Final

Record of Decision/Final Remedial Action Plan for Installation Restoration Site 27 Former Clipper Cove Skeet Range

Former Naval Station Treasure Island San Francisco, California

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ACRONYMS AND ABBREVIATIONS

§	Section
ARAR	Applicable or relevant and appropriate requirement
BRAC	Base Realignment and Closure
Cal. Code Regs.	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COEC	Chemical of ecological concern
COPEC	Chemical of potential ecological concern
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ERA	Ecological risk assessment
ER-L	Effects range-low
ER-M	Effects range-median
FS	Feasibility Study
GRA	General response action
HHRA	Human health risk assessment
HSAA	Hazardous Substances Account Act
HSC	Health and Safety Code
IC	Institutional control
IR	Installation Restoration
LUC	Land use control
mg/kg	Milligram per kilogram
MOA	Memorandum of agreement
NAVSTA TI	Naval Station Treasure Island
NBAR	Nonbinding allocation of responsibility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operation and maintenance
OU	Operable unit
PAH	Polycyclic aromatic hydrocarbon
QC	Quality control
RAB	Restoration Advisory Board
RAO	Remedial action objective

ACRONYMS AND ABBREVIATIONS (Continued)

RAP	Remedial action plan
RD	Remedial design
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
TI	Treasure Island
tit.	Title
UST	Underground storage tank
Water Board	San Francisco Bay Regional Water Quality Control Board
YBI	Yerba Buena Island

1.0 DECLARATION

This Record of Decision/Final Remedial Action Plan (ROD/Final RAP) presents the remedy selected by the Navy for Installation Restoration (IR) Site 27 (Site 27), the former Clipper Cove Skeet Range, at the former Naval Station Treasure Island (NAVSTA TI) in San Francisco, California. The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 (Title 42 *United States Code* Section [§] 9601, et seq.) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 *Code of Federal Regulations* Part 300), the State of California Health and Safety Code (HSC), and the Hazardous Substances Account Act (HSAA) § 25356.1. Site 27 has not been placed on the CERCLA National Priorities List. The CERCLA Information System identification number for NAVSTA TI is CA7170023330.

The California Environmental Protection Agency (Department of Toxic Substances Control [DTSC] and the San Francisco Bay Regional Water Quality Control Board [Water Board]) concurs with the selected remedy. The decision documented in this ROD/Final RAP is based on and relies on the Administrative Record file (Attachment D). Information that is not specifically summarized in this ROD/Final RAP or its references but that is contained in the Administrative Record[1] has been considered and is relevant to the selection of the remedy at Site 27. In addition, the decision was made in accordance with the HSAA, codified in HSC Chapter 6.8. It is the Navy's intent that this document meets the requirements of HSC § 25356.1, which is a state requirement for RAPs at remedial sites; however, § 25356.1 is not considered an applicable or relevant and appropriate requirement (ARAR) for this ROD/Final RAP. The "Statement of Reasons" and the "Nonbinding Allocation of Responsibility" required by the HSAA are presented in Attachment E.

The remedy selected in this ROD/Final RAP is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. The Navy provides funding for site remediation at Former NAVSTA TI under the Base Realignment and Closure (BRAC) program. The Federal Facility Site Remediation Agreement (FFSRA) for Former NAVSTA TI documents how the Navy intends to meet and implement the requirements of CERCLA in partnership with DTSC and the Water Board. Although not a signatory agency, the U.S. Environmental Protection Agency (EPA) has reviewed all major documents and concurs with the selected alternative.

Site 27 was identified as a potential environmental concern in 1993 when the Water Board issued Order No. 93-130, requiring the Navy to investigate and manage contamination attributable to the skeet range in the Clipper Cove area of NAVSTA TI. The order set forth specific compliance requirements and tasks. The Navy has complied with the substantive requirements of the order by way of the CERCLA process, which included sediment and biological

[1] **Bold blue text** identifies detailed site information available in the Administrative Record and listed in the References Table (Attachment C). This ROD/Final RAP is also available on CD, whereby **bold blue text** serves as a hyperlink to reference information. To the extent there may be any inconsistencies between the reference information attached to this ROD/Final RAP via hyperlinks and the information in the basic ROD/Final RAP itself, the language in the basic ROD/Final RAP prevails.

characterization as part of the Remedial Investigation (RI) for the Offshore Sediments Operable Unit (OU) and further investigation of the nearshore area of the site as part of the Site 27 Clipper Cove Feasibility Study (FS).

Site 27 investigations identified lead shot as the only contaminant of concern and incidental ingestion of lead shot by diving ducks, foraging for food or grit, as the receptor pathway of concern. Two feet beneath the sediment surface is considered the maximum depth that is accessible by diving ducks. Lead shot has been found within the top 2 feet of sediment in the area within 75 feet from the shoreline, but in the remainder of the site, lead shot is buried by 2 feet or more of sediment. Accordingly, there is a current complete exposure pathway within 75 feet of the shoreline, and a potentially complete exposure pathway in the remainder of the site under future conditions in which dredging could expose lead shot buried beneath 2 feet of sediment.

A remedial action is warranted to protect the environment because of the potential exposure of diving ducks to lead shot in the nearshore area and because of future reuse scenarios, which could result in an increased risk to diving ducks. This ROD/Final RAP documents the final remedy for Site 27 and does not include or affect any other sites at NAVSTA TI.

1.1 SELECTED REMEDY

The remedy selected in this ROD/Final RAP is necessary to protect the environment from actual or threatened releases of CERCLA hazardous substances. No CERCLA action is needed to protect human health from the actual or threatened releases of CERCLA hazardous substances.

The selected remedial action addresses lead shot in sediment, which poses a risk to diving ducks. The remedy consists of focused dredging and backfill of the area within 75 feet of the shoreline to remove a potentially complete exposure pathway to diving ducks, off-site disposal of sediment at a beneficial reuse site, site-wide institutional controls (IC) to minimize sediment-disturbing activity that could expose lead shot currently buried at the site, and sediment monitoring to ensure the effectiveness of ICs and the integrity of the backfill material.

The selected remedial action is protective of human health and the environment, complies with federal and state statutes and regulations that are applicable or relevant and appropriate to the remedial action, and is cost-effective. The selected remedy does not satisfy the statutory preference for remedies that employ treatment that reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element of the remedy. No complete exposure pathways will remain when the remedy is complete. The effectiveness of the remedial action for Site 27 will be reviewed at a minimum of every 5 years as long as lead shot remains on site above levels that allow for unrestricted use and unlimited exposure. The purpose of the five-year review is to verify that the remedy continues to adequately protect human health and the environment and is achieving remedial action objectives (RAO) while contaminants are present at Site 27. The first five-year review will be submitted 5 years after the remedial action has been initiated.

