaminated soil to less than 50 ppm. For contaminated soil with 50 ppm or greater, an approved mitigation plan, describing removal methods and mitigation measures, must obtained from the District prior to proceeding with the excavation. Uncontrolled spreading of contaminated soil is not permitted.

Regulation XIII - New Source Review

This regulation applies to any new or modified equipment, which may cause the issuance of any non-attainment air contaminant, ozone depleting compound or ammonia. It requires all equipment to be constructed with BACT (Best Available Control Technology). For non-attainment emission increases, it requires the emission increases to be offset and substantiated with modeling that the equipment will not cause a significant increase in concentrations of non-attainment contaminants.

Regulation XIV - Toxics

Rule 1401 - New Source Review of Carcinogenic Air Contaminants
This rule specifies limits for cancer risk and excess cancer cases from new stationary sources and modifications to existing stationary sources that emit carcinogenic air contaminants. The rule establishes allowable emission impacts for all such stationary sources requiring new permits pursuant to AQMD Rules 201 or 203. Best Available Control Technology for Toxics (T-BACT) will be required for any system where a lifetime (70 years) maximum individual cancer risk of one in one million or greater is estimated to occur. Limits are calculated using risk factors for specific contaminants.

Rule 1470 – Requirements for Stationary Diesel Fueled Internal Combustion and Other Compression Ignition Engines
This rule applies to any person who sells, offers for sale, leases or purchases for use in the South Coast AQMD any stationary compression ignition engine with a rated brake horsepower greater than 50. Portable engines are subject to this Rule if they remain at the same facility location for more than 12 consecutive rolling months or 365 rolling days, not including time spent in a storage facility. This Rule specifies the use of CARB low diesel fuel or alternative fuels, limits on non emergency operators or diesel PM standards (including emission control technology) in order to reduce the emissions impact including cancer risk on affected receptors located near the engine exhaust.

Best Available Control Technology (BACT) Guidelines Document

This document was compiled by AQMD. Although a guideline, it set up BACT requirements for various types of equipment or process. BACT is determined on a permit-by-permit basis based on the definition of BACT. In essence, BACT is the most stringent emission limit or control technology that is:

- found in a state implementation plan (SIP), or
- achieved in practice, or
- is technologically feasible and cost effective.

For practical purposes, at this time, nearly all AQMD BACT determinations will be based on achieved-in-practice BACT because it is generally more stringent than BACT based on SIP, and state law constrains AQMD from using the third approach.

If you have any questions regarding these regulations, please call Mr. Ted Kowalczyk at (909) 396-2592.

Very truly yours,

Jay Chen
Senior Manager
Toxics and Waste Management Unit

JC:TK

cc: Carol Coy
Mohsen Nazemi
Susan Nakamura

Air Resources Board

1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Alan C. Lloyd, Ph.D.
Agency Secretary

Arnold Schwarzenegger
Governor

DTSC
DEC 29 2005
CYPRESS

TO: Katherine Leibel
Remedial Project Manager
Southern California Branch
Office of Military Facilities
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

FROM: Jim Aguila, Manager J.A.
Substance Evaluation Section
Air Quality Measures Branch
Stationary Source Division

DATE: December 27, 2005

SUBJECT: APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR SITE 74, SEAL BEACH NAVAL WEAPONS STATION

This memorandum is in response to your request for potential California "Applicable or Relevant and Appropriate Requirements" (ARARs) for Site 74, Seal Beach Naval Weapons Station. State law, as codified in the Health and Safety Code (Division 26, section 40000), provides to local and regional authorities the primary responsibilities for control of air pollution from sources other than emissions from motor vehicles. Air pollution control districts and air quality management districts are required to adopt and enforce rules to achieve or maintain the state and federal ambient air quality standards in all areas affected by emission sources under their jurisdiction.

Rules and regulations of the South Coast Air Quality Management District (SCAQMD) should be included in the consideration of action-specific ARARs for this site. If you have not contacted the SCAQMD, we recommend that you contact Mr. Jay Chen, Manager, Toxics Section, at (909) 396-2664. SCAQMD rules that may apply include:

201 Permit to Construct
203 Permit to Operate
402 Nuisance
403 Fugitive Dust
1401 New Source Review for Toxic Air Contaminants

In addition, the California Ambient Air Quality Standards (CAAQS, list enclosed) may apply as chemical-specific ARARs. If excavation is necessary, the CAAQS for lead should be considered as a potential chemical-specific ARAR. This is to ensure that activities undertaken to remediate this site do not cause ambient air concentrations above the health protection levels of the CAAQS.

If you have questions, please call Mr. Lynn Baker of my staff at (916) 324-6997.

Enclosure

cc: Mr. Jay Chen (w/o Enclosure)
Manager
Toxics Section
South Coast Air Quality Management District
21865 East Copley Drive
Diamond Bar, California 91765

Mr. Lynn Baker (w/o Enclosure)
Staff Air Pollution Specialist
Substance Evaluation Section

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m³)	Ultraviolet Photometry	0.12 ppm (235 µg/m³)[8]	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	—		0.08 ppm (157 µg/m³)[8]		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m³	Gravimetric or Beta Attenuation	150 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m³		50 µg/m³		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		65 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m³	Gravimetric or Beta Attenuation	15 µg/m³		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m³)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m³)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m³)		35 ppm (40 mg/m³)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m³)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	—	Gas Phase Chemiluminescence	0.053 ppm (100 µg/m³)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 µg/m³)		—		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	—	Ultraviolet Fluorescence	0.030 ppm (80 µg/m³)	—	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 ppm (105 µg/m³)		0.14 ppm (365 µg/m³)	—	
	3 Hour	—		—	0.5 ppm (1300 µg/m³)	
	1 Hour	0.25 ppm (655 µg/m³)		—	—	—
Lead[9]	30 Day Average	1.5 µg/m³	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m³	Same as Primary Standard	High Volume Sampler and Atomic Absorption
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m³	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m³)	Ultraviolet Fluorescence			
Vinyl Chloride[9]	24 Hour	0.01 ppm (26 µg/m³)	Gas Chromatography			

See footnotes on next page ...

California Regional Water Quality Control Board
Santa Ana Region

Terry Tamminen
Secretary for Environmental Protection

3737 Main Street, Suite 500, Riverside, California 92501-3348
(951) 782-4130 • Fax (951) 781-6288
http://www.waterboards.ca.gov/santaana

Arnold Schwarzeneg
Governor

January 17, 2006

Ms. Katherine K. Leibel
Remedial Project Manager
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

REGIONAL WATER QUALITY CONTROL BOARD (RWQCB) APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) FOR SITE 74 (OLD SKEET RANGE), U. S. NAVAL WEAPONS STATION, SEAL BEACH

Dear Ms. Leibel:

On September 24, 2004, we received your request for ARARs for a proposed non-time critical removal action at Site 74 at U. S. NWS Seal Beach, in compliance with Section 121 (d) (2) (A) of CERCLA and the National Contingency Plan 40 CFR Section 300.400 (g) and 300.515(d) and (h). The following is a list of our ARARs:

- **Water Quality Control Plan Santa Ana River Basin 1995 (Basin Plan)**

Citation: Chapter 3, Beneficial Uses

Description: Defines beneficial uses for groundwater beneath NWS Seal Beach as municipal, agricultural, industrial service and industrial process supply.

Comments: The identification of the groundwater as a potential drinking water source forms a basis for selection of concentration limits, cleanup levels and treatment levels.

ARAR Status: Applicable, Action

Citation: Chapter 4, Water Quality Objectives

Description: Defines the groundwater quality objectives for non-degradation, taste and odor, bacteria, chemical constituents, toxic substances, radioactivity and minerals.

Comments: Applies to all cleanups of discharges that may affect water quality.

ARAR Status: Applicable, Action, Chemical

- **Statement of Policy with Respect to Maintaining High Quality of Waters in California**

Citation: State Water Resources Control Board Resolution No. 68-16

Description: Establishes policy on maintaining the high quality of California's surface waters and groundwater.

Comments: Applies to discharges of waste to waters of the State, including discharges to soil that may affect surface or groundwater. In-situ cleanup levels for contaminated soils must be set so that groundwater will not be degraded, unless degradation is consistent with the maximum benefit to the people of the State. If degradation is allowed, the discharge must meet standards for best practical treatment or control, and must result in the highest water quality possible, consistent with the maximum benefit to the people of the State. In no case may water quality objectives be exceeded.

ARAR Status: Applicable, Action, Chemical, Location

- **Sources of Drinking Water Policy**

Citation: State Water Resources Control Board Resolution No. 88-63 and Regional Board Resolution No. 89-42.

Description: Defines all groundwater and surface waters as existing or potential sources of drinking water, with a few specified exceptions (these exceptions are specified in Chapter 3, Beneficial Uses of the Basin Plan).

Comments: The identification of the groundwater beneath Site 74 as potential sources of drinking water provides information to determine concentration limits, cleanup levels and treatment levels.

ARAR Status: Applicable, Location

- **Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304**

Citation: State Water Resources Control Board Resolution No. 92-49 (as Amended April 21, 1994 and October 2, 1996).

Description: Requires the investigation, cleanup and abatement to extend to any location affected by a discharge or threatened discharge, and sets policies and procedures for all investigations and cleanup and abatement activities.

Comments: These policies and procedures are applicable to investigations and remedial activities at Site 74.

ARAR Status: Applicable, Action, Chemical, and Location

- **Porter-Cologne Water Quality Control Act 1998**

Citation: California Water Code Section 13000

Description: Defines the legislative intent to attain the highest water quality reasonable, considering all demands being made.

Comments: Basis for selection of background levels as the goal for cleanup criteria.

ARAR Status: Applicable, Action

Citation: California Water Code Section 13176

Description: Requires that the analysis of material be performed in a State-certified laboratory.

Comments: Applies to all investigations and remedial actions.

ARAR Status: Applicable, Action

Citation: California Water Code Chapter 4, Article 4

Description: Requires the submission of information regarding waste discharges, and states that requirements shall be placed to implement water quality control plans. Technical or monitoring reports may be required for investigation of water quality. Provides for penalties for noncompliance.

Comments: Removal and remedial actions must comply with substantive requirements.

ARAR Status: Applicable, Action, Chemical, Location

Citation: California Water Code Chapter 5, Article 1

Description: Requires cleanup and abatement of conditions of pollution or nuisance or threatened pollution or nuisance.

Comments: Applies to all investigation and remedial actions.

ARAR Status: Applicable, Action

Citation: California Water Code, Chapter 10, Article 3

Description: Specifies the requirements for water wells, monitoring wells, and cathodic protection wells.

Comments: Applies to all well installations.

ARAR Status: Applicable, Action

Citation: California Water Code Sections 13240, 13241, 13242, 13243

Description: Establishes water quality objectives, including narrative and numerical standards, that protect the beneficial uses of surface waters and groundwater in the Region. Describes control measures designed to ensure compliance with State plans and policies, and provides comprehensive water quality planning. Includes implementation actions for setting soil cleanup levels for soils that threaten water quality.

Comments: Any activity, including a new discharge of contaminated soils or containment of contaminated soils, that may affect water quality, must not result in exceeding water quality objectives. Implementation plans and other policies and requirements may apply.

ARAR Status: Applicable, Action

- **Discharges of Waste to Land**

Citation: California Code of Regulations, Title 27, Sections 20200(c) and 20210

Description: Requires that designated waste be discharged to Class I or Class II waste management units.

Comments: Applies to discharges of designated waste (non-hazardous waste that could cause degradation of surface or ground water) to land for treatment, storage, or disposal.

ARAR Status: Applicable, Action

Citation: California Code of Regulations, Title 27, Section 20230

Description: Specifies that inert waste does not need to be discharged at classified units.

ARAR Status: Applicable, Action

Citation: California Code of Regulations, Title 27, Sections 20200(c), 20220

Description: Requires that non-hazardous solid waste be discharged to a classified waste management unit.

Comments: Applies to discharges of non-hazardous solid waste to land for treatment, storage or disposal.

ARAR Status: Applicable, Action

- **Storm Water Activities**

Citation: 40 CFR, Parts 9, 122, 123, 124, National Pollutant Discharge Elimination System, implemented by the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit), Water Quality Order No. 99-08-DWQ,

Comments
Construction and earth-moving activities that result in disturbance of at least one acre are subject to Water Quality Order No. 99-08-DWQ and the NPDES General Permit for Storm Water Discharges Associated with Construction Activity. Such activities include, but are not limited to, clearing, grading, stockpiling and excavation of soil or other materials.

ARAR Status: Applicable, Action

If you should have any questions regarding the details of the ARARs listed in this letter, please call me at (951) 782-4498 or send e-mail to phannon@waterboards.ca.gov.

Sincerely,

Patricia A. Hannon

Patricia A. Hannon
SLIC/DoD Section

cc sent electronically: Mr. Si Le, Southwest Division, Naval Facility Engineering Command
Ms. Pei-Fen Tamashiro, U. S. NWS Seal Beach

City of Seal Beach

CITY HALL 211 EIGHTH STREET
SEAL BEACH, CALIFORNIA 90740
(562) 431-2527 • www.ci.seal-beach.ca.us

December 9, 2005

Department of Toxic Substances Control
Attn: Katherine K. Leibel, Remedial Project Manager
Federal Facilities Unit "B", Office of Military Facilities
Southern California Operations
5796 Corporate Avenue
Cypress, CA 90630

Dear Ms. Leibel:

SUBJECT: **CITY OF SEAL BEACH RESPONSE RE: ARARs for IR SITE 74, SEAL BEACH NAVAL WEAPONS STATION**

The City of Seal Beach has reviewed your request of December 2, 2005 relative to "*Request for Applicable or Relevant and Appropriate Requirements*" (ARARs) for Naval Weapons Station (WPNSTA), Seal Beach, Site 74. Upon a review of your letter, the information provided in Attachment A, and the attached EPA Fact Sheet "*Overview of ARARs*", the City of Seal Beach has no input on potential ARARs regarding chemical-specific ARARs. The City does have a "***relevant and appropriate requirement***" in relation to the site. The City requests that all requirements of South Coast Air Quality Management District Rule 402, Nuisances, and Rule 403, Fugitive Dust, be incorporated into the remediation program for all sites, due to the close distance to existing residential areas.

In addition, since there are agreements between the Navy and the State of California which require the Installation Restoration Program to comply with State requirements and regulations, all project activities would be determined a project pursuant to California Public Resources Code Section 21065, and therefore would require an environmental analysis to be performed in accordance with the provisions of the California Environmental Quality Act, Section 21000 et. seq., and the "Guidelines for the Implementation of the California Environmental Quality Act with Discussions", prepared by the Governors Office of Planning and Research. The City has consistently provided this same information regarding such requests regarding the Naval Weapons Station since 2000.

Thank you for allowing the City to comment on the proposed ARARs for Naval Weapons Station, Seal Beach, Site 74. If you have any questions or require further information, please contact my office and I will be most happy to provide any additional information. I can be reached by telephone at (562) 431-2527, extension 313, or by e-mail at lwhittenberg@ci.seal-beach.ca.us.

Sincerely,

Lee Whittenberg
Director of Development Services

cc: City Council
Environmental Quality Control Board

City Manager
Director of Development Services Department

Attachment A-2
California Department of Fish and Game Position Letters Regarding California Fish and Game Code Requirements

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State of California

Memorandum

To: Ms. Katherine Leibel
Office of Military Facilities
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Date: April 26, 2006

From: Charlie Huang, Ph.D., Staff Toxicologist
California Department of Fish and Game
Office of Spill Prevention and Response
Scientific Division
1700 K Street, Suite 250
Sacramento, CA 95814

Subject: **Applicable or Relevant and Appropriate Requirements (ARARs) for Site 74, Seal Beach Navel Weapons Station (NWS), California**

This memo is in response to your letter requesting potential State ARARs for Site 74 at Seal Beach NWS. The Department of Fish and Game, Office of Spill Prevention and Response (DFG-OSPR) appreciates this opportunity to provide State laws and regulations to guide the planned cleanup at Seal Beach NWS.

It is our understanding that the Navy is making the request for ARARs for the purpose of ensuring a coordinated cleanup effort. The request for DFG-OSPR to define appropriate State cleanup requirements is made pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as a portion of the RI/FS process. This memo will serve to advise you of the DFG's continuing interest in coordinating any natural resource issues, as the designated natural resource trustee for the State of California. This may be necessary should release(s) of any hazardous materials at the subject site affect State natural resources.

The Seal Beach NWS is an active base located approximately 26 miles south of Los Angeles, consisting of about 5000 acres of land along the Pacific Coast within the city of Seal Beach in Orange County, California. Seal Beach NWS is bordered on the southwest by Anaheim Bay. The cities adjacent to Seal Beach NWS include Long Beach, Seal Beach, Los Alamitos, Westminster, and Huntington Beach. Anaheim Bay and the associated salt marsh were designated as a National Wildlife Refuge (NWR) in 1964. On August 30, 1972, 200 additional upland acres were added to the NWR. Several avian species, classified as endangered by state and/or federal governments, inhabit Seal Beach NWR: California Least Tern, Light-footed Clapper Rail, Peregrine Falcon, California Brown Pelican, Western Snowy Plover, and Belding's Savannah Sparrow.

Site 74, Old Skeet Range (OSR), is located east of the NWR and south of the small arms range. The site was once an active skeet and trap range. The range was closed down in the early 1990s. Site 74 is very close to the boundary of the NWR.

In 2000, the Navy conducted a Focused Site Inspection (FSI) Phase II to screen for ecological and human health risks at Site 74. The FSI Phase II Report concluded that lead and antimony, but not polycyclic aromatic hydrocarbons (PAHs), were chemicals of concern for representative ecological receptors. The Tier II Ecological Risk Assessment (ERA) conducted in 2004 further concluded that antimony and lead in sediment and soil at Site 74 appear to pose significant ecological risks. The ERA also developed site-specific target cleanup goals for lead and antimony in support of the Site 74 removal action.

Listed on the enclosed table is a list of Fish and Game Code Sections which may apply as site-specific State ARARs or TBCs (to be considered) with the date of enactment or promulgation. The specific citation and explanation for each listed ARAR and TBC are also enclosed, in addition to applicable statutes and regulations.

The staff of the DFG-OSPR appreciates the opportunity to provide our ARARs. If you have any questions or need further information, please contact me at (916) 324-9805 or by e-mail at chuang@ospr.dfg.ca.gov.

Enclosure

Reviewer: Julie Yamamoto, Ph.D., Senior Toxicologist
John Holland, Staff Counsel

cc: Ms. Pei-Fen Tamashiro
Naval Weapons Station, Seal Beach
800 Seal Beach Blvd
Seal Beach, California 90740

Department of Fish and Game
Office of Spill Prevention and Response
Julie Yamamoto, Ph.D., Senior Toxicologist
Wendy Johnson, Staff Counsel

HUANG:gs

CALIFORNIA DEPARTMENT OF FISH AND GAME
LOCATION AND ACTION SPECIFIC ARARs AND TBCs
For Site 74 at Seal Beach NWS

LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
Aquatic habitat/species	Action must be taken if toxic materials are placed where they can enter waters of the State. There can be no release that would have a deleterious effect on species or habitat.	Fish and Game Code section 5650 (a), (b) & (f)	This code section prohibits depositing or placing where it can pass into waters of the state any petroleum products (Section 5650(a)(1)), factory refuse (section 5650(a)(4)), sawdust, shavings, slabs or edgings (section 5650(a)(3)), and any substance deleterious to fish, plant life or bird life (section 5650(a)(6)). These are substantive, promulgated environmental protection requirements. These requirements impose strict criminal liability on violators. (*People v. Chevron Chemical Company (1983) 143 Cal. App. 3d 50).* This imposition of strict criminal liability imposes a standard that is more stringent than federal law. The extent to which each subdivision of section 5650 is relevant and appropriate depends on the site characterization and the potential for contaminants to be deposited near or within waters of the state.
Wildlife Species	Action must be taken to prohibit the taking of birds and mammals, including the taking by poison	Fish and Game Code section 3005 (Stats. 1957, c. 456, p. 1353 section 3005)	This code section prohibits the taking of birds and mammals, including taking by poison. "Take" is defined by Fish and Game Code section 86 to include killing. "Poison" is not defined in the code. Although there is no state authority on this point, federal law recognizes that poison, such as Strychnine, may affect incidental taking. (*Defenders of Wildlife v. Administrator, Environmental Protection Agency (1989) 882. F. 2d. 1295).* This code section imposes a substantive, promulgated environmental protection requirement.
Rare native plants	Action must be taken to conserve native plants, there can be no releases and/or actions that would have a	Fish and Game Code section 1900 *et seq.*(Added by Stats.	These code sections make provisions concerning native plants protection, including: criteria for determining endangered plant species; designation of endangered plants by the Fish and Game Commission; research by the Department; takings by the Department for scientific or propagation purposes; other prohibitions on takings; exercise of enforcement authority; arrests and