1.2 DATA CERTIFICATION CHECKLIST

The following information is included in Section 2.0 of this ROD/Final RAP. Additional information can be found in the Administrative Record file for this site.

- Descriptions of the chemicals of potential ecological concern (COPEC), the chemical of ecological concern (COEC), and their concentrations (Sections 2.3 and 2.5).
- A description of baseline risk represented by the COEC (Section 2.5).
- The RAOs for the COEC and the basis for these objectives (Sections 2.5 and 2.7).
- A discussion of principal threat wastes (Section 2.6).
- Current and reasonably anticipated future land use assumptions (Section 2.4).
- Estimated capital, annual operation and maintenance (O&M), and total present-worth costs; discount rate; and the number of years over which the remedy cost estimate is projected (Table 2).
- Key factors that led to selecting the remedy (for example, a description of how the selected remedy ranked with respect to the balancing and modifying criteria, highlighting criteria key to the remedy selection) (Section 2.9.1).

1.3 AUTHORIZING SIGNATURES

This signature sheet documents the Navy's selection of the remedy in this ROD/Final RAP. This signature sheet also documents the State of California's (DTSC and Water Board) concurrence with this ROD/Final RAP. The parties may sign this sheet in counterparts.

James Sullivan BRAC Environmental Coordinator BRAC Program Management Office West Department of the Navy	3/22/2012 Date
Denise M. Tsuji, Unit Chief Team Leader California Environmental Protection Agency Department of Toxic Substances Control Brownfields and Environmental Restoration Program Berkeley Office	3/23/2012 Date
Bruce H. Wolfe Executive Officer San Francisco Bay Regional Water Quality Control Board	3/28/12 Date

2.0 DECISION SUMMARY

2.1 SITE DESCRIPTION AND HISTORY

NAVSTA TI lies in San Francisco Bay, midway between San Francisco and Oakland, California (Figure 1). The facility consists of two contiguous islands: Treasure Island (TI), which is a man-made island of about 403 acres, and Yerba Buena Island (YBI), which is a natural island of about 147 acres. Military activities at NAVSTA TI date back to about 1866, when the U.S. government took possession of YBI for defensive fortifications. The U.S. Army occupied YBI until 1896, when the Navy assumed control. TI was constructed on the shoals of YBI with San Francisco Bay fill between 1936 and 1937 for use as an airport for the City of San Francisco. It was also the site of the 1939 Golden Gate International Exposition. Navy operations at TI began in 1941, primarily for training, administration, housing, and other support services to the U.S. Pacific Fleet. In 1993, the Defense Base Closure and Realignment Commission recommended closure of NAVSTA TI; the facility was subsequently closed on September 30, 1997.

Clipper Cove is located directly between TI and YBI (Figure 1). Until 1989, a portion of Clipper Cove was used as a **naval skeet range**[(1)]. As clay targets (skeet) were launched from the shoreline, naval personnel fired lead shot over the water. The positions of the shooters and the angles at which the skeet targets were thrown resulted in a fan-shaped fall zone for the lead shot. The **original boundary of Site 27**[(2)] was established based on the onshore location of one skeet range. The boundary of Site 27 was revised in August 2004 to include a second adjacent skeet range, an onshore area of less than 1 acre, and the full shot fall zone (Figure 2). The extent of lead shot contamination was determined to be no more than 750 feet from the firing point.

The onshore area of Site 27 was investigated further after the site boundary had been expanded to include it; however, no unacceptable risk to human health or the environment was found. In 2010, the Navy redefined the **boundary for Site 27**[(3)] under CERCLA because no further action is necessary for the onshore portion. The redefinition of the Site 27 CERCLA boundary excluded the onshore portion of the site (less than 1 acre landward of the mean high water line), so that Site 27 currently consists of approximately 19 offshore acres (Figure 1). The **Proposed Plan/Draft RAP**[(4)] was the first document to utilize the redefined Site 27 boundary.

Figure 1. Facility Location

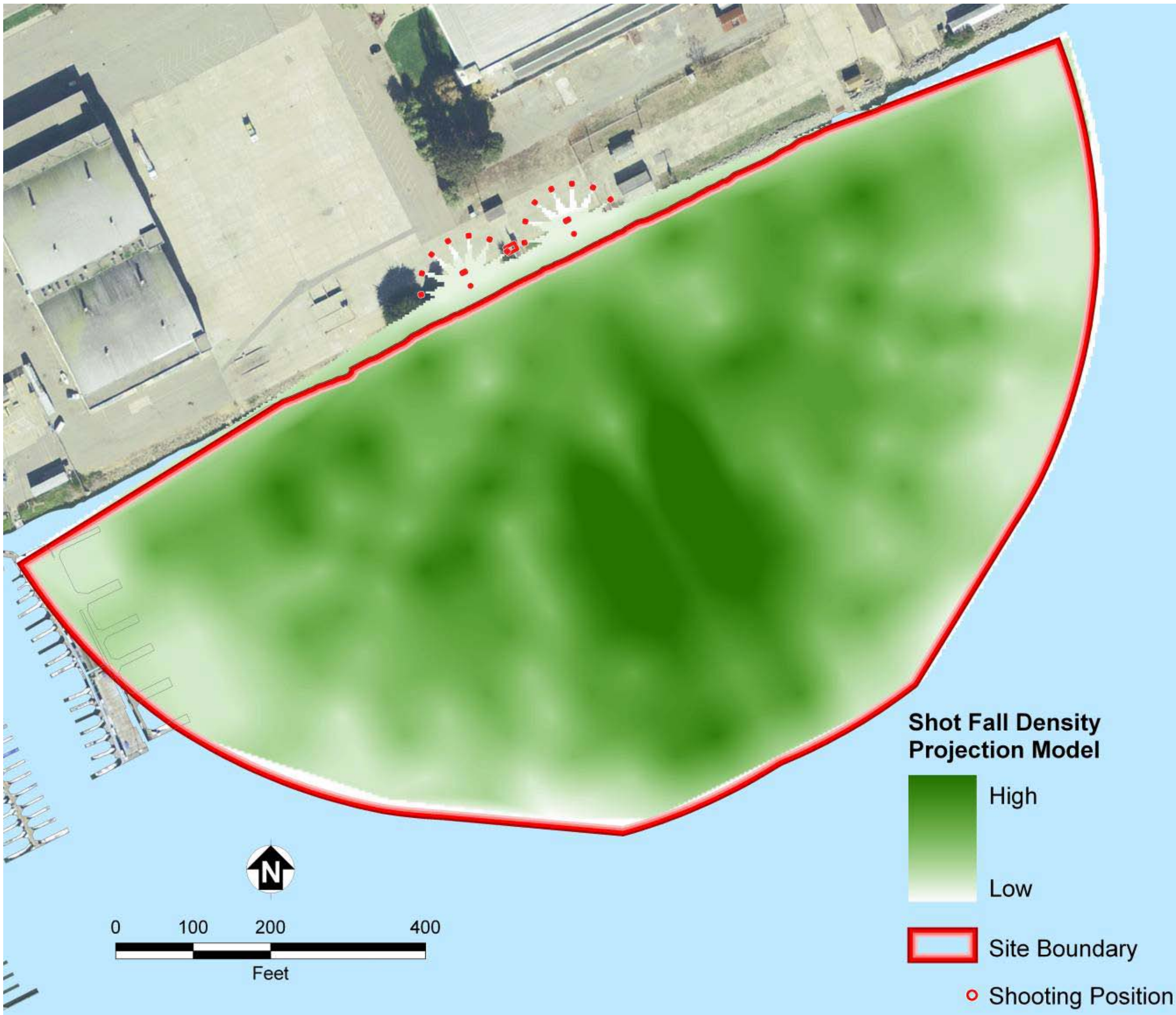

Figure 2. Projected Shot Fall Zone at Site 27

2.2 SITE CHARACTERISTICS

San Francisco Bay comprises separate embayment areas, including a deeper central region near the City of San Francisco (Central Bay), and shallower regions (Suisun Bay, San Pablo Bay, and South Bay). NAVSTA TI is in the Central Bay region.

The hydrodynamics of San Francisco Bay involve complex interactions of tides, winds, salinity, freshwater inflows, and bottom configuration. All of these oceanographic characteristics affect **circulation(5)** and **sediment deposition in San Francisco Bay(6)**. Sediment deposition in San Francisco Bay is a dynamic process, where sediment inflow, outflow, and redistribution depend on numerous variables such as sediment loading rates, particle sizes, and energy gradients.

The most recent hydrographic surveys of Clipper Cove were conducted in January 2002 and September 2005. The water depth over Site 27 ranges from less than 5 feet near shore to about 18 feet along the southwestern border based on the results of the surveys. Within the first 150 feet from shore, water depths drop from approximately 3 feet to 13 feet. The majority of the shot fall zone for the Skeet Range is in water that is between 11 and 16 feet deep. The construction drawings for TI show shoreline riprap extending 40 feet into the bay from the shoreline.

A comparison of hydrographic survey data collected between 1985 and 2005 indicates that, with the exception of the area of the skeet range within 150 feet of the shoreline, Site 27 is a low-energy depositional environment. However, **deposition is minimal(7)** in the area of Site 27 within 150 feet of the shore. Deposition in the nearshore area may be limited by wave action and currents as a result of the shallower water.

Before the 2005 survey, previous reports had described **sediment deposition in Clipper Cove(8).** Available hydrographic data suggest that the total amount of sediment deposited at Site 27 is estimated to have been about 2.4 to 6.3 feet between 1979 and 2005, of which approximately 1.7 to 2.1 feet of sediment had been deposited during the assumed operational period of the skeet range. Lead shot is not expected to occur in any location at a depth greater than 9.4 feet from the sediment surface as of 2009. This maximum depth assumed for lead shot to be present is conservative because it is based on the maximum deposition rates. Closer to the shore, where sediment both accretes and erodes, the lead shot is found within the top 2 feet of sediment and is not expected to be found at or below the 7-foot depth because of the lower rate of sediment deposition over time; based on the dynamic nature of the nearshore area, the layer of sediment contaminated by lead shot is expected to be thinner because less sediment would accrete than in the rest of Clipper Cove.

Characterization of the **ecology(9)** of offshore NAVSTA TI is based on natural history literature and surveys of the San Francisco Bay area and is summarized in the Final RI report. No formal surveys of either the flora or fauna of NAVSTA TI were conducted for the RI, but surveys conducted previously by the Navy and the Audubon Society were used. Natural history information for species that potentially occur at NAVSTA TI was compiled from published literature. No threatened or endangered plants, invertebrates, or mammals are known or suspected to occur offshore at NAVSTA TI. Three special-status fish species (Chinook salmon, longfin smelt, and river lamprey) are known to occur, and two special-status fish species (delta smelt and green sturgeon) may occur in the offshore area of NAVSTA TI. The California least tern is classified as endangered by both the state and federal governments and has been reported to intermittently forage or roost at NAVSTA TI.

2.3 PREVIOUS INVESTIGATIONS

In 1993, the Water Board issued Order No. 93-130, requiring the Navy to investigate and manage contamination attributable to the skeet range in the Clipper Cove area of NAVSTA TI. The order set forth specific compliance requirements and tasks. The Navy subsequently conducted sampling investigations at Site 27 to comply with the substantive requirements of the order.

Chemicals thought to be associated with the former skeet range included lead shot, lead, and polycyclic aromatic hydrocarbons (PAH) (a component of the skeet target), which were targeted as COPECs at Site 27. A complete assessment of contamination and risk at Site 27 is provided in the Final RI for the Offshore Sediments OU, which includes an ecological risk assessment (ERA), and the 2008 lead shot investigation in the nearshore area. The Final FS Report summarized the results of the RI and the lead shot investigation and provides the basis for the ROD/Final RAP. Table 1 summarizes the previous studies and investigations conducted at Site 27.

Screening values$_{(10)}$ referenced in Table 1 include ambient chemical concentrations in San Francisco Bay sediments developed by the Water Board, effects range-low (ER-L) concentrations and effects range-median (ER-M) concentrations. Sediment concentrations below the ER-L are interpreted as “rarely” associated with adverse effects. Concentrations between the ER-L and ER-M are “occasionally” associated with adverse effects, and concentrations above the ER-M are “frequently” associated with adverse effects. Ambient concentrations are the lowest of the screening values and are 43.2 milligrams per kilogram (mg/kg) lead and 3.39 mg/kg PAHs. There are no screening values for lead shot.

2.4 CURRENT AND POTENTIAL FUTURE SITE USES

Currently, a small portion of the southwestern section of Site 27 is part of the Treasure Island Marina (Figure 1). The remainder of Site 27 consists of sediment and open water. Commercial warehouse buildings are located north of Site 27. Clipper Cove is located to the south, east, and west. The Treasure Island Marina is also located to the west. According to the Revised Draft Treasure Island and Yerba Buena Island Design for Development, dated February 2011, Site 27 will be used as a marina in the future.