CALIFORNIA DEPARTMENT OF FISH AND GAME
LOCATION AND ACTION SPECIFIC ARARs AND TBCs
For Site 74 at Seal Beach NWS

LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
	deleterious effect on species or habitat.	1977, c. 1181, p. 3869, section 8)	confiscation; carrying out of plant conservation programs by other state departments and agencies; and unauthorized public agency regulations pertaining to agriculture. Sections 1900, 1901, 1904, 1905, 1906, 1907, 1909, 1910, 1911, 1912, and 1913 are procedural or administrative in nature and do not impose any substantive requirements. Section 1908 imposes a substantive requirement by forbidding any "person" to take rare or endangered native plants. Fish and Game Code section 67 provides the definition of "person" as any natural person or any partnership, corporation, limited liability company, trust, or other type of association. Whether the federal government or contractors acting on behalf of the federal government would fall within that definition is a potential issue. To the extent that there are rare or endangered plants on site, section 1908 would be an ARAR.
Endangered Species	Action must be taken to conserve endangered species, there can be no releases and/or actions that would have a deleterious effect on species or habitat.	Fish and Game Code section 2080 (Added by Stats. 1984, c. 1240, section 2).	This section prohibits the take, possession, purchase or sell within the state, any species (including rare native plant species), or any product thereof, that the commission determines to be an endangered or threatened species, or the attempt of any of these acts. This section is applicable and relevant to the extent that there are endangered or threatened species in the area which have the potential of being affected if actions are not taken to conserve the species. This section prohibits releases and/or actions that would have a deleterious effect on species or their habitat. This section and applicable Title 14 regulations should be considered as ARARs. *California Code of Regulations Title 14 sections 670.2* provides a listing the

CALIFORNIA DEPARTMENT OF FISH AND GAME
LOCATION AND ACTION SPECIFIC ARARs AND TBCs
For Site 74 at Seal Beach NWS

LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
			plants of California declared to be Endangered, Threatened or Rare. *California Code of Regulations Title 14 section 670.5* provides a listing of Animals of California declared to be endangered or threatened. *California Code of Regulations Title 14 section 783 et. seq.*, provides the implementation regulations for the California Endangered Species Act.
Fully protected bird species/habitat	Action must be taken to prevent the taking of fully protected birds	Fish and Game Code section 3511 (Added by Stats.1970, c. 1036, p. 1848 section 4)	This section provides that it is unlawful to take or possess any of the following fully protected birds: (a). American peregrine falcon (b). Brown Pelican (c). California black rail (d). California clapper rail (e). California condor (f). California least tern (g). Golden eagle (h). Greater sandhill crane (i). Light-footed clapper rail (j). Southern bald eagle (k). Trumpeter swan (l). White-tailed kite (m). Yuma clapper rail This should be considered Applicable and Relevant to the extent that such fully

CALIFORNIA DEPARTMENT OF FISH AND GAME
LOCATION AND ACTION SPECIFIC ARARs AND TBCs
For Site 74 at Seal Beach NWS

LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
			protected birds or their habitat are detected on or near the site. The Brown Pelican and California least tern are known to occur on or near this site.
Wetlands	Actions must be taken to assure that there is "no net loss" of wetlands acreage or habitat value. Action must be taken to preserve, protect, restore and enhance California's wetland acreage and habitat values.	Fish and Game Commission Wetlands Policy (adopted 1987) included in Fish and Game Code Addenda	This policy seeks to provide for the protection, preservation, restoration, enhancement and expansion of wetland habitat in California. Further, it opposes any development or conversion of wetland that would result in a reduction of wetland acreage or habitat value. It adopts the USFWS definition of a wetland which utilizes hydric soils, saturation or inundation, and vegetable criteria, and requires the presence of at least one of these criteria (rather than all three) in order to classify an area as a wetland. This policy is not a regulatory program and should be included as a TBC.
Fully Protected Mammals	Actions must be taken to assure that no fully protected mammals are taken or possessed at any time.	Fish and Game Code section 4700 (Added by Stats. 1970, c. 1036, p. 1848 section 6)	This section prohibits the take or possession of any of the fully protected mammals or their parts. The following are fully protected mammals: (a) Morro Bay kangaroo rat (b) Bighorn sheep except Nelson bighorn sheep (c) Northern elephant seal (d) Guadalupe fur seal (e) Ring-tailed cat (f) Pacific right whale (g) Salt-marsh harvest mouse (h) Southern sea otter

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LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
			(i) Wolverine This section is applicable, relevant, and appropriate to the extent that such mammals and/or their habitat are located on or near the site.
Fully Protected Reptiles and Amphibians	Actions must be taken to prevent the take or possession of any fully protected reptile or amphibian.	Fish and Game Code section 5050 (Added by Stats. 1970, c. 1036, p. 1849, section 7)	This section prohibits the take or possession of fully protected reptiles and amphibians or parts thereof. The following are fully protected reptiles and amphibians: (1) Blunt-nosed leopard lizard (2) San Francisco garter snake (3) Santa Cruz long-toed salamander (4) Limestone salamander (5) Black toad This section is applicable, relevant and appropriate to the extent that these amphibians or reptiles and/or their habitat are located on or near the site.
Birds	Action must be taken to avoid the take or destruction of the nest or eggs of any bird	Fish and Game Code section 3503	This section prohibits the take, possession, or needless destruction of the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.
Birds of Prey	Action must be taken to prevent the take, possession, or	Fish and Game Code section	This section prohibits the take, possession, or destruction of any birds in the orders of Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this

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LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
	destruction of any birds-of prey or their eggs	3503.5 (Added by Stats. 1985, c. 1334, section 6)	code or any regulation adopted pursuant thereto. This section will be applicable and relevant to the extent that such species or their eggs are located on or near the site.
Nongame birds	Actions must be taken to prevent the take of nongame birds.	Fish and Game Code section 3800 (Added by Stats. 1971, c. 1470, p. 2906, section 13)	This section prohibits the take of nongame birds, except in accordance with regulations of the commission, or when related to mining operations with a mitigation plan approved by the department. This section further provides requirements concerning mitigation plans related to mining. This section is applicable and relevant to the extent that nongame birds or their eggs are located on or near the site and such species have not been included in the fish and wildlife conservation plan filed pursuant to the Federal Fish and Wildlife Conservation Act. Species included in the plan will be protected at the federal standard making this section an ARAR to the extent that it is more stringent than the federal standard of protection.
Fur-bearing mammals	Provides manners under which fur-bearing mammals may be taken	Fish and Game Code section 4000, et. Seq. (Stats. 1957, c. 456, p. 1380, section 4000)	This section provides that a fur-bearing mammal may be taken only with a trap, a firearm, bow and arrow, poison under a proper permit, or with the use of dogs.
Nongame	Action must be taken to	Fish and	Nongame mammals are those occurring naturally in California which are not

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LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
mammals	avoid the take or possession of nongame mammals	Game Code section 4150 (Added by Stats. 1971, c. 1470, p. 2907, section 21)	game mammals, fully protected mammals, or fur-bearing mammals. These mammals, or their parts, may not be taken or possessed except as provided in this code or in accordance with regulations adopted by the commission.
Tidal Invertebrates	Action must be taken to avoid the take or possession of mollusks, crustaceans, or other invertebrates	Fish and Game Code section 8500 (Added by Stats. 1972, c. 1248, p. 2436. Section 2, eff. Dec. 13, 1972)	It is unlawful to possess or take, unless otherwise expressly permitted in this chapter, mollusks, crustaceans, or other invertebrates, unless a valid tidal invertebrate permit has been issued. The taking, possessing, or landing of such invertebrates pursuant to this section shall be subject to regulations adopted by the commission.
Protected Amphibians	Action must be taken to avoid the take or possession of protected amphibians.	Title 14 C.C.R. sections 40 (Section 40 designated effective 03/01/74)	This regulation makes it unlawful to capture, collect, intentionally kill or injure, possess, purchase, propagate, sell, transport, import, or export any native reptile or amphibian, or parts thereof unless under special permit from the department issued pursuant to Title 14 C.C.R. sections 650, 670.7, or 783 of these regulations, or as otherwise provided in the Fish and Game Code or these regulations.
Furbearing	Action must be taken to	Title 14	Regulation makes it unlawful to take fisher, marten, river otter, desert kit fox,

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LOCATION	STANDARD	SPECIFIC CITATION	ARAR/TBC EXPLANATION
Mammals	avoid take	C.C.R. section 460 (effective 07/01/59)	and red fox. Although these mammals may not be currently present in Site 74, to the extent that the Red Fox, which is highly possible to occur in the area, or it's habitat is found on or near Seal Beach NWS, this section will be an ARAR.
Furbearing Mammals	Provides methods of take for other furbearing mammals not listed in Title 14 C.C.R. section 460	Title 14 C.C.R. section 465 (effective 07/01/69)	Furbearing mammals not listed specifically in Title 14 C.C.R. section 460 and listed in 14 C.C.R. section 461, 462, 463, and section 464 may be taken only with a firearm, bow and arrow, or with the use of dogs, or traps in accordance with the provisions of Section 465.5 of Title 14 and section 3003.1 of the Fish and Game Code. Although these mammals may not be currently present in Site 74, if one is found on or near Sites 74 at some future date, this section will become applicable and relevant.

Appendix B
Cost Development Summaries

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Appendix B
Cost Development Summaries

Feasibility Study Report
Installation Restoration Program Site 74

Naval Weapons Station Seal Beach
Seal Beach, California

Contract Number: N62473-09-D-2622
Contract Task Order Number 0047
Document Control Number: KCH-2622-0047-0021

November 2013

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Southwest

Prepared by

CH2M HILL Kleinfelder, A Joint Venture (KCH)
1320 Columbia Street, Suite 310
San Diego, California 92101

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Acronyms and Abbreviations

FS	feasibility study
IC	institutional control
IRP	Installation Restoration Program
NAVWPNSTA	Naval Weapons Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	operation and maintenance
OMB	Office of Management and Budget
OSR	Old Skeet Range
PAH	polycyclic aromatic hydrocarbon
RACER	Remedial Action Cost Engineering and Requirements (software)
RI	Remedial Investigation
U.S.	United States
USEPA	United States Environmental Protection Agency

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B1 Methodology

This appendix documents the development of remedial action cost estimates for remedial alternatives to restore soil from the upland area impacted by antimony, lead, and polycyclic aromatic hydrocarbons (PAHs) and sediment from the wetland area impacted by antimony and lead at, Naval Weapons Station (NAVWPNSTA) Seal Beach in Seal Beach, California, Installation Restoration Program (IRP) Site 74, Old Skeet Range (OSR). The remedial action cost estimates are used in the evaluation of alternatives in the Feasibility Study (FS) report. The No Action Alternative (Alternative 1) has no associated costs and therefore is not discussed in this appendix.

At the FS stage, the design of the remedial action is still conceptual and not detailed in this design estimate. The cost estimates presented herein, and summarized in the FS report, are developed to be consistent with the expected accuracy for FS-level estimates, as described in United States Environmental Protection Agency (USEPA) remedial investigation (RI) and FS technical guidance (USEPA, 1988 and 2000). As the project progresses, the design will become more complete and the cost estimates more “definitive,” thus increasing the accuracy of the cost estimate.

Cost estimates for the FS report were prepared following USEPA RI and FS technical guidance (USEPA, 1988 and 2000) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Remedial Action Cost Engineering and Requirements (RACER) System Cost Database Software (AECOM, 2009) was the primary source of cost data. Costs for site-specific or unique line items were estimated based on a combination of vendor quotes and engineering judgment. Microsoft Excel spreadsheets were used to summarize estimated costs on an annual basis for the assumed duration of each alternative and to calculate present values in December 2012 United States (U.S.) dollars.

B1.1 Description of RACER

RACER cost models are based on generic engineering solutions for environmental projects, technologies, and processes. The engineering solutions were derived from historical project information, government laboratories, construction management agencies, vendors, contractors, and engineering analyses. The software used for estimating cost, RACER System Cost Database Software (AECOM, 2009), incorporates the most up-to-date engineering practices and procedures to accurately reflect current removal/remediation processes and pricing. When an estimate is developed in RACER, generic engineering solutions are customized by adding site-specific parameters to reflect project-specific conditions and requirements. The tailored plan is then translated into specific work items and priced using the current cost data. RACER incorporates and summarizes costs by the code of accounts that was developed by the interagency Cost Estimating Group for Hazardous, Toxic, and Radiological Waste Remediation.

Estimates for professional labor support for the remedial action are included in the capital costs developed by RACER. This labor support is calculated based on the technology employed and includes construction oversight and preparation of work plans (e.g., health and safety, sampling, and quality control). Indirect cost estimates for the remedial action include items such as sales tax on purchased items, contractors' overhead, contractors' profits, bonds, and insurance costs. Engineering, another indirect cost item, varies for each alternative depending on the complexity of the remedial action.

The cost estimates presented herein have been developed in the detailed analysis of the alternatives stage as summarized in the FS report. Cost estimates have a stated accuracy of +50 percent to -30 percent, consistent with USEPA RI and FS technical guidance (USEPA, 1988 and 2000). It is important to note that costs prepared at the FS stage of a remediation project can increase or decrease during final design and/or implementation as the design becomes more developed and the cost estimates become more definitive. Such changes in costs are usually a result of scope changes that cannot be explicitly defined due to a lack of complete, accurate, and detailed information when the FS report is prepared. A 20 percent contingency allowance has therefore been added to the capital costs and operation and maintenance (O&M) costs to cover increases that may occur as a result of scope-related uncertainties.

B1.2 User-Defined Costs

It was not possible to develop RACER cost estimates for all elements of the alternatives because of certain site-specific or unique characteristics. The costs for these elements were estimated based on quotes and other pertinent cost data from vendors and specialty contractors, and from actual costs being incurred during other remedial actions at IRP Site 74. Costs incurred in future years were not adjusted to account for inflation. Rather, a "real" discount rate is used, which already includes an inflation adjustment.

B1.3 Cost Estimate Components

Cost estimates for IRP Site 74 remedial alternatives include capital costs, O&M costs, and contingency allowances. Regulatory oversight costs are not included in the cost estimates. A description of each category of costs is provided below.

B1.3.1 Capital Costs

Capital costs consist of direct and indirect costs. Direct costs include expenditures incurred for equipment, labor, and materials needed to develop, construct, and implement a remedial action. Indirect costs include all other expenses necessary to support the construction that cannot be directly associated with a specific equipment item or remedial activity. Indirect costs include the following:

- Health and safety items
- Permitting and legal fees
- Site supervision
- Engineering
- Contractor overhead and profit
- Startup costs

Costs for these indirect expenditures are included in the detailed cost analysis, either as separate line items or as a percentage of the direct capital cost.

B1.3.2 Operation and Maintenance Costs

O&M costs refer to those post-construction items necessary to ensure the continued effectiveness of a remedial action. Typical O&M expenses include power, operating labor, consumable materials, purchased services (such as laboratory services), equipment replacement, maintenance, sampling of monitoring wells, and permit fees. O&M costs also include reporting costs such as annual reports, periodic costs such as 5-year reviews, and inspections and reporting related to institutional controls (ICs).

B1.3.3 Contingency Allowances

Contingency allowances are assumed to be 20 percent of the cost of each alternative. As noted in Section B1.1, contingency allowances have been added to the FS cost estimates to account for uncertainties in project scope. The size of the contingency allowance would be expected to decrease as cost estimates are prepared during subsequent phases of design, after a remedial alternative has been selected and is proceeding toward implementation.

B1.4 Present Value

Present value is calculated using present-worth analysis, a method of evaluating alternative remedial action solutions when expenditures occur over different time periods. The costs for the various remedial action alternatives can be compared on the basis of a single figure for each alternative by discounting all future costs to a common year. This single figure, the present value, represents the amount of money which, if invested in the initial year of a remedial action and disbursed as needed, would be sufficient to cover all the stated costs associated with that alternative.

The present worth of expenditures occurring over the life of a remedial action is determined using the formula:

$$PW = \sum_{t=1}^{n} \frac{x_t}{(1+i)^t}$$

Where:

PW	=	Present worth
x_t	=	Escalated expenditures for the remedial action in year t (the escalation rate is assumed to be zero [0] percent per year for the FS)
i	=	Annual interest or discount rate
t	=	Number of years in which each expenditure occurs following start of construction
n	=	Number of years following start of construction

The present value is calculated by adding the capital costs to the present worth of the O&M annual expenditures and periodic costs priced as of December 2012 (including contingency allowances). Because the alternatives may be completed at different times, the present value was calculated on the basis of a real discount rate of 1.1 percent per year based on a 30-year duration for Alternative 3, and on the basis of a real discount rate of negative 1.4 (-1.4) percent per year based on a 2-year duration for Alternatives 2 and 4 (using real discount rates [adjusted for inflation] from Office of Management and Budget [OMB] Circular A-94 Appendix C, December 2012) (OMB, 2012).

B1.5 General Assumptions

Assumptions that influence the cost of implementing remedial alternatives for soil and groundwater at IRP Site 74 were based on general engineering practices and the requirements of RACER, when appropriate. The following general assumptions were used to develop cost estimates for each alternative in the FS report:

- Total costs were calculated using a cost base of 2012 U.S. dollars.
- O&M costs would be incurred beginning in 2015 and continue thereafter, as required by each alternative.
- All operations would be conducted using USEPA Level D protective clothing.
- Work plan, sampling and analysis plan, and safety and health plan preparation; remedial design development; technical oversight during planning; and implementation of work are included in the cost for professional labor.
- Contingency allowances are 20 percent of capital costs, O&M costs, and periodic costs.

B2 Cost Estimates

This section describes the key components of sitewide remedial alternatives and site-specific assumptions and parameters used to estimate costs for Alternatives 2, 3, and 4. Cost estimating assumptions for each alternative are described in detail in Table B-1 at the end of this appendix. The yearly costs and present values for Alternatives 2 through 4 are provided in Tables B-2 through B-4, respectively.

Sensitivity analyses were performed as part of the development of remedial action cost estimates. Sensitivity analysis is a type of uncertainty analysis that assesses the impact of changing one or more input values. In the development of cost estimates for remedial alternatives, a sensitivity analysis was considered for factors that, based on engineering judgment, may have a relatively high degree of uncertainty and that, with only a small change in their value, could significantly affect the overall cost of the alternative. This type of analysis was considered separate from a "cost growth" or "cost risk" analysis used to determine the amount of contingency to apply to the cost estimate.

Factors considered in the cost sensitivity analyses for the remedial alternatives included:

- **Nature and Extent of Contamination –** Estimated volumes of contaminated media or material and degree of contamination (i.e., concentrations) are dependent on assumptions about site conditions and the analytical data currently available.
- **Remedy Failure/Effective Life of Technology –** The potential failure of a remedy, or components thereof, would require substantial additional costs for replacement of the remedy or its components. This factor is particularly relevant for technologies or processes for which effectiveness is less certain, or that are unproven and lack sufficient performance history.
- **Project Duration –** The time required for a remedial action, or components thereof, to meet proposed remedial goals (RGs) can be a major factor, particularly for those actions requiring many years of O&M.
- **Discount Rate –** Although the real discount rates found in OMB Circular A-94 dated December 2012 (OMB, 2012), which are also used in the U.S. President's annual budget submission to Congress and are based on interest rates from Treasury notes and bonds, were used to compare alternatives, for cost estimates that have large future year expenditures, the real discount rates could be uncertain with regard to future economic conditions.

The sensitivity analyses were used as part of the basis for development of alternatives, and to predict time for each alternative to achieve proposed RGs. The durations of alternatives stated in the FS report rely on cost-estimating assumptions. If the cost-estimating assumptions change, the estimated costs of alternatives will change. However, the cost estimates presented herein are considered appropriate for FS purposes and are consistent with the expected accuracy (USEPA, 1988 and 2000). During implementation of the selected alternative, sampling may be conducted to assess the effectiveness of the remedial action.

Four remedial alternatives were considered for the site:

- **Alternative 1:** No action.
- **Alternative 2:** Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
- **Alternative 3:** Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
- **Alternative 4:** Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

A summary of the cost assumptions is presented below, with exception to Alternative 1 because no costs are associated with this alternative.

B2.1 Alternative 2

Alternative 2 would involve pre-design sampling and testing, and the development of a remedial design document, including a work plan and health and safety documents. Alternative 2 includes excavation of soil from the upland area and sediment from the wetland area. Approximately 8.1 acres of soil in the upland area and 2 acres of sediment in the wetland area would be removed to a depth of 1 foot. Approximately 13,100 bank cubic yards of soil and 3,230 bank cubic yards of sediment would be removed under this alternative. Standard excavation equipment (e.g., long-reach excavator with an enclosed bucket) would be used to remove the soil and sediment that contain lead, antimony, and PAHs (in soil only) exceeding remediation goals. Remedial activities would not be performed during the nesting period (April through September). Alternative 2 consists of the following components, described in detail in Section 4.2.2 in the body of the FS report:

- Short-term monitoring activities would be performed during construction activities to assess air quality, water quality, and/or disruption of sensitive biological habitat.
- Physical survey (topographic and bathymetric) would be performed to ensure the required removal depths were achieved.
- Removal of contaminated soil in the upland area is expected to be completed using standard excavation methods and equipment.
- A long-reach excavator, stationed at Case Road (adjacent to the wetland removal area) would be used to remove the sediment. Crane mats (or equivalent) would be to support access of the wetland areas that are not reachable by the long-reach excavator from Case Road.

- Sheet piles would be installed around the perimeter of the sediment excavation area to help control and divert water away from the excavation area during removal activities.
- A staging and dewatering area would be constructed in the soil upland or adjacent area.
- A sediment dewatering bed would be constructed in the staging area to passively dewater the excavated sediment to reduce the weight and volume of the material prior to offsite transportation and disposal.
- Excavated soil from the upland area would be stockpiled in the staging area or directly loaded to trucks for offsite transport. Excavated sediment from the wetland area would be transported to sediment dewatering beds.
- The sediment dewater water would be collected in a holding tank and chemically analyzed prior to disposal.
- Prior to loading for transport, the excavated soil and excavated/dewatered sediment would be stockpiled and chemically analyzed to determine treatment and disposal requirements.
- The soil and sediment would be transported by truck to a treatment and disposal facility where it would be solidified/stabilized and disposed at a permitted landfill. For cost estimating purposes, it is assumed that 70 percent of the excavated soil and sediment would be transported to a Class II nonhazardous waste landfill, and the other 30 percent would be transported to a Class I hazardous waste landfill as non-RCRA hazardous waste.
- The excavated areas would be backfilled with imported soil and re-vegetated to achieve pre-removal elevations and site conditions.
- Confirmation soil and sediment samples would be collected to ensure remediation goals were achieved.

The assumed duration of this alternative for cost estimating purposes is two years. Cost estimating assumptions for this alternative are described in detail in Table B-1. The remedial action cost estimate for Alternative 2 is presented in Table B-2.

The primary cost uncertainty associated with Alternative 2 is the volume of contaminated soil and sediment to be excavated to meet remediation goals.

B2.2 Alternative 3

Alternative 2 would involve pre-design sampling and testing, and the development of a remedial design document, including a work plan, geotechnical analysis, and health and safety documents. Under Alternative 3, 8.1 acres of contaminated soil in the upland area and 2.3 acres of sediment in the wetland area would be capped with low permeability materials. The low permeability cap in the soil upland area would consist of a 12-inch low permeability soil cover, geosynthetic clay liner, and 12 inches of topsoil for a vegetative layer. The low permeability cap in the sediment wetland area would consist of a 6-inch Aquablok® and seed mixture. Placement of the cap over the soil in the upland area would be achieved by standard excavation equipment and amphibious excavation equipment in the wetland area. The capping activities would not take place during the nesting season (April through September). Alternative 3 consists of the following components, described in detail in Section 4.2.3 in the body of the FS report:

- Short-term monitoring activities would be performed during construction activities to assess air quality, water quality, and/or disruption of sensitive biological habitat.
- Physical survey (topographic and bathymetric) would be performed to characterize the soil and sediment prior to- and following cap placement.
- ICs would be implemented to prohibit disruption of the cap.
- Long-term monitoring would be performed annually for 30 years to evaluate cap effectiveness (including physical surveys to evaluate cap thickness and soil, sediment, and/or surface water samples to evaluate cap performance).
- Maintenance of cap materials would be performed as needed (assume five percent of cap footprint would need replacement every 10 years).
- Five-Year reviews for 30 years.
- Construct a new 2.5-acre wetland (2.3-acre wetland loss plus 10%) at another location within the footprint of NAVWPNSTA Seal Beach. The new wetland would be monitored for a period of 5 years after completion.

The assumed duration of this alternative for cost estimating purposes is 30 years. Cost estimating assumptions for this alternative are described in detail in Table B-1. The remedial action cost estimate for Alternative 3 is presented in Table B-3.

The primary cost uncertainties associated with Alternative 3 are the time required to reach remediation goals.

B2.3 Alternative 4

Alternative 4 contains the same components as Alternative2. The only difference between the two alternatives is that under Alternative 4 sediment in the wetland area would be removed using amphibious excavation equipment instead of standard excavation equipment. Marsh buggies will be used to excavate sediment inside the wetlands under this alternative. Because the amphibious excavation equipment is operable in a saturated environment, sheet piling is not necessary to control or divert water away from the sediment excavation area as part of this alternative. Therefore, it is assumed that the excavated sediment would contain a higher water content that would need dewatering than the excavated sediment removed as part of Alternative 2. Alternative 4 is described in detail in Section 4.2.4 in the body of the FS report.

The assumed duration of this alternative for cost estimating purposes is 2 years. Cost estimating assumptions for this alternative are described in detail in Table B-1. The remedial action cost estimate for Alternative 4 is presented in Table B-4.

The primary cost uncertainty associated with Alternative 4 is the volume of contaminated soil and sediment to be excavated to meet remediation goals.

B3 References

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Tables

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TABLE B-1
Cost Estimate Assumptions for Remedial Alternatives
Feasibility Study Report, IRP Site 74
NAVWPSTA Seal Beach, California

Components	Assumptions
Alternative 1	
Remedial Design	· None.
Institutional Controls	· None.
Review Reports	· None.
Alternative 2	
Pre-Design Sampling and Testing	· Collection of soil and sediment samples. - One 5-gal sample collected for treatability testing to determine appropriate reagent mixes required for stabilization of soil and sediment ex situ. Sample will be used to determine soil moisture, friability, pH, and reagent add mix ratio. - 5 samples collected for waste characterization testing (total metals, STLC, TCLP, 8260, 8270, TPH, 8015, paint filter test) to determine disposal requirements for excavated materials. - 10 geotechnical samples [e.g., specific gravity, atterberg limits, unit weight, moisture content, grain size, shear strength). · Perform physical surveys (topographic and bathymetric) to determine elevation of sediment and soil surfaces prior to excavation activities (assume $50,000).
Remedial Design	· Preparation of work plan and health and safety documents for remedial activities · Prepare remedial design and identify appropriate subcontractors and vendors needed for implementation. · Procurement of subcontractors, vendors, equipment, and materials. Prepare bid documents, issue invitations for bids, evaluated contractor bids, select support. · Remedial design level of effort assumes a moderately-complex site (includes 30%, 60%, 90%, and 100% design plans). · Coordinate with regulatory agencies and stakeholders (e.g., DTSC, RWQCB, USFWS). · Identify onsite staging area. Assume ~ 1 acre area in soil upland or adjacent area
Excavation, Offsite Solidification/Stabilization, Offsite Disposal, and Site Restoration	· Construct temporarily fencing/security around the staging area and haul roads as necessary (assume 900 linear feet of fence). · Prepare staging area (site trailer, parking areas, equipment storage area, and sanitation facilities). · Construct/Setup decontamination pad/area. · Construct dewatering bed in staging area. - Set up drying bed for excavated Sediment. Assume 40-mil polymetric liner and overlaid with a geocomposite drainage layer. Assumes 1 acre area by 4 feet high (assume 6,500 cy capacity). - See Sediment Dewatering below for waste water handling. · Establish required vertical control points and tide gages as needed. · Perform ecological/biological survey to determine sensitive species at the site (assume $50,000). · Obtain necessary permits. · USA Notification. · Utility locating and isolation; include geophysical survey (if necessary). · Assumes remediation site work activities will not be performed during the nesting period (April through September). · Mobilization of equipment, materials, and personnel. · Excavation of 8.1 acres soil in Upland Area to a depth of 1-foot (~13,100 bcy). - Assumes use of conventional excavation equipment. · Excavation of 2 acres sediment in wetland area to a depth of 1-foot (~3,230 bcy). Remediation Area Scenario A, B, and C. - Assumes use of long-reach excavator with enclosed bucket. · Use of 1,000 board feet (1 ft long by 1 ft wide by 1 in thick) crane mats (or equivalent) to reach wetland areas that are unreachable with long- · Installation and removal of sheet pile cells in the wetland area. - Assumes installation of sheet pile extending from Case Road to outer bound of excavation area in the wetland (~ 2 acres). · Installation and removal of silt curtain in the wetland area to control turbidity (assume 900 linear feet of silt fence). · Dust mitigation and storm water pollution prevention measures will be implemented throughout remedial action. · Short-term monitoring during construction activities. - Air quality (e.g., dust, PM_{10}, [SVOCs/VOCs]) in upland area (assume 60 samples). - Water quality (e.g., DO, temp, pH, salinity, turbidity) in wetland area (assume 60 samples). - Biological monitoring for sensitive species (assume $50,000). · 342 (total) surface soil (~200 samples) and sediment (~142 samples) confirmation samples analyzed for lead and antimony and PAHs in soil only. · Sediment and soil waste characterization samples collected for total metals, STLC, TCLP, 8260, 8270, TPH, 8015. (1 sample per 1,000 ton). · Waste Transportation and Disposal. - Trucking of waste to treatment/disposal facility. - Assumes 70% will be hauled as hazardous waste (requiring stabilization). - Assumes 30% will be hauled as non-hazardous waste at $45/ton. - Assume 30% soil bulking factor. - Assume ~200 miles from site to disposal facility (one way to Kettleman Hills in Kettleman City, California). · Restore existing soil, sediment, and vegetation in upland and wetland areas to original conditions. - Restore with soil/native seed mix seeding, compacted, and graded to prevent ponding of surface water. - Backfill with 1 foot of clean fill material from local source (within 20 miles) to pre-remediation site elevation. · Professional labor management at 10% of construction cost. · Regulatory oversight costs are not included. · Demobilization of equipment, materials, and personnel.
Sediment Dewatering	· Excavated sediment will be transported to the dewatering bed in the staging area. · Dewater water from dewatering bed will drain to a holding tank and disposed as non-hazardous waste (assume 19,200 gallons). -Assume ~ 1 acre area in soil upland or adjacent area
Reviews and Reports	· Final remedial action completion report and closeout report at the end of Year 2.

TABLE B-1
Cost Estimate Assumptions for Remedial Alternatives
Feasibility Study Report, IRP Site 74
NAVWPSTA Seal Beach, California

Alternative 3	
Pre-Design Sampling and Testing	· Collection of any additional characterization testing determined to be needed to support the engineered cap design. - 10 geotechnical samples [e.g., specific gravity, atterberg limits, unit weight, moisture content, grain size, shear strength). · Perform physical surveys (topographic and bathymetric) to determine elevation of sediment and soil surface prior to capping activities.
Remedial Design	· Full-scale engineered cap design. · Prepare remedial design and identify appropriate subcontractors and vendors needed for implementation. · Procurement of subcontractors, vendors, equipment, and materials. Prepare bid documents, issue invitations for bids, evaluated contractor bids, select support. · Remedial design level of effort assumes a moderately-complex site (includes 30%, 60%, 90%, and 100% design plans). · Preparation of work plan and health and safety documents for remedial activities · Identify onsite staging area (assumed in soil upland area along Case Road [~1 acre]). Identify site for wetland mitigation (2.5 acres). · Engineering and design of constructed wetland · Ensure compliance with regulatory requirements and application of permits. · Coordinate with regulatory agencies and stakeholders (e.g., DTSC, RWQCB, USFWS).
Low Permeability Capping	· Construct temporarily fencing/security around the staging area (assume 900 linear feet of fence). Assumes construction of haul roads not necessary. · Prepare upland staging area (site trailer, parking areas, equipment storage area, and sanitation facilities). · Construct/Setup decontamination pad/area. · Obtain necessary permits. · USA Notification. · Utility locating and isolation; include geophysical survey (if necessary). · Perform ecological/biological survey to determine sensitive species at the site (assume $50,000). · Assumes pre-remediation site work activities will not be performed during the nesting period (April through September). · Mobilization of equipment, materials, and personnel. · Cap 8.1 acres of soil in upland area. - Assumes 12 inches low permeability soil cover, geosynthetic HDPE liner (20 millimeters), composite drainage net, and 12 inches of topsoil for vegetative layer, with a 3:1 side slope. - Assumes use of conventional excavation equipment. · Cap 2.3 acres of sediment in wetland area. - Assumes AquaBlok/sand cap material mixed with seed mixture (6 inches), with a 3:1 side slope. - AquaBlok and covering sand estimated at approximately $6 per square feet (based on placement of a 6-inches thick dry AquaBlok layer). - Material costs (SubmerSeed) for individual species (assuming seed availability and a “standard” application rate of 1,750 pounds per acre) assumed at $5,100 (treated or “stratified”), not including mark up. - Assumes use of amphibious equipment (assume $830,000 for equipment and its operation, not including mark up). · Sediment cap placement rate based on cycle time for placement of cap materials is 2-2.5 minutes per bucket. · Capping materials would be transported to the site via trucks. · Installation and removal of silt curtain in the wetland area to control turbidity (assume 1,300 linear feet of silt fence). · Short-term monitoring during construction activities. - Air quality (e.g., dust, PM_{10}, [SVOCs/VOCs]) in upland area (assume 60 samples). - Water quality (e.g., DO, temp, pH, salinity, turbidity) in wetland area (assume 60 samples). - Biological monitoring for sensitive species (assume $50,000). · Post cap placement physical surveys (topographic and bathymetric) to determine cap thickness and site elevation. · Regulatory oversight activities not included. · Demobilization of equipment, materials, and personnel.
Institutional Controls	· Includes preparation of a IC implementation plan (200 hours). -ICs to restrict activities that could disrupt the caps. · Annual IC inspections and reports for 30 years (150 hours per year).
Long-Term Monitoring and Operation and Maintenance	· Preparation of long-term monitoring Work Plan (200 hours). · Long-term monitoring for 30 years. -Annual visual inspection to assess cap layer thickness and integrity. -Soil (20 samples), sediment (10 samples), and surface water (10 samples) sampling to evaluate cap performance (every 5 years). -Physical surveys to evaluate cap elevation/thickness every 5 years. -Visual inspections and sediment (10 samples) and surface water (10 samples) sampling after severe storm events as needed (assume one storm every 5 years). · Long-term maintenance as needed. - Maintenance of cap materials. Assumes replacement of 5% of cap footprint every 10 years.
Wetland Mitigation	· Site Selection -Assumes 2.5 acre area will be identified at NAVWPSTA Seal Beach (2.3 acre wetland loss plus 10%). · Construction of wetland and access roads. · Inspection, startup and testing. · Development of an operation and maintenance plan. · Operation and maintenance (The new wetland would be monitored for a period of 5 years after completion.)
Reporting	· Installation completion report (interim remedial action completion report) at Year 2. · Annual IC reports for 30 years as noted above. · Five-year reviews every 5 years for 30 years. · Final remedial action completion report and closeout report at Year 30.

TABLE B-1
Cost Estimate Assumptions for Remedial Alternatives
Feasibility Study Report, IRP Site 74
NAVWPSTA Seal Beach, California

	Alternative 4
Pre-Design Sampling and Testing	· Collection of soil and sediment samples. - One 5-gal sample collected for treatability testing to determine appropriate reagent mixes required for stabilization of soil and sediment ex-situ. Sample will be used to determine soil moisture, friability, pH and reagent add mix ratio. - 5 samples collected for waste characterization testing (total metals, STLC, TCLP, 8260, 8270, TPH, 8015, paint filter test) to determine disposal requirements for excavated materials. - 10 geotechnical samples [e.g., specific gravity, atterberg limits, unit weight, moisture content, grain size, shear strength). · Perform physical surveys (topographic and bathymetric) to determine elevation of sediment and soil surfaces prior to excavation activities (assume $50,000).
Remedial Design	· Preparation of work plan and health and safety documents for remedial activities · Prepare remedial design and identify appropriate subcontractors and vendors needed for implementation. Procurement of subcontractors, vendors, equipment, and materials. Prepare bid documents, issue invitations for bids, evaluated contractor bids, select support. · Remedial design level of effort assumes a moderately-complex site (includes 30%, 60%, 90%, and 100% design plans). · Coordinate with regulatory agencies and stakeholders (e.g., DTSC, RWQCB, USFWS). · Identify onsite staging area. -Assume ~ 1 acre area in soil upland or adjacent area
Excavation, Sediment Dewatering (Drying Pad), Offsite Solidification/Stabilization, Offsite Disposal, and Site Restoration	· Construct temporarily fencing/security around the staging area and haul roads as necessary (assume 900 linear feet of silt fence). · Prepare upland staging area (site trailer, parking areas, equipment storage area, and sanitation facilities). · Construct/Setup decontamination pad/area. · Construct dewatering bed in upland staging area. - Set up drying bed for excavated Sediment. Assume 40-mil polymetric liner and overlaid with a geocomposite drainage layer. Assumes 1 acre area by 4 feet high (assume 6,500 cy capacity). - See Sediment Dewatering below for waste water handling. · Establish required vertical control points and tide gages as needed. · Perform ecological/biological survey to determine sensitive species at the site (assume $50,000). · Obtain necessary permits. · USA Notification. · Utility locating and isolation; include geophysical survey (if necessary). · Mobilization of equipment and personnel to the site. · Assumes remediation site work activities will not be performed during the nesting period (April through September). · Excavation of 8.1 acres soil in Upland Area to a depth of 1-foot (~13,100 bcy). - Assumes use of conventional excavation equipment. · Excavation of 2 acres sediment in wetland area to a depth of 1-foot (~3,230 bcy). - Assumes use amphibious excavation equipment with enclosed bucket (assume $830,000 for equipment and its operation). · Installation and removal of silt curtain in the wetland area to control turbidity (assume 900 linear feet of silt fence). · Dust mitigation and storm water pollution prevention measures will be implemented throughout remedial action. · Short-term monitoring during construction activities. - Air quality (e.g., dust, PM_{10}, [SVOCs/VOCs]) in upland area (assume 60 samples). - Water quality (e.g., DO, temp, pH, salinity, turbidity) in wetland area (assume 60 samples). - Biological monitoring for sensitive species (assume $50,000). · 342 (total) surface soil (~200 samples) and sediment (~142 samples) confirmation samples analyzed for lead and antimony and PAHs in soil · Sediment and soil waste characterization samples collected for total metals, STLC, TCLP, 8260, 8270, TPH, 8015. (1 sample per 1000 ton). · Waste Transportation and Disposal. - Trucking of waste (not rail) to treatment/disposal facility. - Assumes 70% will be hauled as hazardous waste (requiring stabilization). - Assumes 30% will be hauled as non-hazardous waste at $45/ton. - Assume 30% soil bulking factor. - Assume ~200 miles from site to disposal facility (one way to Kettleman Hills in Kettleman City, California). · Restore existing soil, sediment, and vegetation in upland and wetland areas to original conditions. - Restore with soil/native seed mix seeding, compacted, and graded to prevent ponding of surface water. - Backfill with 1 foot of clean fill material from local source (within 20 miles) to pre-remediation site elevation. · Demobilization of equipment, materials, and personnel. · Regulatory oversight costs are not included.
Sediment Dewatering	· Excavated sediment will be transported to the drying bed in staging area using amphibious equipment (cargo buggys). · Free water on top of the sediment would be pumped out of the cargo buggy into a temporary holding tank. Dewater from the sediment drying pad would drain to the holding tank. · Dewater water from dewatering bed will drain to a holding tank and disposed as non-hazardous waste (assume 28,800 gallons). Assume ~ 1 acre area in soil upland or adjacent area

Reporting	· Final remedial action completion report and closeout report at the end of Year 2.

Notes:

bcy = bank (in-place) cubic yards
cy = cubic yard
DO = dissolved oxygen
DTSC = (California) Department of Toxic Substances Control
hr. = hour
IC = institutional control
IRP = Installation Restoration Program
lcy = loose cubic yard
LF = linear feet
NAVWPSTA = Naval Weapons Station
PM_{10} = particulate matter with particle size of 10 microns or smaller
RWQCB = Regional Water Quality Control Board
STLC = soluble threshold limit concentration
SVOC = semivolatile organic compound
TCLP = toxicity characteristic leaching procedure
TPH = total petroleum hydrocarbons
USA = Underground Service Alert
USFWS = United States Fish and Wildlife Service
VOC = volatile organic compound

TABLE B-2

Cost Estimate Details for Alternative 2

Feasibility Study Report, IRP Site 74

NAVWPSTA Seal Beach, California

Technology Name	Calendar Year 1 2015	Calendar Year 2 2016	Row Total
Capital Cost			
Remedial design			
Remedial design (including pre-design investigation)	$229,257		$229,000
Physical surveys (topographic and bathymetric)	$50,050		$50,000
Remedial action implementation			
Clear and grub	$210,978		$211,000
Fencing	$32,730		$33,000
Construct dewatering bed and decontamination area	$182,300		$182,000
Excavation including dewatering and confirmation sampling (Upland area - 8.1 acres)	$497,950		$498,000
Excavation including dewatering and confirmation sampling (Wetland area - 2 acres)	$1,118,590		$1,119,000
Sheet piling - Wetland area	$360,316		$360,000
Construction monitoring	$191,841		$192,000
Ecological/biological survey (baseline) and monitoring	$100,100		$100,000
Waste Profiling	$92,384		$92,000
Transportation of sediment to dewatering bed (includes equipment decontamination)	$310,138		$310,000
Backfill including delivery of offsite fill, spreading, and compaction	$297,851		$298,000
Upland and wetland areas restoration	$157,922		$158,000
Residual waste management (transportation and disposal; 70% hazardous and 30% nonhazardous)	$5,153,292		$5,153,000
Professional labor management	$772,884		$773,000
O&M			
Remedial action completion report		$137,168	$137,000
Close-out documentation		$56,127	$56,000
Subtotal (With Markups)	**$9,758,583**	**$193,295**	**$9,951,000**
Contingency (20 Percent)	$1,951,717	$38,659	$1,990,000
Subtotal (With Contingency and Markups)	$11,710,299	$231,954	**$11,941,000**
Escalation	$0	$0	$0
Total Cost	**$11,710,299**	**$231,954**	**$11,941,000**
NET PRESENT VALUE FACTOR [a]	1.000000	1.014199	
NET PRESENT VALUE	**$11,710,299**	**$235,247**	**$11,946,000**

Notes:

a. The net present value of future cash flows was calculated using a real discount rate of negative 1.4 (-1.4) percent per year (adjusted for inflation) from Office of Management and Budget Circular A-94 Appendix C, revised December 2012.