TABLE 1. PREVIOUS INVESTIGATIONS AT SITE 27
ROD/Final RAP, IR Site 27, Former Clipper Cove Skeet Range, Former NAVSTI, TI, San Francisco

Previous Study/Investigation*	Year	Investigation Summary
Phase I Remedial Investigation Offshore Sampling	1992	Sediment and stormwater within the Site 27 boundary as well as in other offshore areas of NAVSTA TI were sampled. Samples were analyzed for metals, pesticides, polychlorinated biphenyls, and PAHs. None of the samples collected within the Site 27 boundary contained concentrations of lead or PAHs above screening values.
Site 27 Clipper Cove Skeet Range Offshore Investigation	1996	As a direct result of Water Board Order No. 93-130, sediment, pore water, and bay water samples were collected and analyzed to define the vertical and horizontal extent of **lead, lead shot**(11), and **PAHs**(12) in offshore sediments and overlying surface water that may have resulted from the skeet range operations. Three-foot to 5-foot sediment core samples were collected at 12 sampling locations. Sampling locations were based on the estimated shot fall zone, and additional samples were collected to assure the horizontal extent of contamination was defined. Sediment cores were separated into 1-foot sections for a total of 46 samples. Lead (excluding lead shot) was detected in every 1-foot section at concentrations ranging from 6.3 mg/kg to 54.4 mg/kg. The highest concentrations of lead were generally detected at depths of 3 to 5 feet. Detected lead concentrations in Site 27 sediments were within the range of concentrations detected in other offshore areas of NAVSTA TI outside of Clipper Cove. PAHs were not detected in the skeet range at concentrations exceeding screening values. Sediment in each 1-foot section of 10 sediment cores was sieved for lead pellets, which were counted and weighed. Lead shot was detected in nine out of 10 locations and was most prevalent in the 3- to 4-foot depth interval. Four pore water and four grab surface water samples were collected. Lead and PAHs were not detected in any of the samples. Sediment surface grab samples were collected at four sampling locations for bioassays and chemical and physicochemical analysis. Toxicity was observed in the bioassays; however, it was concluded that toxicity was attributable to chemicals other than lead or PAHs, or to physicochemical factors because of no or low concentrations of lead and PAHs detected in sediment and water samples.
Phase II Remedial Investigation for Offshore Sediments	1997	Sediment sampling focused on further characterizing Clipper Cove both within and outside the boundary of Site 27, and tracking contaminants from onshore sources to offshore sediments through storm-water outfalls. Nineteen surface sediment samples (0 to 0.5 foot) and four sediment core samples were collected in Clipper Cove. Sediment core samples were collected to a depth of 8 feet below the sediment surface and divided into 2-foot intervals for analysis. Lead concentrations in sediment were below screening values in every sample except for three samples. One of these samples was collected between 6 and 8 feet below the sediment surface within Site 27 and had a lead concentration of 63.3 mg/kg, which was the maximum lead concentration detected during this investigation. The two other samples were located outside of Site 27. Concentrations of PAHs did not exceed screening values at any location. Sediment from two sampling locations within the Site 27 boundary was used in bioassays. Although toxicity was observed, low survival rates were attributed to other factors (slow acclimation to salinity changes, longer holding times, and sediment grain size). It was concluded that risk to benthic invertebrates and avian receptors from exposure to the sediment was minimal based on chemical and toxicity data.

TABLE 1. PREVIOUS INVESTIGATIONS AT SITE 27 (CONTINUED)
ROD/Final RAP, IR Site 27, Former Clipper Cove Skeet Range, Former NAVSTI, TI, San Francisco

Previous Study/Investigation*	Year	Investigation Summary
Evaluation of Sediment Deposition	2005	Recent hydrographic surveys were reviewed to obtain a better understanding of sediment deposition rates in Clipper Cove. The evaluation found that (1) the nearshore area of Clipper Cove (within 150 feet of the shoreline) is a dynamic area where sediment both accretes and erodes, resulting in limited sediment accumulation; and (2) the remainder of Clipper Cove is a depositional environment, where sediment accumulates at a rate of about 1 to 2 inches each year. A layer of sediment more than 2 feet thick has been deposited in Clipper Cove (excluding the nearshore area) since skeet range operations ceased in 1989. This sediment deposition has effectively covered the lead shot, eliminating the ingestion exposure pathway to diving ducks over most of the site. However, it was not known whether an ingestion pathway was complete within 150 feet of the shoreline.
Lead Shot Investigation in the Nearshore Area of Site 27 (conducted during Feasibility Study)	2008	Based on the results of the 2005 evaluation of sediment deposition, the Navy investigated the nearshore area in 2008 to characterize the extent of lead shot in the top 2 feet of nearshore sediments and evaluate whether there was a potential risk to diving ducks. Sediment core samples were collected to a depth of 2 feet below the sediment surface from 30 locations in the nearshore area. Each 0.5 foot section of the sediment cores was analyzed for lead shot to determine the depth lead shot was buried, and after screening to remove lead shot, for total lead in sediment. Ten grab samples were collected from the sediment surface and analyzed for benthic biomass, total organic carbon, and grain size. Lead shot was detected within the top 2 feet of sediment within 75 feet of the shoreline, where waterfowl foraging for food or grit could ingest the shot. No lead shot was found in the samples collected in the top 2 feet of sediment from 75 feet to 150 feet from the shoreline. Therefore, there is a potentially complete exposure pathway for diving ducks within 75 feet of the shoreline. The concentrations of total lead in sediment, not including the lead shot, were consistent with other offshore samples collected at Treasure Island and San Francisco Bay ambient values. The investigation concluded that lead shot was a COEC at Site 27, but total lead was not. Benthic organisms were recovered from the grab samples, indicating that there is a food source for diving ducks in the nearshore area, and diving ducks were observed at Site 27 during the field investigation.
Feasibility Study	2001-2010	The results of previous investigations were used to identify remedial action objectives and remedial alternatives to address potential risks to diving ducks associated with lead shot in sediment. Three remedial alternatives were evaluated: (1) no action; (2) focused dredging and backfill, off-site disposal of sediment, IC, and sediment monitoring; and (3) site-wide dredging and off-site disposal of sediment. Alternatives 2 and 3 were split into “a” and “b” alternatives because of two possible disposal options. Under Alternatives 2a and 3a, dredged sediments would be disposed of at a landfill after on-site dewatering. Dewatering could take up to 1 year for Alternative 2a and 6 years for Alternative 3a. Under Alternatives 2b and 3b, dredged sediment would be transported by barge to an upland beneficial reuse site where sediment is being collected to create a restored wetland. Land-based dewatering would not be required and contaminated sediment transported to the reuse site would be covered by a layer of clean sediment to minimize future exposure to ecological receptors.