IRP = Installation Restoration Program

NAVWPSTA = Naval Weapons Station

O&M = operation and maintenance

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TABLE B-3
Cost Estimate Details for Alternative 3
Feasibility Study Report, IRP Site 74
NAVWPSTA Seal Beach, California

Technology Name	Calendar Year 1	Calendar Year 2	Calendar Year 3	Calendar Year 4	Calendar Year 5	Calendar Year 6	Calendar Year 7	Calendar Year 8	Calendar Year 9	Calendar Year 10	Calendar Year 11	Calendar Year 12	Calendar Year 13	Calendar Year 14
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Capital Cost														
Remedial design														
Remedial design	$152,640													
Physical surveys (topographic and bathymetric)	$50,050													
ICs implementation plan	$33,772													
Wetland mitigation design	$261,988													
Remedial action implementation														
Clear and grub	$217,484													
Fencing	$32,730													
Construct decontamination area	$145,056													
Capping (including restoration, Upland area - 8.1 acres)	$1,698,621													
Capping (including restoration, Wetland area - 2.3 acres)	$1,246,711													
Amphibious equipment - Wetland area	$995,004													
Construction monitoring	$191,841													
Ecological/biological survey (baseline) and monitoring	$100,100													
New wetland construction (2.5 acres)	$359,640													
Professional labor management	$408,539													
O&M														
ICs review and reporting	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165
Long-term monitoring					$109,006					$78,268				
Caps O&M (includes replacement of 5% of cap footprint every 10 years)		$81,046	$81,046	$81,046	$81,046	$81,046	$81,046	$81,046	$81,046	$278,063	$81,046	$81,046	$81,046	$81,046
New wetland O&M		$60,106	$60,106	$60,106	$60,106	$60,106								
Physical surveys (topographic and bathymetric, post-caps installations and every 5 years)	$50,050				$50,050					$50,050				
Five-year reviews					$46,563					$46,563				
Interim remedial action completion report		$137,168												
Final remedial action completion report														
Close-out documentation														
Subtotal (With Markups)	**$5,971,391**	**$305,485**	**$168,317**	**$168,317**	**$373,936**	**$168,317**	**$108,211**	**$108,211**	**$108,211**	**$480,109**	**$108,211**	**$108,211**	**$108,211**	**$108,211**
Contingency (20 Percent)	$1,194,278	$61,097	$33,663	$33,663	$74,787	$33,663	$21,642	$21,642	$21,642	$96,022	$21,642	$21,642	$21,642	$21,642
Subtotal (With Contingency and Markups)	$7,165,669	$366,582	$201,980	$201,980	$448,723	$201,980	$129,853	$129,853	$129,853	$576,131	$129,853	$129,853	$129,853	$129,853
Escalation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost	**$7,165,669**	**$366,582**	**$201,980**	**$201,980**	**$448,723**	**$201,980**	**$129,853**	**$129,853**	**$129,853**	**$576,131**	**$129,853**	**$129,853**	**$129,853**	**$129,853**
NET PRESENT VALUE FACTOR [a]	1.000000	0.989120	0.978358	0.967713	0.957184	0.946769	0.936468	0.926279	0.916201	0.906232	0.896372	0.886620	0.876973	0.867431
NET PRESENT VALUE	**$7,165,669**	**$362,593**	**$197,609**	**$195,459**	**$429,510**	**$191,228**	**$121,603**	**$120,280**	**$118,971**	**$522,109**	**$116,397**	**$115,130**	**$113,878**	**$112,639**

Notes:

a. The net present value of future cash flows was calculated using a real discount rate of 1.1 percent per year (adjusted for inflation) from Office of Management and Budget Circular A-94 Appendix C, revised December 2012.

IRP = Installation Restoration Program
NAVWPSTA = Naval Weapons Station
O&M = operation and maintenance

TABLE B-3
Cost Estimate Details for Alternative 3
Feasibility Study Report, IRP Site 74
NAVWPSTA Seal Beach, California

Technology Name	Calendar Year 15	Calendar Year 16	Calendar Year 17	Calendar Year 18	Calendar Year 19	Calendar Year 20	Calendar Year 21	Calendar Year 22	Calendar Year 23	Calendar Year 24	Calendar Year 25	Calendar Year 26	Calendar Year 27	Calendar Year 28
	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Capital Cost														
Remedial design														
Remedial design														
Physical surveys (topographic and bathymetric)														
ICs implementation plan														
Wetland mitigation design														
Remedial action implementation														
Clear and grub														
Fencing														
Construct decontamination area														
Capping (including restoration, Upland area - 8.1 acres)														
Capping (including restoration, Wetland area - 2.3 acres)														
Amphibious equipment - Wetland area														
Construction monitoring														
Ecological/biological survey (baseline) and monitoring														
New wetland construction (2.5 acres)														
Professional labor management														
O&M														
ICs review and reporting	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165	$27,165
Long-term monitoring	$78,268					$78,268					$78,268			
Caps O&M (includes replacement of 5% of cap footprint every 10 years)	$81,046	$81,046	$81,046	$81,046	$81,046	$278,063	$81,046	$81,046	$81,046	$81,046	$81,046	$81,046	$81,046	$81,046
New wetland O&M														
Physical surveys (topographic and bathymetric, post-caps installations and every 5 years)	$50,050					$50,050					$50,050			
Five-year reviews	$46,563					$46,563					$46,563			
Interim remedial action completion report														
Final remedial action completion report														
Close-out documentation														
Subtotal (With Markups)	**$283,092**	**$108,211**	**$108,211**	**$108,211**	**$108,211**	**$480,109**	**$108,211**	**$108,211**	**$108,211**	**$108,211**	**$283,092**	**$108,211**	**$108,211**	**$108,211**
Contingency (20 Percent)	$56,618	$21,642	$21,642	$21,642	$21,642	$96,022	$21,642	$21,642	$21,642	$21,642	$56,618	$21,642	$21,642	$21,642
Subtotal (With Contingency and Markups)	$339,710	$129,853	$129,853	$129,853	$129,853	$576,131	$129,853	$129,853	$129,853	$129,853	$339,710	$129,853	$129,853	$129,853
Escalation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Cost	**$339,710**	**$129,853**	**$129,853**	**$129,853**	**$129,853**	**$576,131**	**$129,853**	**$129,853**	**$129,853**	**$129,853**	**$339,710**	**$129,853**	**$129,853**	**$129,853**
NET PRESENT VALUE FACTOR [a]	0.857993	0.848658	0.839424	0.830291	0.821257	0.812322	0.803483	0.794741	0.786094	0.777541	0.769081	0.760713	0.752437	0.744250
NET PRESENT VALUE	**$291,469**	**$110,201**	**$109,002**	**$107,816**	**$106,643**	**$468,004**	**$104,335**	**$103,200**	**$102,077**	**$100,966**	**$261,265**	**$98,781**	**$97,706**	**$96,643**

Notes:

a. The net present value of future cash flows was calculated using a real discount rate of 1.1 percent per year (adjusted for inflation) from Office of Management and Budget Circular A-94 Appendix C, revised December 2012.

IRP = Installation Restoration Program
NAVWPSTA = Naval Weapons Station
O&M = operation and maintenance

TABLE B‑3
Cost Estimate Details for Alternative 3
Feasibility Study Report, IRP Site 74
NAVWPSTA Seal Beach, California

Technology Name	Calendar Year 29	Calendar Year 30	Row Total
	2043	2044	
Capital Cost			
Remedial design			
Remedial design			$153,000
Physical surveys (topographic and bathymetric)			$50,000
ICs implementation plan			$34,000
Wetland mitigation design			$262,000
Remedial action implementation			
Clear and grub			$217,000
Fencing			$33,000
Construct decontamination area			$145,000
Capping (including restoration, Upland area - 8.1 acres)			$1,699,000
Capping (including restoration, Wetland area - 2.3 acres)			$1,247,000
Amphibious equipment - Wetland area			$995,000
Construction monitoring			$192,000
Ecological/biological survey (baseline) and monitoring			$100,000
New wetland construction (2.5 acres)			$360,000
Professional labor management			$409,000
O&M			
ICs review and reporting	$27,165	$27,165	$815,000
Long-term monitoring		$78,268	$500,000
Caps O&M (includes replacement of 5% of cap footprint every 10 years)	$81,046	$278,063	$2,941,000
New wetland O&M			$301,000
Physical surveys (topographic and bathymetric, post-caps installations and every 5 years)		$50,050	$350,000
Five-year reviews		$46,563	$279,000
Interim remedial action completion report			$137,000
Final remedial action completion report		$137,168	$137,000
Close-out documentation		$56,127	$56,000
Subtotal (With Markups)	**$108,211**	**$673,404**	**$11,412,000**
Contingency (20 Percent)	$21,642	$134,681	$2,282,000
Subtotal (With Contingency and Markups)	$129,853	$808,085	**$13,694,000**
Escalation	$0	$0	$0
Total Cost	**$129,853**	**$808,085**	**$13,694,000**
NET PRESENT VALUE FACTOR [a]	0.736152	0.728143	
NET PRESENT VALUE	**$95,592**	**$588,401**	**$12,725,000**

Notes:

a. The net present value of future cash flows was calculated using a real discount rate of 1.1 percent per year (adjusted for inflation) from Office of Management and Budget Circular A-94 Appendix C, revised December 2012.

IRP = Installation Restoration Program
NAVWPSTA = Naval Weapons Station
O&M = operation and maintenance

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TABLE B‒4

Cost Estimate Details for Alternative 4

Feasibility Study Report, IRP Site 74

NAVWPSTA Seal Beach, California

Technology Name	Calendar Year 1	Calendar Year 2	Row Total
	2015	2016	
Capital Cost			
Remedial design			
Remedial design (including pre-design investigation)	$229,257		$229,000
Physical surveys (topographic and bathymetric)	$50,050		$50,000
Remedial action implementation			
Clear and grub	$210,978		$211,000
Fencing	$32,730		$33,000
Construct dewatering bed and decontamination area	$182,300		$182,000
Excavation including dewatering and confirmation sampling (Upland area - 8.1 acres)	$497,950		$498,000
Excavation including dewatering and confirmation sampling (Wetland area - 2 acres)	$1,072,389		$1,072,000
Amphibious excavation equipment - Wetland area	$995,004		$995,000
Construction monitoring	$191,841		$192,000
Ecological/biological survey (baseline) and monitoring	$100,100		$100,000
Waste Profiling	$92,384		$92,000
Transportation of sediment to dewatering bed (includes equipment decontamination)	$310,138		$310,000
Backfill including delivery of offsite fill, spreading, and compaction	$297,851		$298,000
Upland and wetland areas restoration	$157,922		$158,000
Residual waste management (transportation and disposal; 70% hazardous and 30% nonhazardous)	$5,172,116		$5,172,000
Professional labor management	$833,615		$834,000
O&M			
Remedial action completion report		$137,168	$137,000
Close-out documentation		$56,127	$56,000
Subtotal (With Markups)	**$10,426,625**	**$193,295**	**$10,619,000**
Contingency (20 Percent)	$2,085,325	$38,659	$2,124,000
Subtotal (With Contingency and Markups)	$12,511,950	$231,954	**$12,743,000**
Escalation	$0	$0	$0
Total Cost	**$12,511,950**	**$231,954**	**$12,743,000**
NET PRESENT VALUE FACTOR [1]	1.000000	1.014199	
NET PRESENT VALUE	**$12,511,950**	**$235,247**	**$12,747,000**

Notes:

1. The net present value of future cash flows was calculated using a real discount rate of negative 1.4 (-1.4) percent per year (adjusted for inflation) from Office of Management and Budget Circular A-94 Appendix C, revised December 2012.

IRP = Installation Restoration Program

NAVWPSTA = Naval Weapons Station

O&M = operation and maintenance

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Appendix C
Sustainability Assessment

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Appendix C

Sustainability Assessment

Feasibility Study for Installation Restoration Program Site 74

Naval Weapons Station Seal Beach
Seal Beach, California

Contract Number: N62473-09-D-2622
Contract Task Order Number 0047
Document Control Number: KCH-2622-0047-0021

November 2013

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Southwest

Prepared by

CH2M HILL Kleinfelder, A Joint Venture (KCH)
1320 Columbia Street, Suite 310
San Diego, California 92101

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Contents

Attachment

Acronyms and Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DTSC	California Department of Toxic Substances Control
FS	feasibility study
GHG	greenhouse gas
GSR	green and sustainable remediation
IRP	Installation Restoration Program
KCH	CH2M HILL Kleinfelder, A Joint Venture
MMBTU	million British thermal units
NOx	oxides of nitrogen
PM_{10}	particulate matter with particles 10 micrometers or less in diameter
SOx	oxides of sulfur
USEPA	United States Environmental Protection Agency

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C1 Introduction

CH2M HILL Kleinfelder, A Joint Venture (KCH), has prepared this sustainability assessment appendix to the Feasibility Study (FS) Report for Installation Restoration Program (IRP) Site 74, which estimates the greenhouse gas (GHG) emissions and green and sustainable remediation (GSR) metrics for remedial alternatives considered for mitigating environmental impacts to soil at Naval Weapons Station Seal Beach, Seal Beach, California. This appendix assesses remedial alternatives for IRP Site 74, hereinafter referred to as the site. Work will be performed for Naval Facilities Engineering Command Southwest, Contract Number N62473-09-D-2622, under Contract Task Order Number 0047.

Four remedial alternatives were considered for the site:

- **Alternative 1:** No action.
- **Alternative 2:** Removal of contaminated soil in the upland area and sediment in the wetland area using standard excavation equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.
- **Alternative 3:** Capping of soil in upland area and sediment in wetland area, short-term monitoring during construction activities, institutional controls, long-term monitoring, and wetland mitigation.
- **Alternative 4:** Removal of contaminated soil in the upland area using standard excavation equipment, removal of sediment in the wetland area using amphibious equipment, short-term monitoring during construction activities, onsite dewatering of sediment, offsite transportation of soil and sediment, physical/chemical treatment of soil and sediment, offsite disposal of soil and sediment, and site restoration in soil upland and wetland areas.

In addition to the comparative analysis of remedial alternatives considered in the FS, an evaluation of the sustainability of Alternatives 1, 2, 3, and 4 is included. The United States Environmental Protection Agency (USEPA) currently defines green remediation as "the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions." USEPA guidance regarding green remediation is provided in *Principles for Greener Cleanups* (USEPA, 2009) and *Methodology for Understanding and Reducing a Project's Environmental Footprint* (USEPA, 2012).

USEPA's guidance states that green remediation must meet threshold requirements for protectiveness and other site-specific cleanup objectives (i.e., the nine criteria discussed below [USEPA, 1988]). Thus, green remediation is intended to decrease the environmental footprint of the cleanup action rather than trade cleanup objectives for other environmental objectives.

The California Department of Toxic Substances Control (DTSC) guidance also describes the importance of considering sustainability in addition to the nine Comprehensive Environmental Resources Conservation and Liability Act (CERCLA) criteria (DTSC, 2009). DTSC guidance describes the importance of considering sustainability in addition to the nine CERCLA criteria as follows:

> Notwithstanding its absence in the list of criteria, sustainability should be considered as one of several factors to be examined in evaluating the environmental impact of a remedy. Some of these factors may compete with sustainability, and trade-offs may become necessary to achieve the best approach or most acceptable solution for the stakeholders.

C1.1 SiteWise™ Tool Methods

A GSR evaluation tool, known as SiteWise™, was used to perform the sustainability assessment, which was developed jointly in 2010 by the United States Army Corps of Engineers and the United States Department of the Navy to calculate the environmental footprint for various metrics (Naval Facilities Engineering Command, 2011). Input values to SiteWise™ are broken down into four phases of work: remedial investigation, remedial action construction, remedial action operation, and long-term monitoring. Within each work phase, the input values are further divided into categories: material production, transportation, equipment use, and residual handling. Detailed input values to SiteWise™ included estimated vehicle miles for personnel and equipment, amount of liner material required for the sediment dewatering bed (Alternative 2 and 4) or capping material (Alternative 3), total volume (in cubic yards) of excavated soil and sediment, volume of backfill or capping soil required, equipment (excavators) operated for each alternative including type of fuel used, and additional materials used. The eight sustainability factors evaluated include GHG emissions, total energy used, water impacts, oxides of nitrogen (NO_X) emissions, oxides of sulfur (SO_X) emissions, particulate matter with particles 10 micrometers or less in diameter (PM_{10}), accident risk (fatality), and accident risk (injury). Additional sustainability metrics considered by SiteWise™ include nonhazardous waste landfill space used, hazardous waste landfill space used, topsoil consumption, and lost hours resulting from injury of site workers.

For the purposes of this evaluation, standard equipment was assumed with conventional fuels (diesel or gasoline), with no particulate filters fitted to diesel-powered machinery. Local travel to and from the site was assumed for each phase of work (approximately 50 miles round trip). The sustainability assessment outputs from SiteWise™ for Alternatives 2, 3, and 4 are included in Attachment C-1. These include a comparative assessment of each of the sustainability factors and calculated values for each of the sustainability categories.

The following five green remediation elements are listed in USEPA's guidance documents and are relevant to selection of a GSR for the sites:

- Minimize total energy use and maximize renewable energy use.
- Minimize air pollutants and GHG emissions.
- Minimize water use and impacts to water resources.
- Reduce, reuse, and recycle materials and waste.

- Minimize land use and protect ecosystems.

USEPA guidance for reducing a project's environmental footprint (USEPA, 2012) includes the following steps:

Step 1 – Collect information about the remedy design, construction, and operation. This step includes an accounting of numerous parameters, including the remedial alternatives, conceptual design, well networks, injection points, discharge points, backfill material, types of equipment needed for construction of the alternative, and the types of equipment to be installed.

Step 2 – Quantify materials to be used from offsite and wastes that will be generated. Materials from offsite may include well casings, grout, piping, granular activated carbon, ionic resins, injectants, concrete, and others. This step accounts for recycle content of materials, and waste types and quantities.

Step 3 – Estimate the quantity of water that will be used onsite, including potable water, groundwater, stormwater, and reclaimed water.

Step 4 – Estimate the energy required and air emissions associated with each alternative, including personnel transportation, equipment and materials transportation to the site, and equipment use.

Step 5 – Qualitatively describe the affected ecosystems.

Each step is captured in the SiteWise™ GSR tool, with the exception of the qualitative assessment performed in Step 5.

C1.2 Methods for Assessing Community and Natural Resources Impacts

Community and ecological impacts were not evaluated using the SiteWise™ tool because it does not currently quantify these impacts. However, qualitative evaluations of community and ecological impacts were completed as discussed below.

Community impacts are local disturbances, economic impacts of remediation to the local community (positive and negative), and health and safety issues caused by remedial activities, such as: noise; traffic issues; impacts to roadways due to truck traffic; odor; dust; and emissions of volatile compounds or other contaminants. IRP Site 74 is located within the active facility near the active small arms range; therefore, impacts to the immediate community are likely to minimal. The users of the small arms range will be impacted because the range will need to be closed during the remediation activities; however, the impact due to closure would be the same for all alternatives.

The USEPA-recommended element called "Protect Land and Ecosystems" is addressed in this sustainability assessment using a metric called "Net High Quality Acre-Equivalents." Estimating the value of the metric involves tracking habitat quality changes. The metric is referred to as "net" because it is based on the comparison of the expected outcome of an alternative to no further action. Acreages are normalized to high quality equivalents so that alternatives can be compared on the same basis.

Under this approach, one of three natural resource quality rankings is assigned to affected habitats: low, medium, or high. A high quality habitat would be represented by a value of 1, a medium quality habitat as two/thirds the value of a high quality habitat (i.e., 0.67), and a low quality habitat as one/third the value of a high quality habitat (i.e., 0.33). This method of assigning value makes the difference in value between a high and medium quality habitat and a medium and low quality habitat the same and acknowledges that low quality habitats do provide value. Quality ratings are based on a variety of factors. Examples of potential indicators for high and low quality habitats are listed below. Medium quality habitats may have some of the high quality indicators but do not fall within the high quality rating.

- High quality habitat indicators
  - Threatened and endangered species present
  - Critical for wildlife reproduction
  - Locally rare habitat
  - Scores in the top tier of an index
  - Provides services in high demand by the public (e.g., recreation or water supply)
- Low quality
  - Maintained landscape
  - Small isolated area
  - Ecological risks associated with the presence of contamination
  - Contains high percentage cover of invasive plant species
  - Scores in the bottom tier of an index

While there is subjectivity in assigning values, the analysis is relative. As a result, the key to a quality analysis is maintaining a consistent approach.

At IRP Site 74, five habitat types are present in the potential remediation footprint: middle salt marsh, upper salt marsh, open mud flat (non-tidal), annual grassland, and disturbed. Most of the annual grassland habitat type is present between Case Road and a complex of buildings. This juxtaposition indicates a high likelihood of the presence of invasive species, and consequently this habitat type is rated as “Low” quality in the pre-remedy state. The disturbed habitat type is also rated “Low” quality for the same reason. The salt marsh and mud flat habitats are rated “Medium” quality. Although they are currently used by sensitive species (rails, Belding’s sparrow), contamination is present.

The analysis for IRP Site 74 did not address staging areas, nor did it include the net uplift that may be created through any required off-site mitigation. In addition, it is important to note that quality values estimated for the post-remedy condition are based on the future state that is likely to evolve naturally or to be attained via customary habitat management obligations.

C2 Remedial Alternatives Assessment

This section describes the key components of the remedial alternatives and site-specific assumptions and parameters used for the sustainability assessment. Assumptions for each alternative are described in the body of the FS as shown in Tables C-1, C-2, C-3.

C2.1 Alternative 1 – No Action

Alternative 1, no action, would leave affected media in their existing state at each site, with no remedial measures or land use controls to prevent potential exposure by receptors to constituents of concern. No active remediation, inspections, reviews, or groundwater monitoring would be performed under this alternative.

The no action alternative provides a baseline against which other remedial alternatives are compared. This alternative would not include any activities to achieve remedial action objectives. If implemented, this alternative would be considered a final remedy for the sites listed above. No monitoring or periodic reviews would be conducted to verify the protectiveness of the no action alternative.

C2.1.1 Greenhouse Gas Emissions

The no action alternative would not generate GHG emissions.

C2.1.2 Additional Quantitative GSR Metrics

The no action alternative would not require the use of energy or water; would not result in the generation of NOx, SOx, or PM_{10}; and would not cause increased risks (fatality or injury) to workers or cause lost hours (injury) during implementation. In addition, Alternative 1 would not consume nonhazardous waste landfill space, hazardous waste landfill space, or topsoil.

C2.1.3 Community and Natural Resource GSR Metrics

The no action alternative would continue to provide medium to low quality habitat at IRP Site 74 with impacts to natural resources from the presence of contamination. No impacts would occur to the community because no action would be implemented.

C2.2 Alternative 2 – Removal of Contaminated Soil in Upland Area and Sediment in Wetland Area Using Standard Excavation Equipment

Alternative 2 includes the following components that are relevant to the overall sustainability footprint:

- Transportation of personnel to and from the site during cleanup actions.

- Production and transportation of materials and equipment by truck (soil for backfill, liner material for sediment dewatering bed, crane mat, and excavators). SiteWise™ does not have a default assumption for wood products. The GHG emissions and total energy requirements estimate for production of crane mats were obtained from Puettmann and Wilson (2005).
- Construction and removal of sheet piling along the wetland perimeter.
- Removal of contaminated soil (13,100 bank cubic yards) in the upland area and sediment (3,230 bank cubic yards) in the wetland area using standard excavation equipment. A 30 percent expansion factor for the soil and a 10 percent expansion factor for the sediment were assumed.
- Onsite dewatering of sediment in a lined bed.
- Offsite transportation of soil, sediment, and dewatering water to landfills, as described in the FS.
- Site restoration in soil upland and wetland areas, including backfilling with imported soil to pre-removal elevations.
- Onsite personnel hours were used as an overall estimate of potential accident risk.

Onsite personnel hours and transportation trips were estimated using the following assumptions: average of 12 workers (3 oversight/construction managers/health and safety officer, 6 laborers/other personnel, 3 operators) onsite for 12 hours per day, 6 days per week, for a 26-week duration of work (156 days). Preparation of work plans, designs, and reports was not included in this analysis.

Detailed assumptions used in the SiteWise™ model are provided in Table C-1.

C2.2.1 Greenhouse Gas Emissions

The GHG potentially emitted during implementation of Alternative 2 is approximately 2,904 metric tons, primarily from consumables (liner and lime manufacturing, and borrow pit operations for fill soil), and from transporting excavated soil and sediment to the landfills. Transportation of personnel and equipment used onsite contributed a small portion of the total GHG footprint.

A summary of results is included in Attachment C-1.

C2.2.2 Additional GSR Metrics

Alternative 2 would require the use of energy to fuel vehicles and construction equipment, and to transport wastes to a waste disposal facility. Approximately 32,900 million British thermal units (MMBTUs) of energy would be required to implement Alternative 2. Emissions of approximately 2.6 metric tons of NO_X, 1.15 metric tons of SO_X, and 5.76 metric tons of PM_{10} would occur almost exclusively from transportation of wastes. Approximately 97,200 gallons of water are estimated for dust control during excavation operations. Increased risk to workers would generate approximately 5.5 lost-time hours caused by a combination of onsite labor hours and transportation. In addition, approximately 25,000 metric tons of nonhazardous landfill capacity, 6,200 tons of hazardous landfill capacity, and 21,000 cubic yards of topsoil would be consumed during implementation of this alternative.

C2.2.3 Community and Natural Resource GSR Metrics

The community would be impacted by this alternative because of increased traffic to haul equipment and materials and/or excavated soil and sediment during the remedial activities. Furthermore, users of the small arms range would be impacted by closures during remediation activities.

Five habitat types are impacted by this alternative: middle salt marsh, upper salt marsh, open mud flat, annual grassland, and disturbed. In the pre-remedy state, these lands together provide 6.22 acres of high quality acre-equivalents (Table C-4). The post-remedy state would provide 8.96 acres of high quality acre-equivalents, as the quality of each habitat type would be improved with the exception of the middle salt marsh. Removal of contaminants from the middle salt marsh would improve quality, but use of sheet piling, dewatering, and standard excavation equipment is likely to diminish that effect. The approach could cause soil compaction, permanent alteration of water movement, and/or the creation of anaerobic sediments. Overall, the net high quality acre-equivalents that would be provided by this alternative is estimated to be 2.73 acres, which equates to a positive outcome with respect to ecological impact.

GSR metrics for implementation of Alternative 2 at the Site are included in Attachment C-1.

C2.3 Alternative 3 – Capping Contaminated Soil in Upland Area and Sediment in Wetland Area

Alternative 3 includes the following components that are relevant to the overall sustainability footprint:

- Transportation of personnel to and from the site during the cleanup action.
- Transportation of materials equipment by truck (soil and other materials for cap, compactors, excavators).
- Manufacturing liner material for the soil cap and AquaBlok® for sediment cap (AquaBlok® is primarily composed of bentonite clay, which is included in the SiteWise™ tool. Bentonite was used as a proxy to estimate the sustainability footprint of AquaBlok®).
- Placing the cap in the upland area and sediment in wetland area using standard equipment (excavators and rollers for compaction).
- Constructing a wetland at a different location to mitigate the loss of wetlands during capping.
- Long-term monitoring, which includes visual inspections, physical surveys, and cap maintenance for 30 years.
- Onsite personnel hours were used as an overall estimate of potential accident risk.

Onsite personnel hours and transportation trips were estimated using the following assumptions: average of 10 workers (3 oversight/construction managers/health and safety officer, 5 laborers/other personnel, 2 operators) onsite for 12 hours per day, 6 days per week, for a 26-week duration of work (156 days). Preparation of work plans, designs, and reports was not included in this analysis.

A wetland with 10 percent more area than the capped wetland area would be constructed to offset the loss of habitat. While this is a GSR best practice, it is not currently quantified in SiteWise™. An additional 14 days is assumed for wetland construction.

Detailed assumptions used in the SiteWise™ model are provided in Table C-2.

C2.3.1 Greenhouse Gas Emissions

Alternative 3 has the potential to generate approximately 2,180 metric tons of GHG emissions, primarily as a result of the manufacture of consumables (soil handling at a borrow pit for capping material, liner manufacturing, and AquaBlok® production) and transportation of consumables. Transportation of personnel and equipment use contributed to approximately 5 percent of the total potential GHG emissions.

A summary of results is included in Attachment C-1.

C2.3.2 Additional GSR Metrics

Alternative 3 would require the use of energy to fuel vehicles to transport personnel, equipment, and capping materials, and to fuel the construction equipment to place the cap. Approximately 39,000 MMBTUs of energy would be required to implement this alternative. Approximately 46,000 gallons of water would be consumed primarily for dust suppression during construction activities. Emissions of approximately 0.44 metric ton of NO_X, 0.052 metric ton of SO_X, and 0.037 metric ton of PM_{10} would occur because of transportation of capping materials and use of equipment. In addition, 6.6 hours of lost time resulting from injury is estimated from onsite labor hours and vehicle accident risks. In addition, 15,000 cubic yards of topsoil would be consumed during this alternative. No nonhazardous and hazardous landfill space would be consumed during this alternative.

C2.3.3 Community and Natural Resource GSR Metrics

The community would be impacted by this alternative because of increased traffic to haul equipment and materials to the site; however, because soil and sediment would not be excavated, traffic impacts would be less than Alternatives 2 and 4. Furthermore, users of the small arms range would be impacted by closures during remediation activities.

This alternative applies to the same habitat types as Alternative 2, but includes an additional 0.37 acre of disturbed land between the upland and wetland areas. Capping east of the Case Road would likely decrease quality by replacing current habitat types with a low permeability, low diversity grass cover. With the AquaBlok® cap on the east side of the road, the area would be returned to a wetland environment but, due to the cap, will not likely attain a value of “High.” It assumed that the middle salt marsh would remain “Medium” and the current disturbed area next to Case Road would remain “Low.” High quality acre-equivalents would be expected to be reduced from 6.35 acres to 4.15 acres, a net of -2.20 acres. This equates to a negative outcome with respect to ecological impact.

GSR metrics for implementation of Alternative 3 at the Site are included in Attachment C-1.

C2.4 Alternative 4 - Removal of Contaminated Soil in Upland Area Using Standard Excavation Equipment and Sediment in Wetland Area Using Amphibious Excavation Equipment

Alternative 4 includes the same components as Alternative 2, except the sediment excavation portion would be completed using marsh buggies instead of traditional excavators. The marsh buggies would allow excavation without installing sheet piling to divert water. It is assumed that the sediment excavated using marsh buggies will be more saturated and will require treatment of more decant water.

Onsite personnel hours and transportation trips were estimated using the following assumptions: average of 12 workers (3 oversight/construction managers/health and safety officer, 6 laborers/other personnel, 3 operators) onsite for 12 hours per day, 6 days per week, for a 26-week duration of work (156 days). Preparation of work plans, designs, and reports was not included in this analysis.

Detailed assumptions used in the SiteWise™ model are provided in Table C-3.

C2.4.1 Greenhouse Gas Emissions

The GHG potentially emitted during implementation of Alternative 4 is approximately 2,886 metric tons, mostly from consumables (liner manufacturing, lime production, and borrow pit operations for fill soil) and from transporting excavated soil and sediment to the landfills. Transportation of personnel and equipment contributed a small portion of the total GHG footprint (less than 10 percent).

A summary of results is included in Attachment C-1.

C2.4.2 Additional GSR Metrics

Alternative 4 would require the use of energy to fuel vehicles and construction equipment, and to transport wastes to a waste disposal facility. Approximately 32,700 million MMBTUs of energy would be required to implement Alternative 4. Approximately 107,000 gallons of water would be consumed or lost during execution of this alternative. Emissions of approximately 2.4 metric tons of NO_X, 1.2 metric tons of SO_X, and 5.75 metric tons of PM_{10} would occur primarily from transportation of wastes. Increased risk to workers would generate approximately 5.5 lost-time hours caused by onsite labor hours. In addition, approximately 25,000 tons of nonhazardous landfill capacity, 6,200 tons of hazardous landfill capacity, and 21,000 cubic yards of topsoil would be consumed during implementation of this alternative.

C2.4.3 Community and Natural Resource GSR Metrics

The community would be impacted by this alternative because of increased traffic to haul equipment and materials and/or excavated soil and sediment during the remedial activities. Furthermore, users of the small arms range would be impacted by closures during remediation activities.

From a habitat quality standpoint, Alternative 4 and Alternative 2 are the same, with the exception that amphibious equipment is specified for use in the middle salt marsh in Alternative 4. The use of amphibious equipment is likely to cause less damage. In the pre-remedy state, this alternative provides 6.22 acres of high quality acre-equivalents. The post-remedy state provides 9.60 acres of high quality acre-equivalents, as the quality of each habitat type is improved. The net high quality acre-equivalents provided by this alternative is estimated to be 3.38 acres. This equates to a positive outcome with respect to ecological impact.

GSR metrics for implementation of Alternative 4 at the site are included in Attachment C-1.

C3 Comparative Analysis of Alternatives

A comparative evaluation of sustainability assessment results for remedial alternatives is presented in this section.

C3.1 Comparative Analysis of Alternatives for Greenhouse Gas Emissions

Alternative 1 would not result in GHG emissions. Alternative 3 would result in fewer GHG emissions than Alternatives 2 and 4 as a result of the residual handling (waste transportation), transportation of personnel, and use of equipment. Approximately half of the GHG emissions generated by Alternatives 2 and 4 would be generated during residual handling (offsite transport of wastes). The other half would be generated during operations at the borrow pit where clean fill is extracted.

C3.2 Comparative Analysis of Alternatives for Additional GSR Metrics

A comparison of GSR parameters is presented below:

- **Total energy used.** Alternative 3 would require the most energy use compared with Alternatives 2 and 4. Alternative 1 would not use any energy.
- **Water impacts.** Alternative 4 would consume slightly more water than Alternatives 2 and 3 because of the dust suppression required and the volume of groundwater lost through the dewatering process. Water from dewatering would be taken offsite to a treatment plant and would be lost from the site. Alternative 3 uses the least amount of water because there is no water loss from dewatering activities, and less water is used during construction than excavation. Alternative 1 would not require the use of water.
- **Nitrogen oxide emissions.** Alternatives 2 and 4 would generate significantly more NO_X emissions than Alternative 3 because Alternatives 2 and 4 have a greater need for residual handling (waste transportation). Alternative 1 would not result in NO_X emissions.
- **Sulfur oxide emissions.** Alternatives 2 and 4 would generate significantly more SO_X emissions than Alternative 3 because Alternatives 2 and 4 have a greater need for residual handling (waste transportation). Alternative 1 would not result in SO_X emissions.
- **Particulate emissions.** Alternatives 2 and 4 would generate a higher quantity of PM_{10} emissions than Alternative 3 because Alternatives 2 and 4 have a greater need for residual handling (waste transportation). Alternative 1 would not generate PM_{10} emissions.

- **Accident risk – fatality.** Alternative 3 would result in an increased risk of fatality for site workers than Alternatives 2 and 4 because Alternative 3 includes more miles driven for consumables transportation to the site. Alternative 1 would not result in increased risk to site workers.
- **Accident risk – injury.** Alternative 3 would result in an increased risk of fatality for site workers than Alternatives 2 and 4 because Alternative 3 includes more miles driven for consumables transportation to the site. Alternative 1 would not result in increased risk to site workers.

Of the GSR factors evaluated, Alternatives 2 and 4 ranked least favorably in five of the eight sustainability factors. Alternative 3 ranked least favorably in three of eight evaluation factors. The greatest overall impacts for Alternatives 2 and 4 are related to residual handling and transportation, and impacts from the manufacturing of the consumables required (primarily for GHG and energy use).

Additional sustainability metrics considered by SiteWise™ include nonhazardous waste landfill space used, hazardous waste landfill space used, topsoil consumption, and lost hours resulting from injury of site workers. Comparison of these alternatives, with respect to these additional sustainability metrics, is discussed below:

- **Nonhazardous waste landfill space used.** Alternatives 2 and 4 would require the same volume of nonhazardous waste landfill space. Alternatives 1 and 3 would not consume nonhazardous landfill space.
- **Hazardous waste landfill space used.** Alternatives 2 and 4 would require the same volume of hazardous waste landfill space. Alternatives 1 and 3 would not consume hazardous landfill space.
- **Topsoil consumption.** Alternatives 2, 3, and 4 would require the use of topsoil for backfilling excavations. Alternative 3 would require less topsoil than Alternatives 2 and 4. Alternative 1 would not require topsoil for backfill material.
- **Lost-hours injury.** Alternative 3 would result in slightly more lost time resulting from injury to workers than Alternatives 2 and 4. Alternative 1 would not result in lost time resulting from injury to workers.

Some uncertainties are inherent within the SiteWise™ model; for example, the type of equipment assumed in the alternatives could affect the overall evaluation significantly. Varying the assumptions built into the FS, such as the overall duration of alternatives, and the frequency of operations and maintenance, would have a substantial effect on the results of the SiteWise™ model.

The use of proxy data such as bentonite for AquaBlok® may under-estimate or over-estimate the actual impacts of the consumable. Additionally, SiteWise™ only accounts for the GHG and total energy of consumable manufacturing and may be underestimating impacts in the other GSR categories.

Tables

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Table C-1
Alternative 2 SiteWise Entry Assumptions
Sustainability Assessment
Feasibility Study for Installation Restoration Program Site 74
Naval Weapons Station Seal Beach, Seal Beach, California

SITEWISE TAB	Assumptions
Remedial Action Construction	Removal of Contaminated Soil in the Upland Area and Sediment in the Wetland Area (by Long-Reach Excavator), Short-Term Monitoring, Onsite Sediment Dewatering, Transportation, Offsite Physical/Chemical Treatment, Offsite Disposal, and Site Restoration
Material Production	Drying Bed Liner Material (40-mil polymetric liner and geocomposite drainage layer) - proxy 40-mil poly liner for both layers: 1 acre area (43,560 ft2) x 0.04 inches (0.00333 ft) x 2
	Crane Mats - 1,000 board feet (1 ft long by 1 ft wide by 1 inch thick) = 83.3 cubic feet
	Lime for stabilization - 1,613 cy (43,551 ft3)
	Backfill Soil - 20,583 cy (x27 = 555,741 ft3)
Personnel Transportation - Road	156 days of work, average 12 people traveling to site per day, 50 miles round trip (1,872 trips total)
Equipment Transportation - Road	Liner Material Transportation - 8.7 tons transported 100 miles one way
	Sheet Piling materials (assume reusable so no manufacture burden for onsite use) - 40 tons of material brought onsite by truck, 200 miles one way
	Crane Mats - 83.3 cubic feet = approximately 2.4 m3 x 700 kg/m3 = 1,670 kg required (1.67 tons transported 200 miles)
	Heavy Equipment Transportation - 40 tons transported 50 miles one way
	Backfill Soil - 20,583 cy (x1.5 = 30,875 tons) transported in 40 ton loads 20 miles one way (773 trips full and empty)
	Empty - 773 trips of 20 miles for soil, 100 miles empty for liner, 50 miles empty for equipment, 200 miles empty for Sheet piling = 15,810 miles total
Equipment Use	Soil and sediment - Excavator moving a total of 20,583 cy of material three times (once out of the ground/wetland, once from stockpile/dewater area to dump trucks, and same volume for backfill) = 61,750 cy
	Sheet Piling installation - assume internal combustion engine w/diesel consumption of 10 gallons per hour (equivalent to mid-sized excavator) used to install and remove sheet piling, approximately 150 hours of up-time
	Lime Mixing - Equipment to mix 1,613 cy, assume backhoe used to mix into soil for stabilization
	Grading/Compacting - Assume compactor/grader covers entire area twice (10.1 acres x 43,560 x 2 = 879,912 square feet)
Residual Handling/Fill Material Transport	Non-hazardous soil/sediment - 70 miles per trip, 40 tons, 618 trips
	Hazardous Soil/Sediment - 200 miles per trip, 40 tons full, 115 trips
	Water from dewatering - 19,200 gallons total, 5,000 gallons per trip (21 tons) transported 70 miles to wastewater treatment plant (4 trips)
Resource Consumption	Water Use - 78,000 gallons (500 gallons per day x 156 days)
	Water disposed at treatment plant - 19,200 gallons
	Water lost onsite - 19,200 gallons (dewatering to wastewater treatment plant)
	Topsoil consumed (fill) - 20,583 cy
Labor Hours Onsite	12 people working 12-hr days for 156 days = 22,464 hours

Table C-2
Alternative 3 SiteWise Entry Assumptions
Sustainability Assessment
Feasibility Study for Installation Restoration Program Site 74
Naval Weapons Station Seal Beach, Seal Beach, California

SITEWISE TAB	Assumptions
Remedial Action Construction	
Material Production	Soil Cap - HDPE liner (0.00167 ft thick, 352,836 ft2 area)
	Soil Cap - Top soil fill (352,836 ft3)
	Soil Cap - Low permeability soil fill (352,836 ft3)
	Sediment/Wetland - AquaBlok (proxy bentonite) - 50,094 ft3
Personnel Transportation - Road	170 days of work, average 10 people traveling to site per day, 50 miles round trip
Equipment Transportation - Road	Capping Equipment - 40 tons of equipment 50 miles
	Wetland construction equipment - 40 tons, 50 miles
	Excavators - 40 tons, 50 miles
	HDPE Liner - 17.7 tons transported 200 miles one way
	Soil for backfill - 490 trips, 40 tons each, 20 miles one way (9,800 miles full/empty) Two times (one for low permeability and one for topsoil, assume local source)
	AquaBlok - 53 trips, 40 tons each, 2,300 miles one way (121,900 miles full/empty)
	Empty Trips - 141,850 miles
Equipment Use	Excavators - assume moves low permeability soil, topsoil, and AquaBlok (13,068 yd3 + 13,068 yd3 + 1,855 yd3 = 27,975 yd3)
	New Wetland Construction - Excavator or equivalent moving the the amount of soil covering 2.5 acres (108,900 ft2) to 2 ft deep = 8,000 yd3
	Capping - Roller over 10.1 acres x 43,560 = 439,956 square feet)
Labor Hours Onsite	10 people working 12-hr days (156 days construction, Crew of 10 working 14 days on wetland construction) = 20,400 hours
Resource Consumption	Water Use - 39,000 gallons (250 gallons per day x 156 days of construction)
	Topsoil consumed (fill) - 13,070 cy
LTM	Cap Maintenance
Material Production	Cap replacement (5% of original cap 3 times)
	Soil Cap - 5% of original Soil fill (17,641 ft3) x 3 = 52,924 ft3
	Soil Cap - 5% of original low permeability soil fill (17,641 ft3) x 3 = 52,924 ft3
	Sediment/Wetland - 5% of original AquaBlok (proxy bentonite) - 2,504 ft3 x 3 = 7,513 ft3
Personnel Transportation - Road	Annual visual inspection (1 person, 30 trips, 50 miles round trip)
	Wetland Inspection - (2 people, 5 trips, 50 miles round trip)
	Physical Survey (2 people, 50 miles round trip, 6 events, 2 trips per event = 12 trips total)
	Visual inspection and sampling after storm event (2 people, 6 trips, 50 miles round trip)
	Maintenance trips (3 events, 10 people, separate vehicles, 50 miles round trip, 240 trips total)
Equipment Transportation - Road	Excavator - 20 tons, 50 miles x 3 trips
	Cap materials - 1,400 yd3 each event (2,100 tons material, 53 trips, 40 tons each, average 100 miles each way to account for Aquablok shipments if needed), 15,900 miles total (53 x 100 x 3)
	Empty Trips - 16,050 miles
Equipment Use	Excavator assume moves 5% of original cap (5% of 27,975 yd3 = 1,400 yd3) every 10 years for total of 4,200 yd3
Resource Consumption	Water Use - 6,750 gallons (250 gallons per day x 9 days x 3 events)
	Topsoil consumed (5% of original x 3) = 1,960 yd3
Labor Hours Onsite	4,000 hours (wetland inspections 5 x 10hrs x 2 people, visual inspection 30x10 hours= 300 hrs, survey 2 people x 2 x 10 hr days x 6 events = 240 hrs, visual inspection and sampling 2 people x 1 x 10 hour day x 6 events = 120 hrs, maintenance 10 people x 9 x 12 hour days x 3 events = 3,240 hrs)