TABLE 1. PREVIOUS INVESTIGATIONS AT SITE 27 (CONTINUED)

ROD/Final RAP, IR Site 27, Former Clipper Cove Skeet Range, Former NAVSTI, TI, San Francisco

Previous Study/Investigation*	Year	Investigation Summary
Proposed Plan/Draft RAP	2011	The Proposed Plan/Draft RAP identified the Navy's preferred alternative for lead shot in sediment at Site 27 and invited the public to review and comment on the preferred alternative prior to selection of the final remedy. The preferred alternative is Alternative 2b, focused dredging and backfill, off-site disposal of sediment at a beneficial reuse site, ICs, and sediment monitoring. Alternative 2b would be implemented by removing sediment located within 75 feet from the shoreline to a depth of at least 2.5 feet. Therefore, a complete exposure pathway to diving ducks would be eliminated since (1) all sediment that contains lead shot within the top 2 feet would be removed; and (2) any lead shot remaining in sediment at Site 27 is buried under at least 2 feet of sediment, which is not accessible to diving ducks. ICs would be implemented site-wide to restrict activities that might disturb sediment and re-suspend lead shot currently buried at the site. Post-construction sediment monitoring would confirm consistent sediment profile against erosion. A public meeting held in June 2011 provided an additional opportunity for the public to learn about the Proposed Plan/Draft RAP and provide comments.

Note:

* The documents listed are available in the Administrative Record and provide detailed information used to support remedy selection at Site 27.

IR Installation Restoration
NAVSTA TI Naval Station Treasure Island
RAP Remedial Action Plan
ROD Record of Decision

2.5 SUMMARY OF SITE RISKS

Lead shot is the only COEC at Site 27. Lead shot contamination in sediment originated from the site's former use as a skeet range. The results of the 2008 investigation of lead shot in the nearshore area determined that the primary fate and transport mechanism was incidental ingestion of lead shot within the top 2 feet of sediments by diving ducks.

The Final RI for the Offshore Sediments OU, completed in 2001, included analytical results for sediment, bay water, and pore water samples collected during investigations conducted in 1992 (Phase I), 1996 (Clipper Cove Skeet Range Offshore Investigation) and 1997 (Phase II). As part of the RI, analytical results for these samples were evaluated in an ERA. No human health risk assessment (HHRA) was conducted because no direct exposure pathway for humans to sediment was identified. The conclusions of the ERA were revised in the FS after the 2008 investigation of the nearshore area was complete. The results of ERA and the 2008 lead shot investigation are summarized in Section 2.5.2.

2.5.1 Human Health Risk Assessment

No HHRA has been conducted at Site 27 because there is no pathway for exposure to lead, lead shot, or PAHs in sediment for humans.

2.5.2 Ecological Risk Assessment

An **ERA(13)** was conducted as part of the RI for the Offshore Sediments OU to evaluate the incremental risk to ecological receptors attributable to past activities and releases at NAVSTA TI. Chemicals associated with skeet range activities (lead shot, lead in sediment, and PAHs) were targeted for evaluation at Site 27. Concentrations of lead and PAHs detected in sediment, pore water, and surface water at the site were compared with screening values to identify COPECs; there are no screening values for lead shot. A chemical was identified as a COPEC if the chemical (1) exceeded local or ambient conditions; (2) potentially caused toxicity; or (3) did not have a screening value. Frequency of detection, magnitude of detected concentration, and toxicity information for COPECs was evaluated as a second step in the screening process. The **secondary evaluation(14)** resulted in the list of COEC; these COECs were then evaluated in terms of risk to ecological receptors. Ingestion of and dermal contact with sediments, or direct ingestion of organic material constituted the primary routes of exposure to chemicals. Receptors were not considered to be at risk unless they were spatially and temporally co-occurring with contaminants.

PAHs were not detected in skeet range sediments at concentrations exceeding screening values and were not detected in any of the pore water or surface water samples. Thus, PAHs were not considered a COPEC at the skeet range. Risk to benthic invertebrate and vertebrate receptors from exposure to PAHs was minimal based on sediment chemistry and toxicity data.

Lead was detected in sediment at concentrations ranging from 6.3 mg/kg to 54.4 mg/kg during the skeet range investigation. All detected concentrations were well below the ER-M level (218 mg/kg). Eight samples contained lead at concentrations higher than the ambient value (43.2 mg/kg) and six of the eight samples contained lead at concentrations higher than the ER-L value (46.7 mg/kg). The highest concentrations of lead were generally detected at depths of 3 to 5 feet. One Phase II sample collected within the boundaries of Site 27 contained lead at a concentration (63.3 mg/kg, sample depth 6 to 8 feet bgs) above the ER-L. However, lead was not detected in any of the pore water or surface water samples. Thus, lead was retained as a COPEC for sediment because it was detected at concentrations that exceeded screening values. The primary concern was subsurface sediments; no concerns were identified for lead in surface sediments, pore water, or surface water.

The maximum number of lead shot recovered (estimated) per kilogram in skeet range sediments was 11.91, found between the 3- and 4-foot depth intervals. Surface samples produced very low levels of lead shot. Lead shot was also retained as a COPEC.

The secondary evaluation identified **lead as a COEC(15)** because concentrations of lead exceeded screening values by more than 10 percent in subsurface sediments. However, the RI concluded that risk associated with exposure to lead in subsurface sediments was minimal because detected concentrations were only slightly greater than the ER-L. Lead shot did not pose an unacceptable risk to ecological receptors because it was effectively buried in sediment. However, future dredging might disturb sediments overlying the lead shot and could provide an unacceptable risk pathway specific to foraging diving ducks.

Incidental ingestion of lead shot by diving ducks was further evaluated as the receptor pathway of concern in the FS because diving ducks such as the surf scoter (*Melanitta perspicillata*) can penetrate the sediment surface from depths ranging from the length of their head (5 to 6.5 inches) to the length of their entire body (17 to 21 inches) while they forage for food in water as deep as 40 feet. Lead shot can produce **toxic effects(16)** in diving ducks after it is ingested. After the Revised Draft FS Report was submitted in 2004, uncertainty about the sediment accumulation and deposition rates in Clipper Cove was identified as a data gap.

In 2005, the Navy reviewed hydrographic surveys conducted between 1985 and 2005 to gain a better understanding of sediment accumulation rates at Site 27. The study concluded that sediment is naturally being deposited in areas of the Skeet Range farther than 150 feet from the shoreline. A layer of sediment more than 2 feet thick had been deposited in Clipper Cove since skeet range operations ceased in 1989. This sediment deposition has effectively covered the lead shot, eliminating the ingestion exposure pathway to diving ducks over most of the site because it is out of their reach. However, minimal sediment deposition was occurring within 150 feet of the shoreline (the nearshore area).

The Navy decided to conduct additional **investigation of the nearshore area(17)** in 2008 because sediment deposition was minimal and because only one sample had previously been collected from the nearshore area for analysis of lead shot. This investigation focused on further characterizing the distribution of lead shot in the top 2 feet of sediment in the nearshore area to determine whether there was potential risk to diving ducks and support development of the remedial alternatives in the FS. As a secondary characterization, residual lead, grain size, total organic carbon, and benthic biomass in the upper 3 inches were analyzed. Benthic biomass refers to the total mass of organisms that live within the sediment surface that could be available as food forage for diving ducks.