Table C-3
Alternative 4 SiteWise Entry Assumptions
Sustainability Assessment
Feasibility Study for Installation Restoration Program Site 74
Naval Weapons Station Seal Beach, Seal Beach, California

SITEWISE TAB	Assumptions
Remedial Action Construction	Removal of Contaminated Soil in the Upland Area and Sediment in the Wetland Area (by Long-Reach Excavator), Short-Term Monitoring, Onsite Sediment Dewatering, Transportation, Offsite Physical/Chemical Treatment, Offsite Disposal, and Site Restoration
Material Production	Drying Bed Liner Material (40-mil polymetric liner and geocomposite drainage layer) - proxy 40-mil poly liner for both layers: 1 acre area x 0.04 inches x 2
	Lime for stabilization - 1,613 cy x 27 = 43551 ft3
	Backfill Soil - 20,583 cy (x27 = 555,741 ft3)
Personnel Transportation - Road	156 days of work, average 12 people traveling to site per day, 50 miles round trip (1,872 trips total)
Equipment Transportation - Road	Liner Material Transportation - 8.7 tons transported 200 miles one way
	Heavy Equipment Transportation - 40 tons transported 50 miles
	Backfill Soil - 20,583 cy (x1.5 = 30,875 tons) transported in 40 ton loads 20 miles one way (773 trips full and empty)
	Empty - 773 trips of 20 miles for soil, 100 miles empty for liner, 50 miles empty for equipment= 15,610 miles total
Equipment Use	Soil and sediment - Excavator moving a total of 20,583 cy of material three times (once out of the ground/wetland, once from stockpile/dewater area to dump trucks, and same volume for backfill) = 61,750 cy
	Lime Mixing - Equipment to mix 1,613 cy, assume backhoe used to mix into soil for stabilization
	Grading/Compacting - Assume compactor/grader covers entire area twice (10.1 acres x 43,560 x 2 = 879,912 ft2)
Residual Handling/Fill Material Transport	Non-hazardous soil/sediment - 70 miles per trip, 40 tons, 618 trips
	Hazardous Soil/Sediment - 200 miles per trip, 40 tons full, 115 trips
	Water from dewatering - 28,800 gallons total, 5,000 gallons per trip (21 tons) transported 70 miles to wastewater treatment plant (6 trips)
Resource Consumption	Water Use - 78,000 gallons (500 gallons per day x 156 days)
	Water disposed at treatment plant - 19,200 gallons
	Water lost onsite - 28,800 gallons (dewatering to wastewater treatment plant)
	Topsoil consumed (fill) - 20,583 cy
Labor Hours Onsite	12 people working 12-hr days for 156 days = 22,464 hours

Table C-4
Comparison of Net High Quality Acre-Equivalents, by Alternative
Sustainability Assessment
Feasibility Study for Installation Restoration Program Site 74
Naval Weapons Station Seal Beach, Seal Beach, California

	Before Remedy Implementation				**After Remedy Implementation**				**Net High Quality Acre-Equivalents**
Alternative	Habitat Type	Acreage	Quality	High Quality Acre-Equivalents	Habitat Type	Acreage	Quality	High Quality Acre-Equivalents	
2. Removal with standard excavation equipment	Middle Salt Marsh	1.94	M	1.29	Middle Salt Marsh	1.94	M	1.29	
	Upper Salt Marsh	5.48	M	3.65	Upper Salt Marsh	5.48	H	5.48	
	Open Mud Flat	1.11	M	0.74	Open Mud Flat	1.11	H	1.11	
	Annual Grassland	1.45	L	0.483	Annual Grassland	1.45	M	0.97	
	Disturbed	0.16	L	0.053	Disturbed	0.16	M	0.11	
TOTAL		10.14		6.22		10.14		8.96	2.73
3. Capping	Middle Salt Marsh	1.94	M	1.29	Middle Salt Marsh	1.94	M	1.29	
	Upper Salt Marsh	5.48	M	3.65	Upper Salt Marsh	5.48	L	1.83	
	Open Mud Flat	1.11	M	0.74	Open Mud Flat	1.11	L	0.37	
	Annual Grassland	1.45	L	0.483	Annual Grassland	1.45	L	0.48	
	Disturbed	0.53	L	0.177	Disturbed	0.53	L	0.18	
TOTAL		10.51		6.35		10.51		4.15	-2.20
4. Removal with standard and amphibious excavation equipment	Middle Salt Marsh	1.94	M	1.29	Middle Salt Marsh	1.94	H	1.94	
	Upper Salt Marsh	5.48	M	3.65	Upper Salt Marsh	5.48	H	5.48	
	Open Mud Flat	1.11	M	0.74	Open Mud Flat	1.11	H	1.11	
	Annual Grassland	1.45	L	0.483	Annual Grassland	1.45	M	0.97	
	Disturbed	0.16	L	0.053	Disturbed	0.16	M	0.11	
TOTAL		10.14		6.22		10.14		9.60	3.38

Notes:
H: High
L: Low
M: Medium

Attachment C-1

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Remedial Alternatives	GHG Emissions	Total energy Used	Water	NO_x emissions	SO_x Emissions	PM_{10} Emissions	Accident Risk Fatality	Accident Risk Injury
	metric ton	MMBTU	gallons	metric ton	metric ton	metric ton		
Alternative 2	2904.00	3.29E+04	9.72E+04	2.57E+00	1.15E+00	5.76E+00	4.10E-03	6.85E-01
Alternative 3	2476.73	3.87E+04	4.58E+04	4.41E-01	5.18E-02	3.72E-02	5.50E-03	8.27E-01
Alternative 4	2885.95	3.27E+04	1.07E+05	2.44E+00	1.15E+00	5.75E+00	4.10E-03	6.85E-01

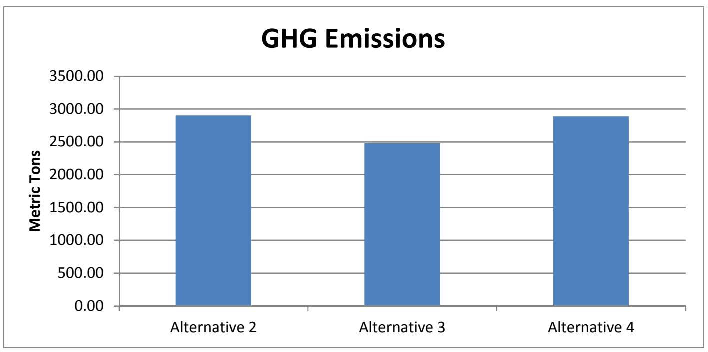
Additional Sustainability Metrics

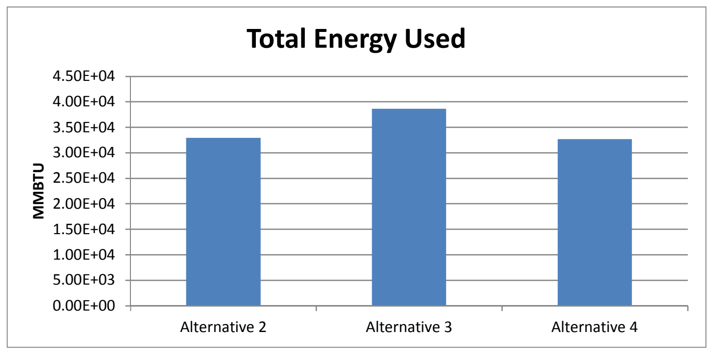
Remedial Alternatives	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury	Final Cost with Footprint Reduction
	tons	tons	cubic yards	$		$
Alternative 2	24700.00	6.18E+03	2.06E+04	0.00E+00	5.48E+00	0.00E+00
Alternative 3	0.00	0.00E+00	1.50E+04	0.00E+00	6.62E+00	0.00E+00
Alternative 4	24700.00	6.18E+03	2.06E+04	0.00E+00	5.48E+00	0.00E+00

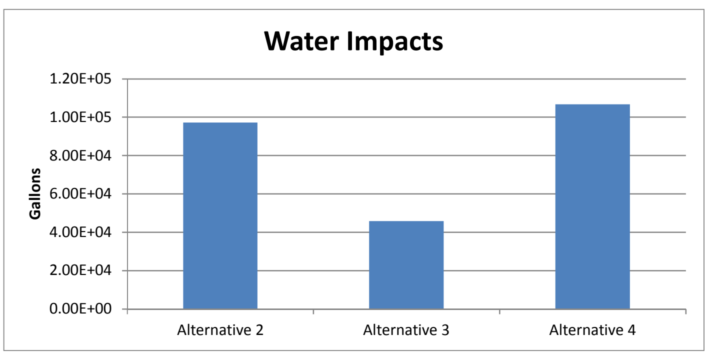
Relative Impact

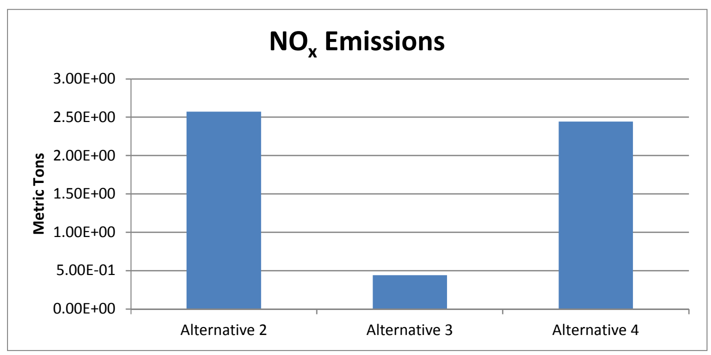
Remedial Alternatives	GHG Emissions	Energy Usage	Water Usage	NOx emissions	SOx Emissions	PM10 Emissions	*Accident Risk Fatality	*Accident Risk Injury	Community Impacts	Resources Lost
Alternative 2	High	High	High	High	High	High	High	High	Medium	Medium
Alternative 3	High	High	Medium	Low	Low	Low	High	High	Low	High
Alternative 4	High	High	High	High	High	High	High	High	Medium	Low

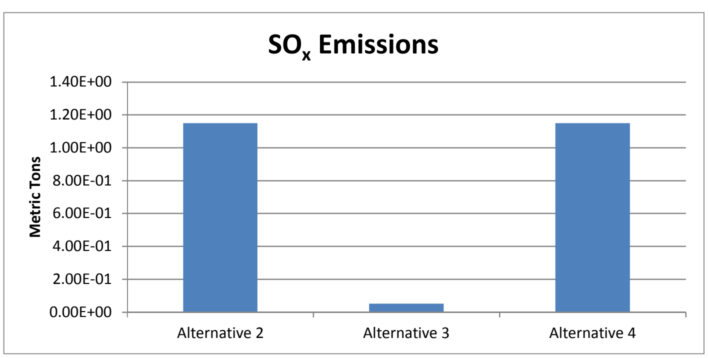
*Accident Risk is an estimate of how many accidents may occur. This risk is not the same as Cancer Risk, which is the probablity (for a single person) of getting cancer. Accident risk is not comparable to Cancer Risk due to inherent fundamental differences.

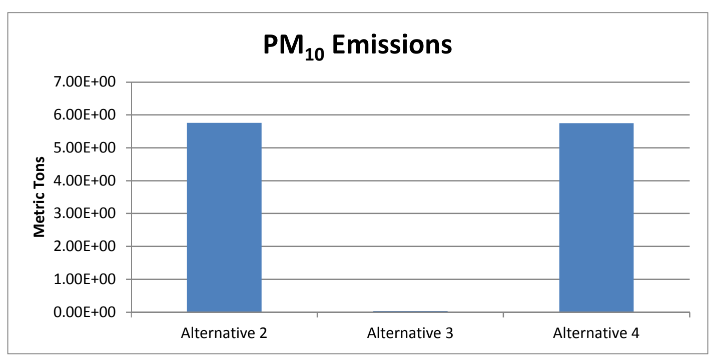


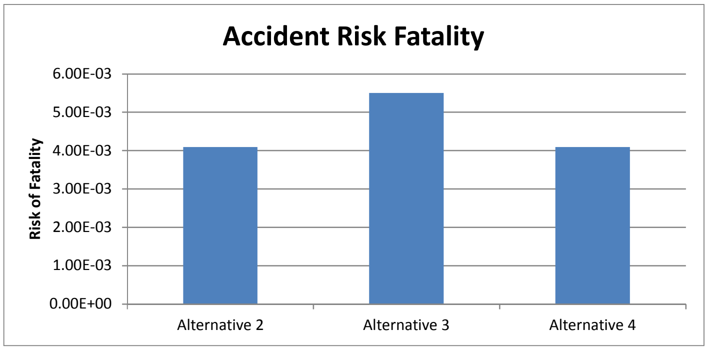


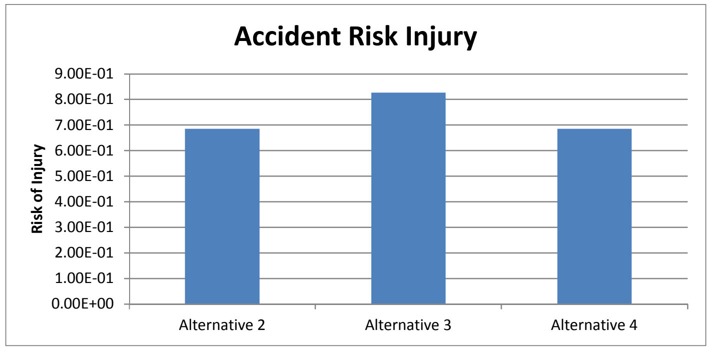


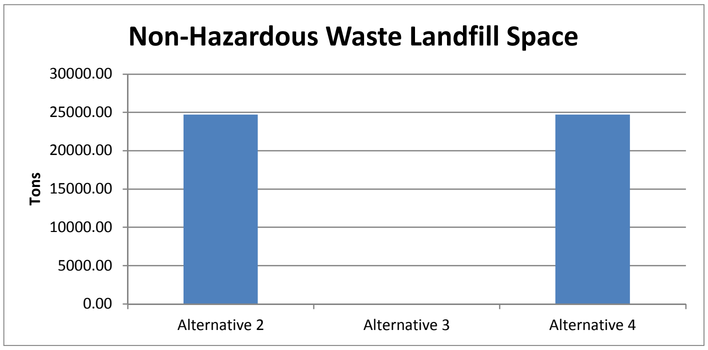


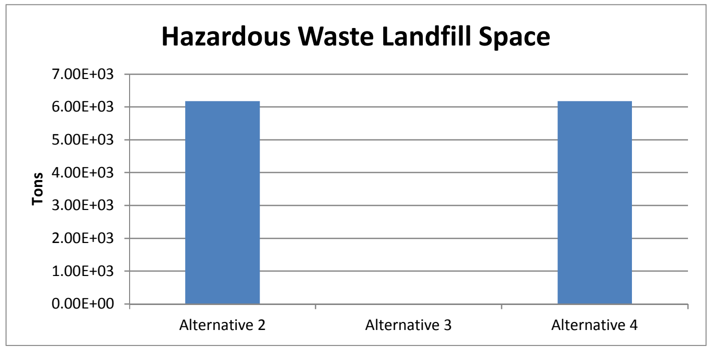


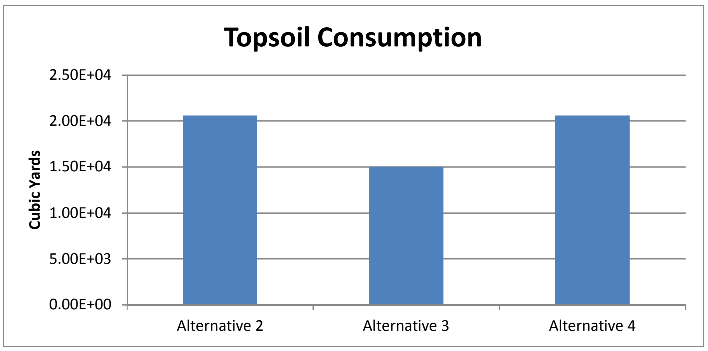


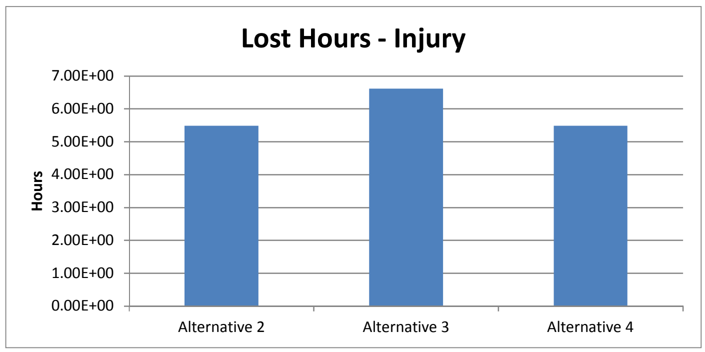

Accident Risk Fatality
Risk of Fatality
6.00E-03
5.00E-03
4.00E-03
3.00E-03
2.00E-03
1.00E-03
0.00E+00
Alternative 2
Alternative 3
Alternative 4


Accident Risk Injury
Risk of Injury
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alternative 2
Alternative 3
Alternative 4


Non-Hazardous Waste Landfill Space
Tons
30000.00
25000.00
20000.00
15000.00
10000.00
5000.00
0.00
Alternative 2
Alternative 3
Alternative 4


Hazardous Waste Landfill Space
Tons
7.00E+03
6.00E+03
5.00E+03
4.00E+03
3.00E+03
2.00E+03
1.00E+03
0.00E+00
Alternative 2
Alternative 3
Alternative 4


Topsoil Consumption
Cubic Yards
2.50E+04
2.00E+04
1.50E+04
1.00E+04
5.00E+03
0.00E+00
Alternative 2
Alternative 3
Alternative 4

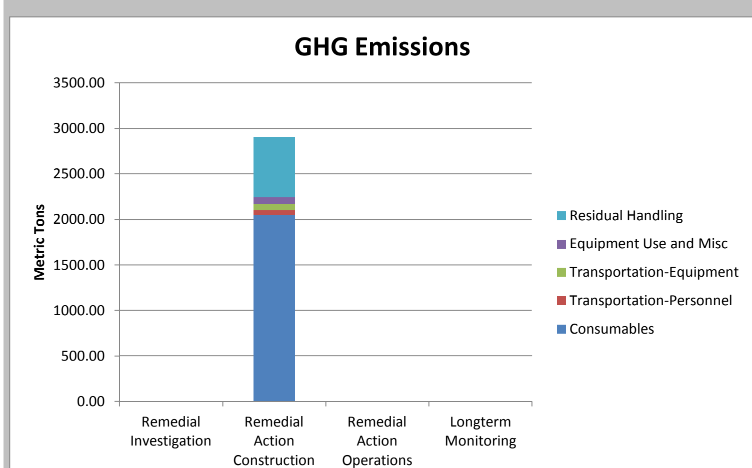

Lost Hours - Injury
Hours
7.00E+00
6.00E+00
5.00E+00
4.00E+00
3.00E+00
2.00E+00
1.00E+00
0.00E+00
Alternative 2
Alternative 3
Alternative 4

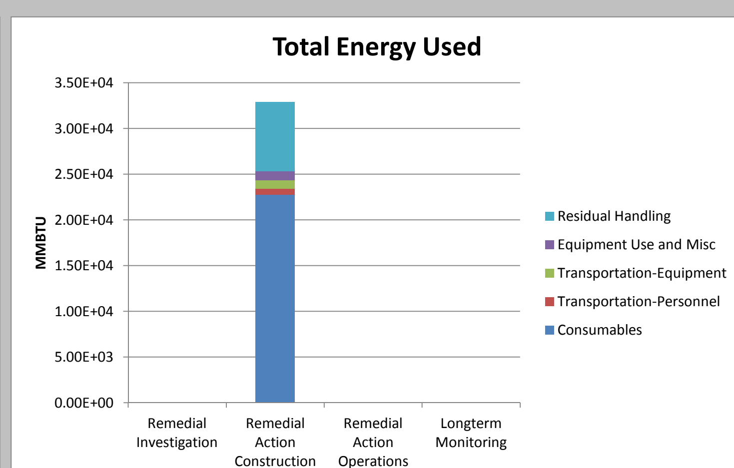
Sustainable Remediation - Environmental Footprint Summary
Alternative 2

Phase	Activities	GHG Emissions (metric ton)	Total energy Used (MMBTU)	Water Consumption (gallons)	NOx emissions (metric ton)	SOx Emissions (metric ton)	PM10 Emissions (metric ton)	Accident Risk Fatality	Accident Risk Injury
Remedial Investigation	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Remedial Action Construction	Consumables	2,052.36	2.3E+04	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	51.56	6.5E+02	NA	2.1E-02	6.7E-04	3.1E-03	7.3E-04	5.9E-02
	Transportation-Equipment	71.89	9.4E+02	NA	2.3E-02	4.0E-04	2.0E-03	2.5E-04	2.0E-02
	Equipment Use and Misc	68.20	1.0E+03	9.7E+04	4.3E-01	7.6E-02	3.3E-02	2.1E-03	5.2E-01
	Residual Handling	660.00	7.5E+03	NA	2.1E+00	1.1E+00	5.7E+00	1.0E-03	8.4E-02
	Sub-Total	2,904.00	3.29E+04	9.72E+04	2.57E+00	1.15E+00	5.76E+00	4.10E-03	6.85E-01
Remedial Action Operations	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Longterm Monitoring	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total		**2.9E+03**	**3.3E+04**	**9.7E+04**	**2.6E+00**	**1.2E+00**	**5.8E+00**	**4.1E-03**	**6.9E-01**

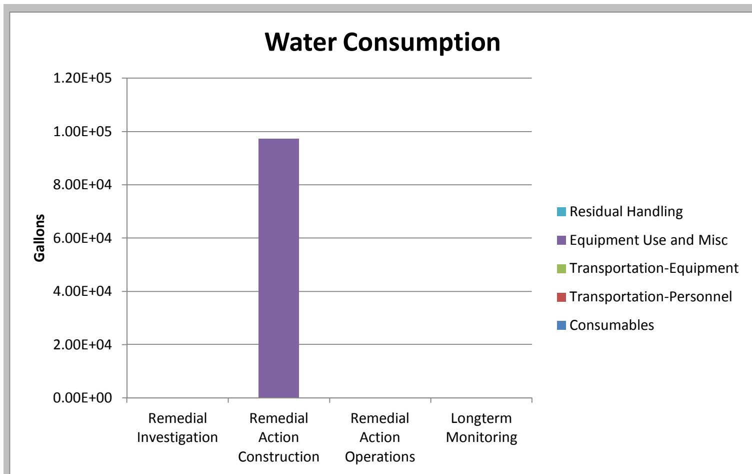
Remedial Alternative Phase	Non-Hazardous Waste Landfill Space (tons)	Hazardous Waste Landfill Space (tons)	Topsoil Consumption (cubic yards)	Costing ($)	Lost Hours - Injury
Remedial Investigation	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Remedial Action Construction	2.5E+04	6.2E+03	2.1E+04	0	5.5E+00
Remedial Action Operations	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Longterm Monitoring	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Total	**2.5E+04**	**6.2E+03**	**2.1E+04**	**$0**	**5.5E+00**

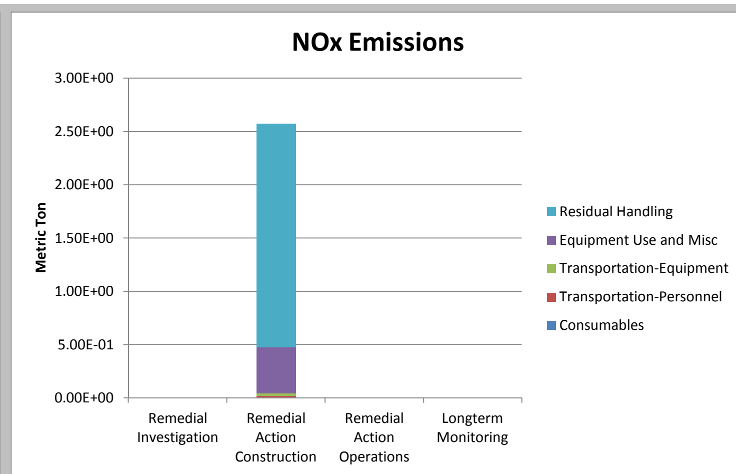
Total Cost with Footprint Reduction
$0

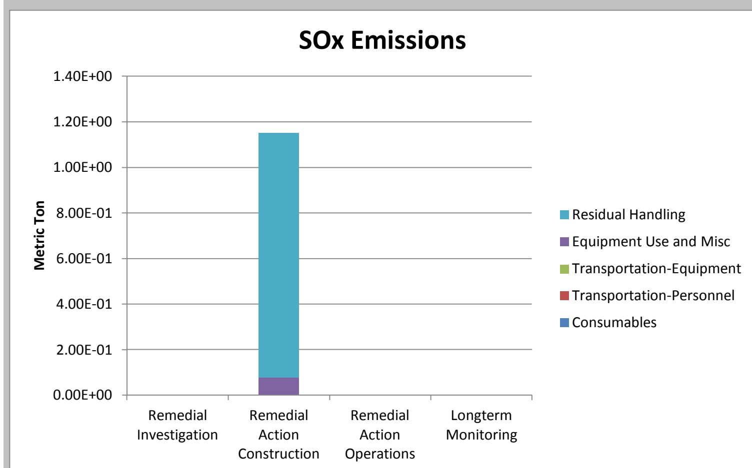


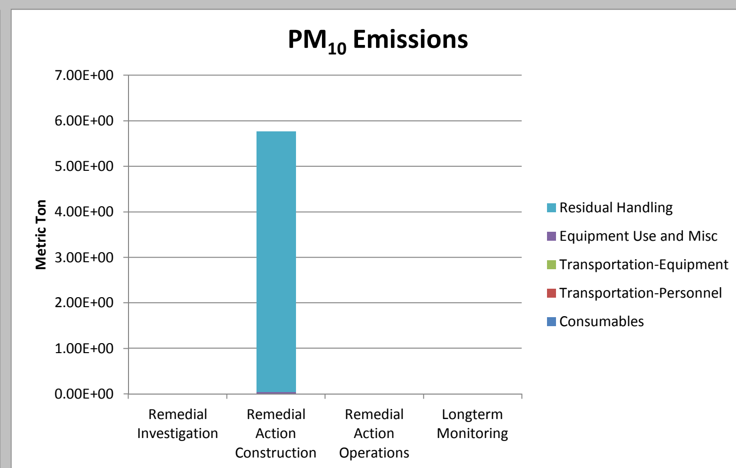


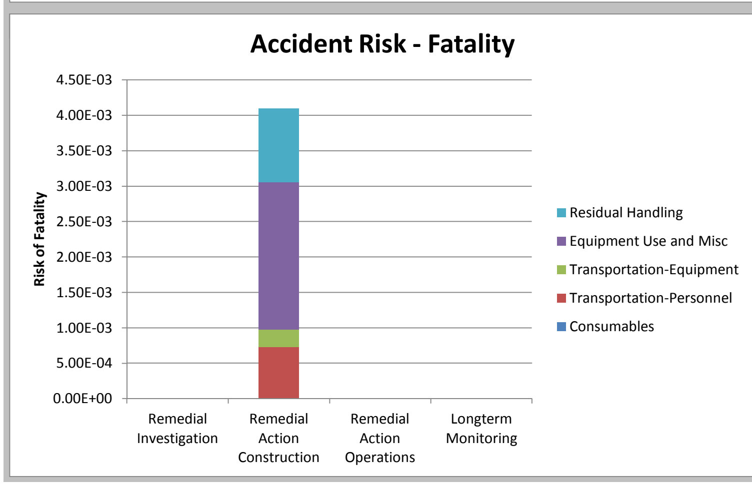
Attachment 1
Alternative 2 Results

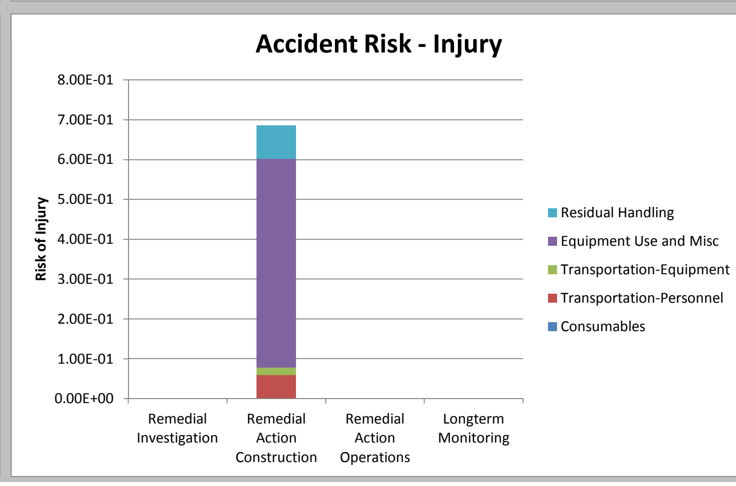


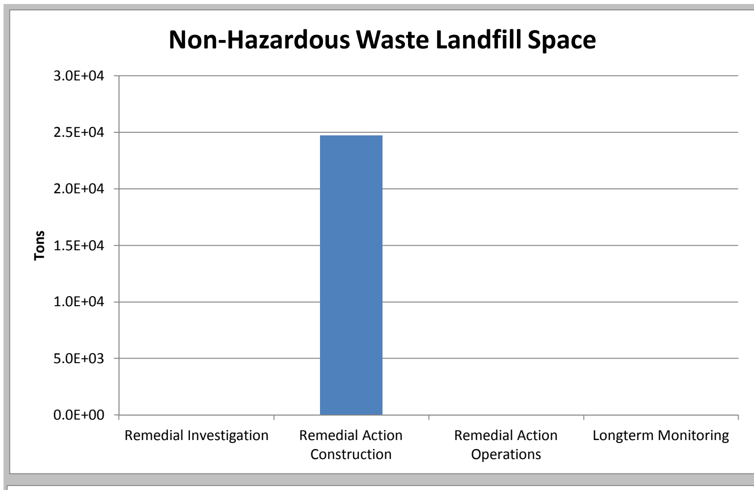


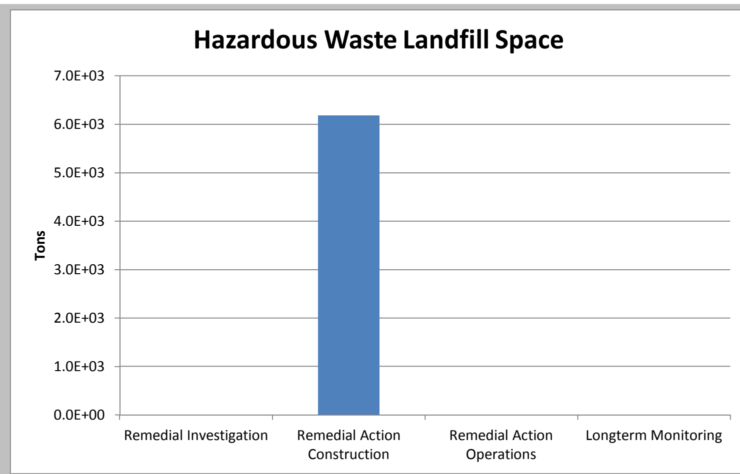


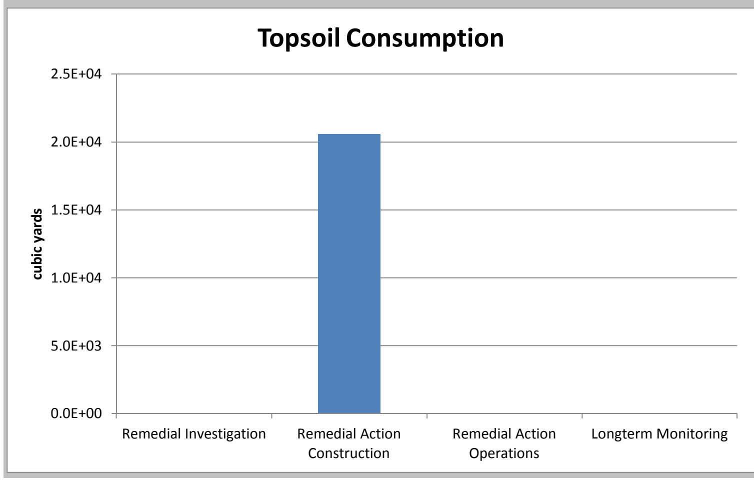


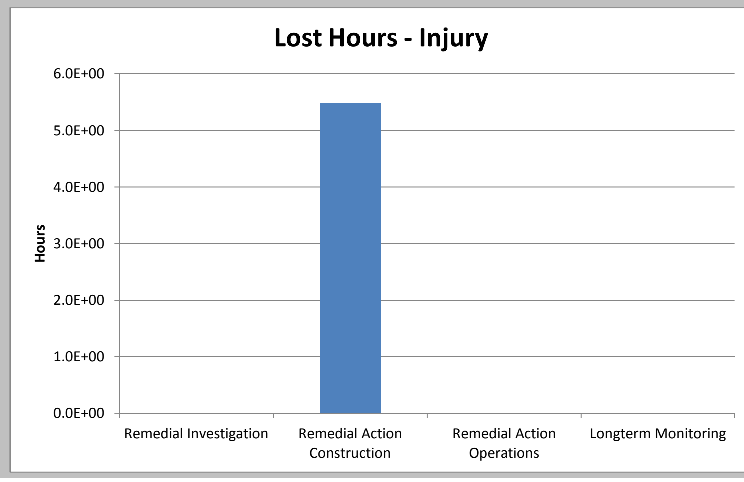





Non-Hazardous Waste Landfill Space
Tons
3.0E+04
2.5E+04
2.0E+04
1.5E+04
1.0E+04
5.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Hazardous Waste Landfill Space
Tons
7.0E+03
6.0E+03
5.0E+03
4.0E+03
3.0E+03
2.0E+03
1.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Topsoil Consumption
cubic yards
2.5E+04
2.0E+04
1.5E+04
1.0E+04
5.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
6.0E+00
5.0E+00
4.0E+00
3.0E+00
2.0E+00
1.0E+00
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

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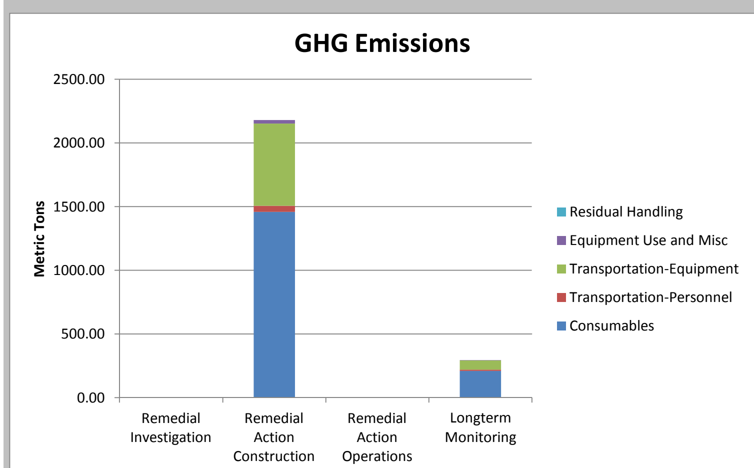
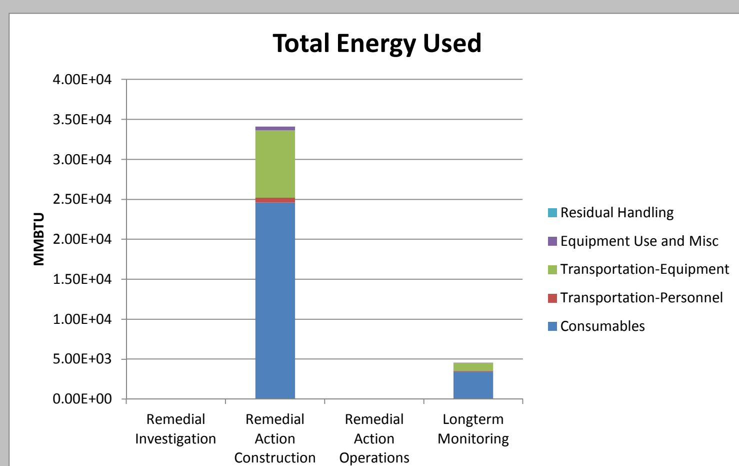
Sustainable Remediation - Environmental Footprint Summary
Alternative 3

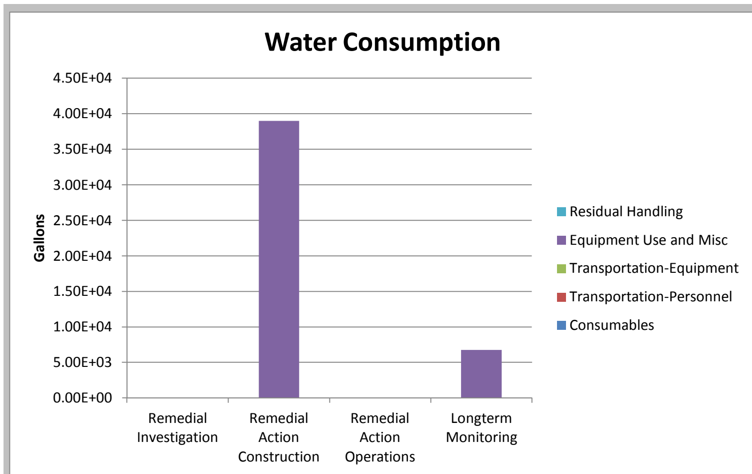
Phase	Activities	GHG Emissions	Total energy Used	Water Consumption	NOx emissions	SOx Emissions	PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	metric ton	metric ton	metric ton		
Remedial Investigation	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Remedial Action Construction	Consumables	1,460.27	2.5E+04	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	46.82	5.9E+02	NA	1.9E-02	6.1E-04	2.8E-03	6.6E-04	5.3E-02
	Transportation-Equipment	646.12	8.4E+03	NA	2.0E-01	3.6E-03	1.8E-02	2.2E-03	1.8E-01
	Equipment Use and Misc	28.27	4.8E+02	3.9E+04	1.8E-01	4.3E-02	1.3E-02	1.9E-03	4.7E-01
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	2,181.47	3.41E+04	3.90E+04	4.00E-01	4.75E-02	3.34E-02	4.76E-03	7.05E-01
Remedial Action Operations	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Longterm Monitoring	Consumables	211.78	3.5E+03	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	8.07	1.0E+02	NA	3.4E-03	1.1E-04	4.8E-04	1.2E-04	9.9E-03
	Transportation-Equipment	72.96	9.5E+02	NA	2.3E-02	4.1E-04	2.0E-03	2.5E-04	2.0E-02
	Equipment Use and Misc	2.45	3.8E+01	6.8E+03	1.4E-02	3.8E-03	1.2E-03	3.7E-04	9.3E-02
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	295.25	4.55E+03	6.75E+03	4.03E-02	4.35E-03	3.72E-03	7.42E-04	1.23E-01
Total		**2.5E+03**	**3.9E+04**	**4.6E+04**	**4.4E-01**	**5.2E-02**	**3.7E-02**	**5.5E-03**	**8.3E-01**

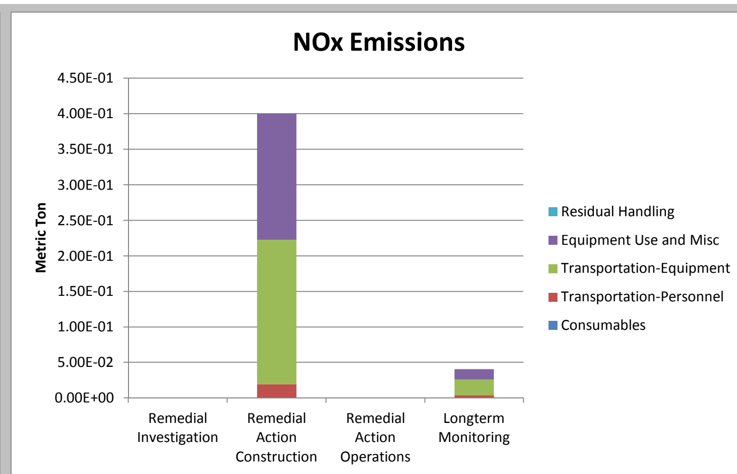
Remedial Alternative Phase	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury
	tons	tons	cubic yards	$	
Remedial Investigation	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Remedial Action Construction	0.0E+00	0.0E+00	1.3E+04	0	5.6E+00
Remedial Action Operations	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Longterm Monitoring	0.0E+00	0.0E+00	2.0E+03	0	9.8E-01
Total	**0.0E+00**	**0.0E+00**	**1.5E+04**	**$0**	**6.6E+00**