Lead shot was detected$_{(18)}$ in **eight of 30 locations$_{(19)}$** in the 12- to 18-inch and 18- to 24-inch depth intervals. The maximum number of shot per 6-inch core was 46. All detections were within 75 feet of the shoreline, where waterfowl foraging for food or grit could ingest the shot. No lead shot was found in the samples collected in the top 2 feet of sediment from 75 feet to 150 feet from the shoreline. Therefore, there is a potentially complete exposure pathway for diving ducks within 75 feet of the shoreline, as shown in the **conceptual site model$_{(20)}$** that was developed after the results were analyzed . The concentrations of lead in sediment (24 mg/kg to 120 mg/kg) were consistent with other offshore samples collected at Treasure Island and San Francisco Bay ambient values. The investigation concluded that lead shot was a contaminant of concern at Site 27, but that total lead was not.

Benthic organisms were recovered from the grab samples, indicating that there is a food source for diving ducks in the nearshore area, and diving ducks were observed at Site 27 during the field investigation.

2.5.3 Basis for Response Action

The response action selected in this ROD/Final RAP is necessary to protect public health, welfare, or the environment from actual or potential releases of hazardous substances into the environment. The response action specifically addresses ecological receptors because no unacceptable risk for humans was identified in the RI. The Navy, in partnership with DTSC, the Water Board, and EPA, considered all pertinent factors in accordance with CERCLA and the NCP remedy selection criteria and concluded that remedial action is necessary to address lead shot in sediment at Site 27. This decision was made because:

- Lead shot in sediment is buried under as little as 1 foot of sediment within 75 feet of the shoreline, which is within the reach of diving ducks. Therefore, there is current potential risk to diving ducks from lead shot in sediment within 75 feet of the shoreline.
- Lead shot buried beneath 2 feet of sediment in the rest of the site poses a potential future risk to diving ducks if exposed by dredging or other sediment-disturbing activities.

2.6 Principal Threat Waste

Principal threat wastes are hazardous or highly toxic source materials that result in ongoing contamination to surrounding media, generally cannot be reliably contained, or present a significant risk to human health or the environment should exposure occur. Non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. Although a remedial response action is necessary (Section 2.5.3), lead shot at Site 27 does not constitute a "principal threat." Lead shot at Site 27 is a non-principal threat waste because it is relatively stable, rather than highly mobile.

2.7 REMEDIAL ACTION OBJECTIVES

RAOs are established based on attainment of regulatory requirements, standards, and guidance; contaminated media; chemicals of concern; potential receptors and exposure scenarios; and human health and ecological risks. Ultimately, the success of a remedial action is measured by its ability to meet the RAOs. No unacceptable human health risks were identified in the Offshore RI because no complete exposure pathway is present. Therefore, the RAOs are not based on risk to human health. Instead, the RAOs established for Site 27 in the FS are based on exposure of diving ducks to lead shot under both current and future use scenarios. The RAOs for Site 27 were developed in conjunction with the regulatory agencies and are listed below:

- Prevent or minimize ingestion of lead shot by diving ducks within 75 feet of the shoreline, where there is a complete exposure pathway under current conditions.
- Prevent or minimize ingestion of lead shot by diving ducks site-wide, where there is a potentially complete exposure pathway for diving ducks under future conditions where lead shot is currently buried below at least 2 feet of sediment.

2.8 DESCRIPTION AND EVALUATION OF REMEDIAL ALTERNATIVES

Preliminary screening of **general response actions (GRA)(21)** and process options was completed in the FS Report to refine the remedy selection process to address contamination in sediment. Five potential GRAs were identified to achieve RAOs: no action, ICs, treatment technologies, sediment removal, and sediment disposal. Remedial technologies and response actions were evaluated with respect to implementability, effectiveness, and relative cost (high, moderate, and low) in a preliminary screening. Detailed cost analysis was not performed as part of this preliminary screening. Three basic remedial alternatives were developed based on the technologies and process options retained for a detailed comparative analysis in accordance with the NCP. The alternatives are (1) no action; (2) focused dredging and backfill, off-site disposal, ICs, and monitoring; and (3) site-wide dredging and off-site disposal.

2.8.1 Description of Remedial Alternatives

Table 2 provides the major components, details, and cost of each remedial alternative identified for sediment.

TABLE 2. REMEDIAL ALTERNATIVES

ROD/Final RAP, IR Site 27, Former Clipper Cove Skeet Range, Former NAVSTI, TI, San Francisco

Remedial Alternative	Components	Details	Cost and Timeframe
1	▪ No Action	▪ No action for contaminated sediment and no restriction of site use. ▪ Existing conditions would remain. ▪ Evaluation of no action alternative is required by the NCP.	No cost or timeframe
2a	▪ Focused Dredging ▪ Backfill ▪ Landfill Disposal of Sediment ▪ ICs ▪ Sediment Monitoring	▪ The area within 75 feet of the shoreline would be dredged to remove contaminated sediments that present a current, complete exposure pathway to diving ducks. ▪ Removed sediments would be dewatered and disposed of off-site at a landfill. ▪ The dredged area would be backfilled. ▪ ICs would be implemented site-wide to reduce likelihood of activities that may cause sediment disturbance. ▪ Sediment monitoring consisting of bathymetric surveys would be conducted before the remedy is implemented, 1 year after backfilling is complete, and every 5 years after to ensure the sediment profile is stable in the backfill area.	Capital Cost: $2.7 million Total O&M Cost: $0.35 million **Present-Value Cost: $2.9 million(22)** Discount Rate: 2.8% Timeframe: 1 year for construction, 30 years for periodic costs
2b	▪ Focused Dredging ▪ Backfill ▪ Beneficial Reuse of Sediment ▪ ICs ▪ Sediment Monitoring	▪ The area within 75 feet of the shoreline would be dredged to remove contaminated sediments that present a current, complete exposure pathway to diving ducks. ▪ Removed sediments would be transported by barge to an upland beneficial reuse site. ▪ The dredged area would be backfilled. ▪ ICs would be implemented to reduce likelihood of activities that may cause sediment disturbance. ▪ Sediment monitoring consisting of bathymetric surveys would be conducted before the remedy is implemented, 1 year after backfilling is complete, and every 5 years after to ensure the sediment profile is stable in the backfill area.	Capital Cost: $2.1 million Total O&M Cost: $0.35 million **Present-Value Cost: $2.2 million(23)** Discount Rate: 2.8% Timeframe: 2 months for construction, 30 years for periodic costs
3a	▪ Site-wide Dredging ▪ Landfill Disposal of Sediment	▪ The entire site would be dredged to remove contaminated sediments that present a potentially complete exposure pathway to diving ducks in the future. ▪ Removed sediments would be dewatered and disposed of off-site at a landfill.	Capital Cost: $21.0 million Total O&M Cost: $0 **Present-Value Cost: $21.0 million(24)** Discount Rate: NA Timeframe: 6 years
3b	▪ Site-wide Dredging ▪ Beneficial Reuse of Sediment	▪ The entire site would be dredged to remove contaminated sediments that present a potentially complete exposure pathway to diving ducks in the future. ▪ Removed sediments would be transported by barge to an upland beneficial reuse site.	Capital Cost: $23.9 million Total O&M Cost: $0 **Present-Value Cost: $23.9 million(25)** Discount Rate: NA Timeframe: 6 months