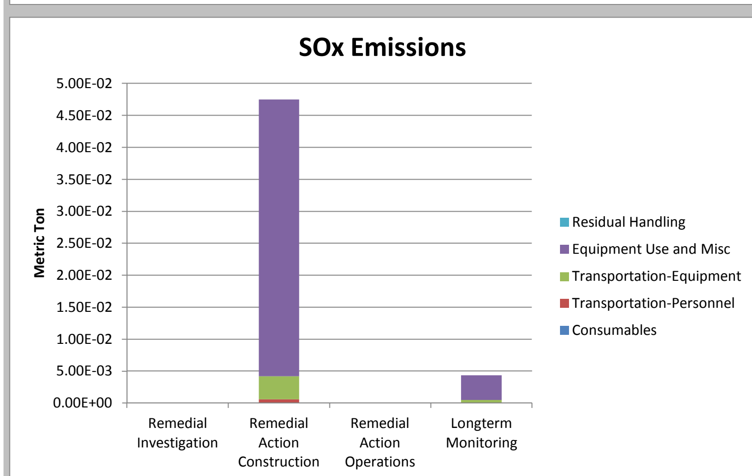
Total Cost with Footprint Reduction
$0

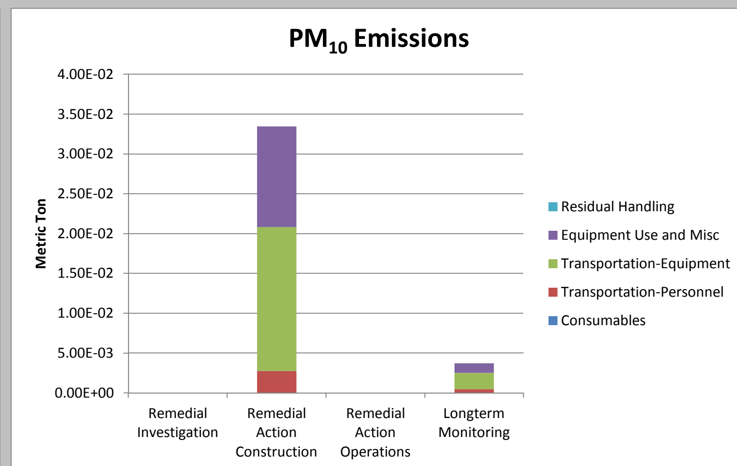


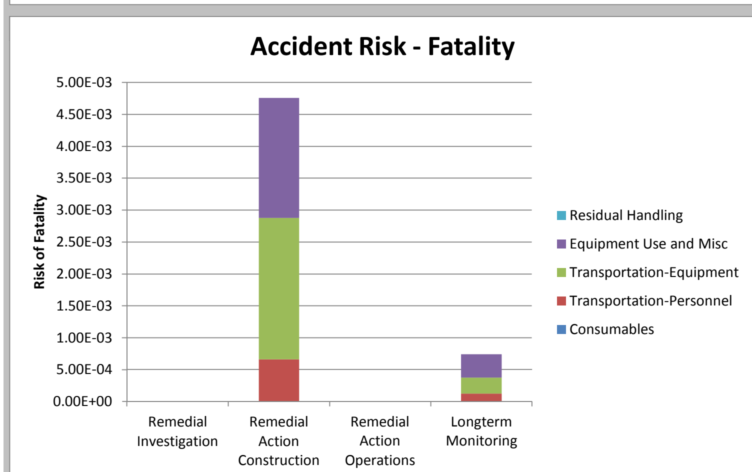


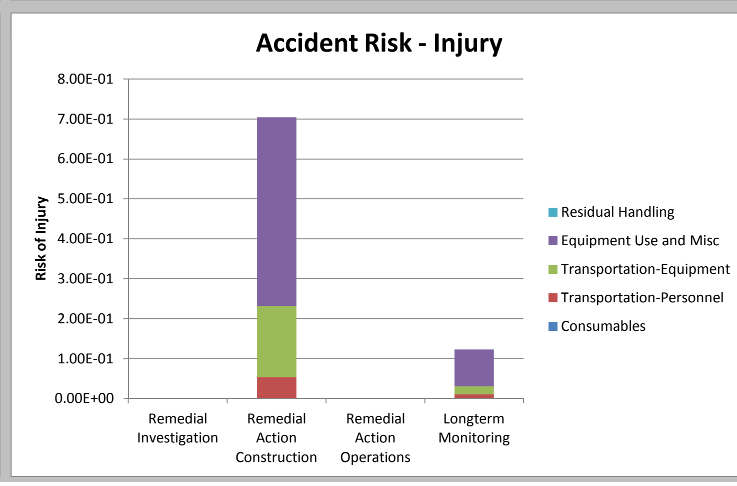

Water Consumption
Gallons
4.50E+04
4.00E+04
3.50E+04
3.00E+04
2.50E+04
2.00E+04
1.50E+04
1.00E+04
5.00E+03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

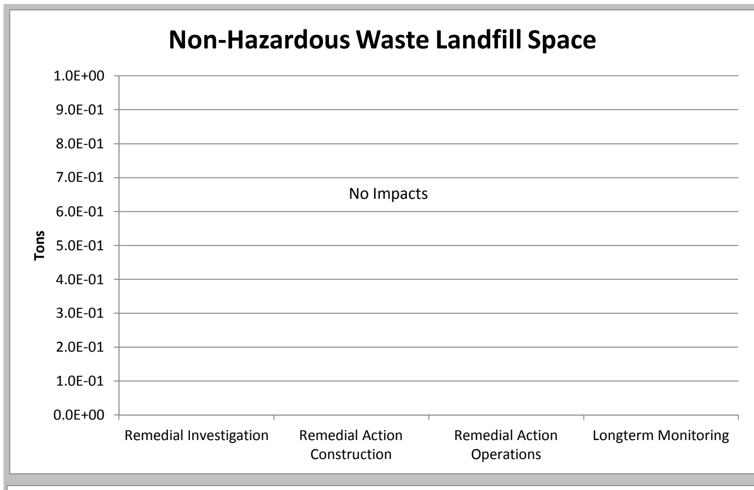

NOx Emissions
Metric Ton
4.50E-01
4.00E-01
3.50E-01
3.00E-01
2.50E-01
2.00E-01
1.50E-01
1.00E-01
5.00E-02
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


SOx Emissions
Metric Ton
5.00E-02
4.50E-02
4.00E-02
3.50E-02
3.00E-02
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

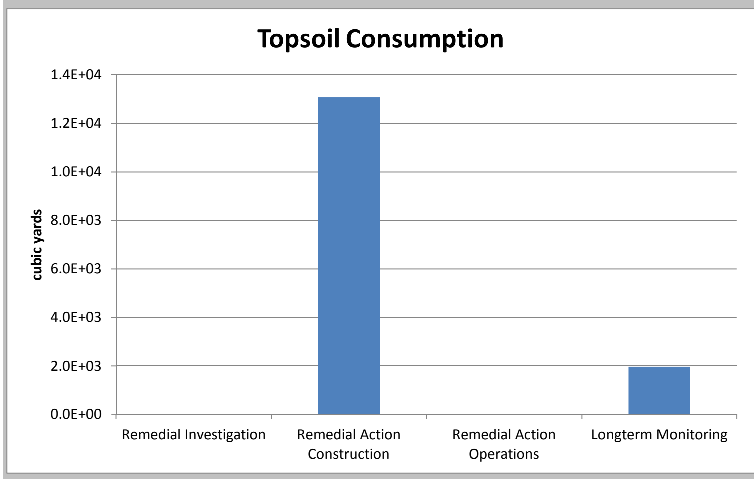

PM_{10} Emissions
Metric Ton
4.00E-02
3.50E-02
3.00E-02
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

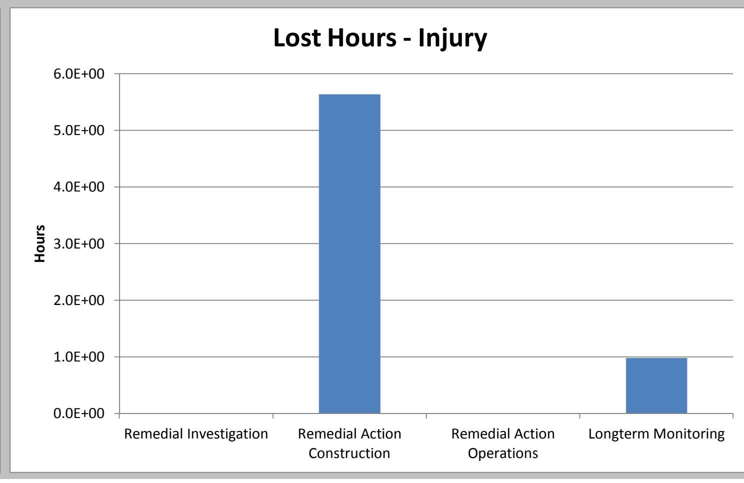

Accident Risk - Fatality
Risk of Fatality
5.00E-03
4.50E-03
4.00E-03
3.50E-03
3.00E-03
2.50E-03
2.00E-03
1.50E-03
1.00E-03
5.00E-04
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Injury
Risk of Injury
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Non-Hazardous Waste Landfill Space
Tons
1.0E+00
9.0E-01
8.0E-01
7.0E-01
6.0E-01
5.0E-01
4.0E-01
3.0E-01
2.0E-01
1.0E-01
0.0E+00
No Impacts
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Hazardous Waste Landfill Space
Tons
1.0E+00
9.0E-01
8.0E-01
7.0E-01
6.0E-01
5.0E-01
4.0E-01
3.0E-01
2.0E-01
1.0E-01
0.0E+00
No Impacts
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Topsoil Consumption
cubic yards
1.4E+04
1.2E+04
1.0E+04
8.0E+03
6.0E+03
4.0E+03
2.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
6.0E+00
5.0E+00
4.0E+00
3.0E+00
2.0E+00
1.0E+00
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

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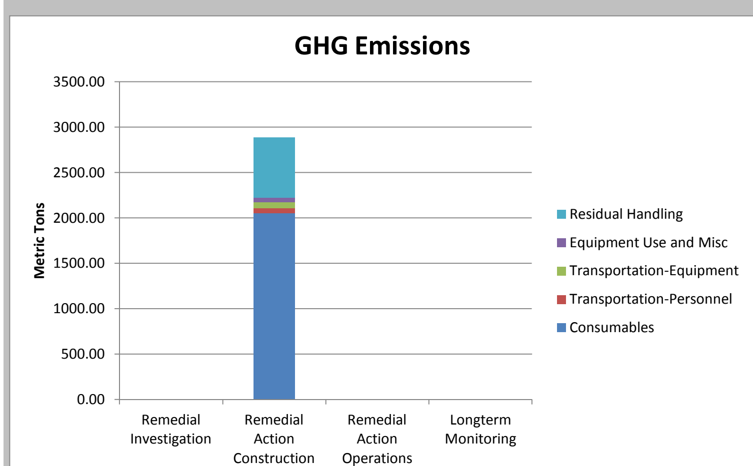
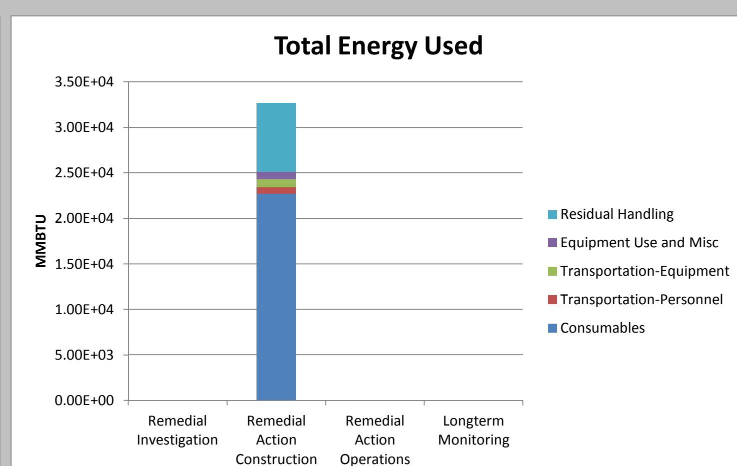
Sustainable Remediation - Environmental Footprint Summary
Alternative 4

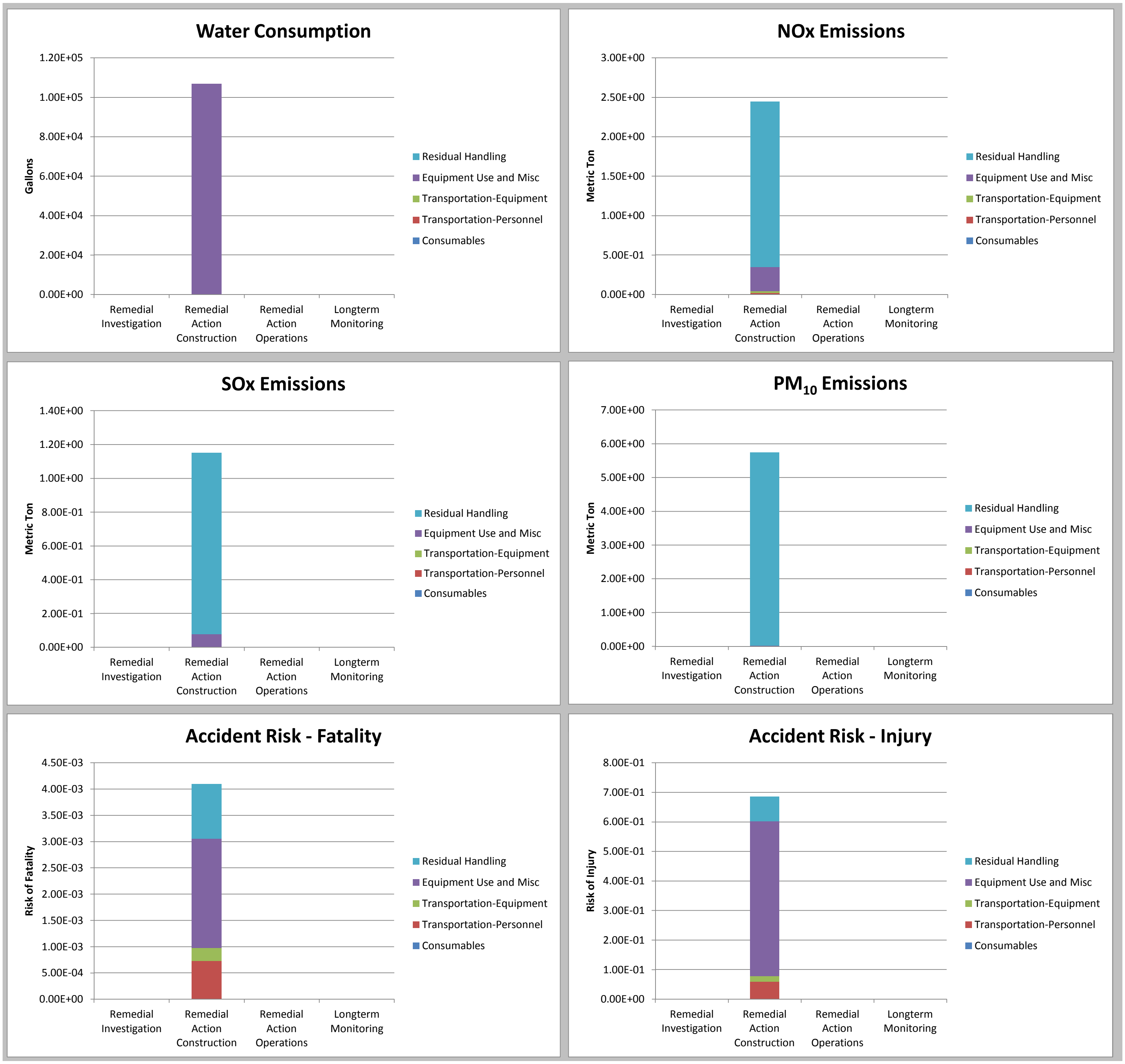
Phase	Activities	GHG Emissions	Total energy Used	Water Consumption	NOx emissions	SOx Emissions	PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	metric ton	metric ton	metric ton		
Remedial Investigation	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Remedial Action Construction	Consumables	2,052.36	2.3E+04	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	51.56	6.5E+02	NA	2.1E-02	6.7E-04	3.1E-03	7.3E-04	5.9E-02
	Transportation-Equipment	70.98	9.3E+02	NA	2.2E-02	3.9E-04	2.0E-03	2.4E-04	2.0E-02
	Equipment Use and Misc	50.59	8.1E+02	1.1E+05	3.1E-01	7.6E-02	2.1E-02	2.1E-03	5.2E-01
	Residual Handling	660.47	7.6E+03	NA	2.1E+00	1.1E+00	5.7E+00	1.0E-03	8.4E-02
	Sub-Total	2,885.95	3.27E+04	1.07E+05	2.44E+00	1.15E+00	5.75E+00	4.10E-03	6.85E-01
Remedial Action Operations	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Longterm Monitoring	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total		**2.9E+03**	**3.3E+04**	**1.1E+05**	**2.4E+00**	**1.1E+00**	**5.7E+00**	**4.1E-03**	**6.9E-01**

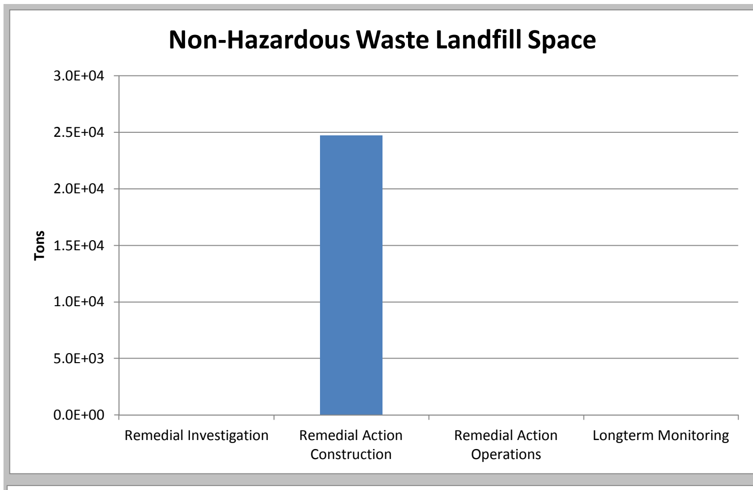
Remedial Alternative Phase	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury
	tons	tons	cubic yards	$	
Remedial Investigation	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Remedial Action Construction	2.5E+04	6.2E+03	2.1E+04	0	5.5E+00
Remedial Action Operations	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Longterm Monitoring	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00
Total	**2.5E+04**	**6.2E+03**	**2.1E+04**	**$0**	**5.5E+00**

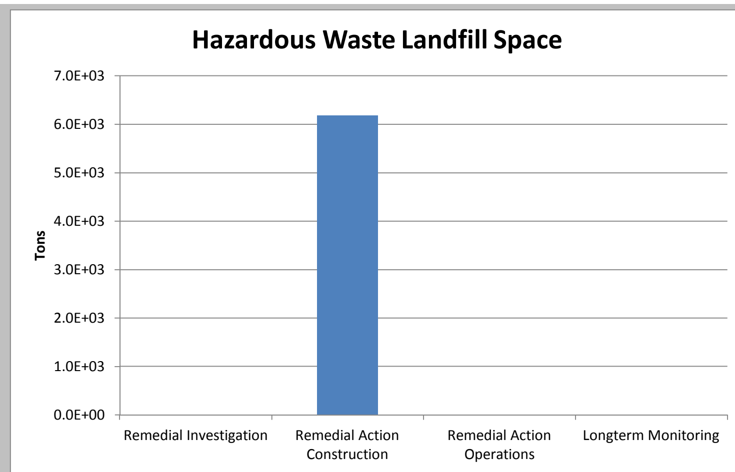
Total Cost with Footprint Reduction
$0

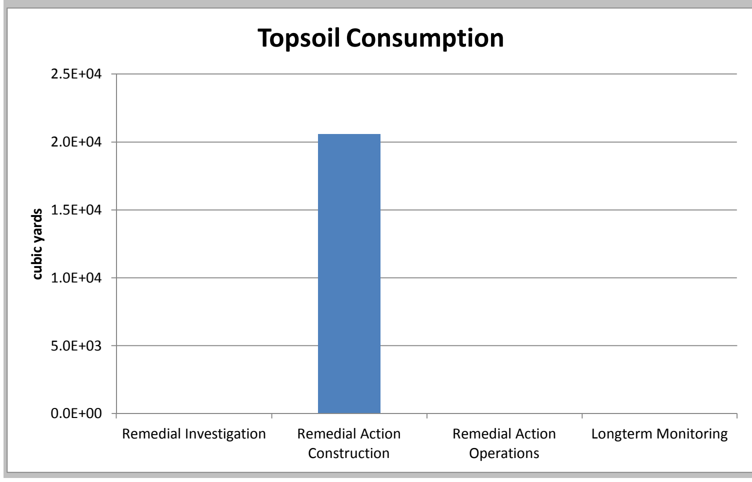


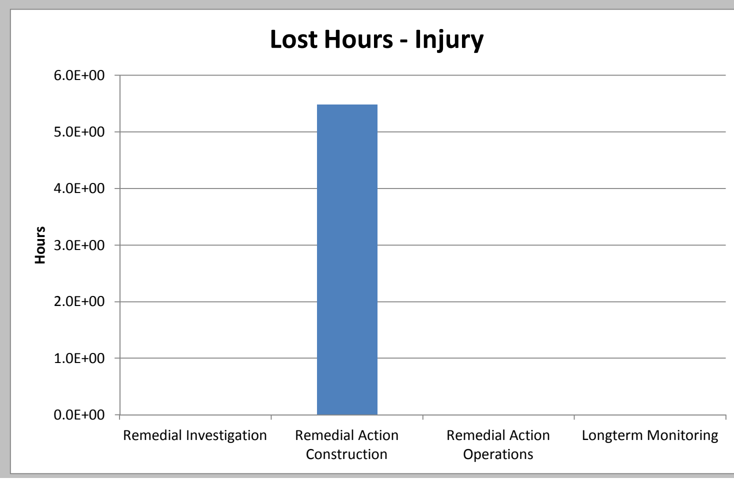



Water Consumption
Gallons
1.20E+05
1.00E+05
8.00E+04
6.00E+04
4.00E+04
2.00E+04
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
NOx Emissions
Metric Ton
3.00E+00
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
SOx Emissions
Metric Ton
1.40E+00
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
PM10 Emissions
Metric Ton
7.00E+00
6.00E+00
5.00E+00
4.00E+00
3.00E+00
2.00E+00
1.00E+00
0.00E+00
Accident Risk - Fatality
Risk of Fatality
4.50E-03
4.00E-03
3.50E-03
3.00E-03
2.50E-03
2.00E-03
1.50E-03
1.00E-03
5.00E-04
0.00E+00
Accident Risk - Injury
Risk of Injury
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00


Non-Hazardous Waste Landfill Space
Tons
3.0E+04
2.5E+04
2.0E+04
1.5E+04
1.0E+04
5.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Hazardous Waste Landfill Space
Tons
7.0E+03
6.0E+03
5.0E+03
4.0E+03
3.0E+03
2.0E+03
1.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Topsoil Consumption
cubic yards
2.5E+04
2.0E+04
1.5E+04
1.0E+04
5.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
6.0E+00
5.0E+00
4.0E+00
3.0E+00
2.0E+00
1.0E+00
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

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KCH Program Management Office
1320 Columbia Street, Suite 310
San Diego, CA 92101
office (619) 694-5500
fax (619) 694-5520