Notes:

IR	Installation Restoration
NAVSTA TI	Naval Station Treasure Island
RAP	Remedial Action Plan
ROD	Record of Decision

2.8.2 Comparative Analysis of Alternatives

A comparative analysis of alternatives with respect to the **nine evaluation criteria$_{(26)}$** was completed. The analysis is presented in Table 3 and described in the text that follows. The no-action alternative (Alternative 1) is included in the FS for comparison per the NCP.

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative 1, the no action alternative, would not be protective of the environment. Alternatives 2 and 3 would protect the environment because both would eliminate the exposure pathway to diving ducks, whereas Alternative 1 would not. Alternatives 2 and 3 were ranked equally based on this criterion. There are no human health risks at Site 27, so no action is necessary to protect human health.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

CERCLA § 121(d)(1) states that remedial actions at 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. Chemical-specific ARARs are health- or risk-based numerical values or methods that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions on the concentrations of hazardous substances or on conducting activities solely because they are in specific locations. Specific locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats. Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site. Under Alternative 1, no action would be conducted, so ARARs are not evaluated for this alternative. Alternatives 2 and 3 would comply with the ARARs identified in Attachment A of this report. Thus, these alternatives were ranked equally based on this criterion.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence

Alternative 1 would provide no long-term effectiveness or permanence because no remedial action would be conducted to mitigate ecological risk. Alternatives 2 and 3 would provide a remedy with long-term effectiveness and permanence by eliminating the exposure pathway to diving ducks. Long-term effectiveness is considered high for Alternative 2, as the exposure pathway would be eliminated through focused dredging, backfilling, and IC implementation. Long-term effectiveness is considered very high for Alternative 3, as the exposure pathway would be eliminated through dredging to completely remove all contaminated sediments within the site boundary. These differences are reflected in the rankings in Table 3. Figure 3 presents a visual comparison of the proposed excavation and backfill areas for Alternatives 2 and 3.

TABLE 3. REMEDIAL ALTERNATIVE RANKING

ROD/Final RAP, IR Site 27, Former Clipper Cove Skeet Range, Former NAVSTI, TI, San Francisco

Criterion and *Score Description*	Alternative 2: Focused Dredging and Backfill, Off-site Disposal of Sediment, Institutional Controls, and Sediment Monitoring		Alternative 3: Site-wide Dredging and Off-Site Disposal of Sediment	
	2a: Landfill Disposal of Sediment	2b: Beneficial Reuse of Sediment	3a: Landfill Disposal of Sediment	3b: Beneficial Reuse of Sediment
(1) Overall Protection of Human Health and the Environment ***Average Protectiveness score*** *(1 is least and 5 is most protective)*	***5***	***5***	***5***	***5***
(2) Compliance with ARARs *Chemical-, Location-, and Action-Specific ARARs score* *(1 is least and 5 is most compliant)*	***5***	***5***	***5***	***5***
(3) Long-Term Effectiveness and Permanence ***Average Long-Term Effectiveness score*** *(1 is least and 5 is most effective)*	***4***	***4***	***5***	***5***
(4) Reduction of Toxicity, Mobility, or Volume through Treatment ***Average Reduction Through Treatment score*** *(0 indicates no reduction and 5 indicates the most reduction)*	***0***	***0***	***0***	***0***
(5) Short-Term Effectiveness ***Average Short Term Effectiveness score*** *(1 is least and 5 is most effective)*	***2.5***	***3***	***1***	***2***
(6) Implementability ***Average Implementability score*** *(1 is least and 5 is most easily implemented)*	***2.5***	***3***	***1***	***2***
(7) Cost ***Present Worth Cost score*** *(1 is most and 5 is least expensive)*	***3***	***3***	***1***	***1***
(8) State Acceptance	***PP***	***PP***	***PP***	***PP***
(9) Community Acceptance	***NC***	***NC***	***NC***	***NC***
Overall Score	**22**	**23**	**18**	**20**
Rank	**2nd**	**1st**	**4th**	**3rd**

Notes: Individual ratings for each criterion were summed to yield a total score and relative ranking. The maximum total score is 35. Alternative 1 is not eligible for selection and therefore not presented.

ARAR Applicable or relevant and appropriate requirement
NC No changes were made because public comments received did not require a revision to the preferred alternative. Public comments are addressed in Attachment B.
PP State acceptance of the selected remedy is documented in the Proposed Plan/Draft RAP and ROD/Final RAP

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Figure 3. Comparison of Alternative 2 and Alternative 3 Dredging Areas

Reduction in Toxicity, Mobility, or Volume through Treatment

Implementation of Alternatives 1, 2, or 3 would not reduce the toxicity, mobility, or volume of hazardous substances through treatment; therefore, none of the alternatives is considered effective under this criterion.

Short-Term Effectiveness

Alternative 1 would provide no protection to the environment because no action would be conducted to limit the risk posed by lead shot within 75 feet of the shoreline. During construction, implementation of Alternatives 2 and 3 could affect the public, environment, and workers because of potential re-suspension of lead shot, traffic, and noise. Effects would be minimized through implementation of construction quality control (QC) monitoring and environmentally sensitive construction practices, other monitoring protocols, and health and safety plans. Short-term effectiveness for Alternative 2a would be considered low to moderate and for Alternative 2b moderate because of the limited dredging area and shorter performance period than Alternative 3. Short-term effectiveness for Alternative 3a would be considered very low and for Alternative 3b low given the large area to be dredged and the amount of sediment to be removed, as well as the longer performance period than Alternative 2. These differences are reflected in the rankings in Table 3.

Implementability

Alternative 1 would be the easiest to implement because no action is required. Alternative 2 would be moderately difficult to implement, requiring construction, monitoring, and ICs. Alternative 3 would be the most difficult to implement given the large quantity of sediment that would require removal. Alternatives 2a and 3a are more difficult to implement than Alternatives 2b and 3b because dewatering is required prior to off-site disposal at a landfill. Therefore, implementability is considered low to moderate for Alternative 2a and moderate for Alternative 2b. Similarly, implementability is considered very low for Alternative 3a and low for Alternative 3b. These differences are reflected in the rankings in Table 3.

Cost

No cost would be associated with Alternative 1. The costs for Alterative 2a ($2.9 million) and Alternative 2b ($2.2 million) are moderate. The costs for Alterative 3a ($21.0 million) and Alternative 3b ($23.9 million) are very high. These differences are reflected in the rankings in Table 3.

Modifying Criteria

State Acceptance. State involvement has been solicited throughout the CERCLA process. The Navy, DTSC, and the Water Board coordinated on all major documents and investigative activities associated with Site 27, including the RI and FS. Based on these reviews and discussions of key documents, the state supports the selected remedy. The State of California's acceptance of the Navy's selected remedial alternative is documented in the Proposed Plan/Draft RAP and ROD/Final RAP.

Community Acceptance. Community acceptance was evaluated based on comments received on the Proposed Plan/Draft RAP, which was presented to the community and discussed during a public meeting on June 14, 2011. Comments were also accepted during the public comment period from June 2 through July 2, 2011. The preferred alternative presented in the Proposed Plan/Draft RAP was Alternative 2b. Attachment B, the responsiveness summary, addresses the public's comments and concerns about the preferred remedial alternative for Site 27 presented in the Proposed Plan/Draft RAP. No significant public comments that would warrant a revision to the preferred alternative were received.

2.9 SELECTED REMEDY

The selected remedy is Alternative 2b, **focused dredging and backfill$_{(27)}$**, off-site disposal of sediment at a beneficial reuse site, ICs, and sediment monitoring.

2.9.1 Rationale for Selected Remedy

As indicated in Table 3, Alternative 2b ranked the highest in the comparative analysis of remedial alternatives. Therefore, Alternative 2b is selected as the remedy for Site 27. Alternative 2b:

(1) Will meet the RAOs by eliminating the current complete exposure pathway for diving ducks and ensure the pathway remains incomplete throughout the site.

(2) Is the most effective in the short term and would have the least effect on the community, remedial workers, and the environment because of the limited dredging area and the relatively shorter performance period.

(3) Would be implemented in the shortest period of time. Periodic costs will include long-term monitoring to ensure RAOs are consistently achieved.

(4) Meets federal and state ARARs.

(5) Is the most cost effective to implement.

2.9.2 Description of Selected Remedy

The remedy will be implemented by **removing sediment$_{(28)}$** located within 75 feet from the shoreline to a depth of at least 2.5 feet (the focused dredging area) (Figure 3). Approximately 8,600 cubic yards of sediment would be dredged from an approximately 92,500-square-foot area of Site 27. Therefore, a complete exposure pathway to diving ducks will be eliminated since (1) all sediment that contains lead shot within the top 2.5 feet will be removed; and (2) lead shot in the remaining offshore area of Site 27 is buried under at least 2 feet of sediment, which is not accessible to diving ducks.

After dredging is complete, the area will be backfilled. The vertical extent of dredging and the backfill design will be established during the remedial design and will take into account relevant hydrodynamic conditions and consider current and historical uses of the marina, including maintenance dredging. Dredged sediment will be transported by barge to an upland

beneficial reuse(29) site, such as the Montezuma Wetlands in Solano County, California, and dewatering will not be required.

Alternative 2b construction (focused dredging, backfill, and disposal) is expected to require 2 months to complete. Post-remedy **sediment monitoring(30)** will consist of baseline monitoring before dredging, construction QC monitoring during dredging, and post-construction monitoring. A post-remedy bathymetric survey will be followed by monitoring 1 year after the remedy has been implemented and every 5 years after the remedy has been implemented in the backfill area to confirm that the engineered backfill remains stable. Detailed post-remedy survey and monitoring plans will be developed and presented in the remedial action work plan.

After dredging and backfilling, **site-wide ICs**(31) will be implemented to restrict disturbance of the remaining sediment, which will prevent or minimize re-suspension of lead shot from deeper sediments in the undredged portion of the site. ICs are legal and administrative mechanisms used to implement land use restrictions to limit exposure of future landowners or users of the property to hazardous substances present on the property and to ensure the integrity of the remedial action. ICs are required on a property where the selected remedial cleanup levels result in contamination remaining at the property above levels that allow for unlimited use and unrestricted exposure.

ICs applied to IR Site 27 will consist of land use restrictions and could include restrictions on vessel speed, controls on dredging within the boundary of Site 27, and long-term monitoring of the backfill. ICs will be maintained until the concentrations of hazardous substances in sediment are at levels that allow for unlimited use and unrestricted exposure. Implementation of ICs includes requirements for monitoring, inspections, and reporting to ensure compliance with land use or activity restrictions.

The Navy has determined that it will rely on proprietary controls in the form of environmental restrictive covenants as provided in the "Memorandum of Agreement between the United States Department of the Navy and the California Department of Toxic Substances Control" and associated covenant models (the "Navy/DTSC MOA").

More specifically, land use and activity restrictions will be incorporated into two separate legal instruments as provided in the Navy/DTSC MOA:

1. Restrictive covenants included in Quitclaim Deeds from the Navy to the property recipient.
2. Restrictive covenants included in a "Covenant to Restrict Use of Property" entered into by the Navy and DTSC as provided in the Navy/DTSC MOA and consistent with the substantive provisions of California Code of Regulations (Cal. Code Regs.) Title (tit.) 22 § 67391.1.

The "Covenant(s) to Restrict Use of Property" will incorporate the land use restrictions into environmental restrictive covenants that run with the land and that are enforceable by DTSC against future transferees. The Quitclaim Deed(s) will include the identical land use and activity restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the Navy against future transferees.

A land use control (LUC) remedial design (RD) will be prepared as the land use component of the remedial design and in accordance with the schedule set forth in the Federal Facility State Remediation Agreement. The LUC RD will include additional details regarding implementation, maintenance, and periodic inspections of ICs and will contain the activity restrictions in the "Covenant(s) to Restrict Use of Property" and Deed(s). The LUC RD shall identify the roles of local and state government in administering the LUC RD.

The Navy is responsible for implementing, monitoring, reporting on, maintaining, and enforcing ICs. Although the Navy may later transfer the procedural responsibilities for enforcement of land use restrictions to another party by contract, property transfer agreement, or through other means, the Navy will retain ultimate responsibility for the integrity of the remedy. The Navy shall not modify or terminate ICs, implementation actions, or modify land use without approval by DTSC. The Navy shall seek prior concurrence before any anticipated action that may disrupt the effectiveness of the ICs or any action that may alter or negate the need for ICs.

2.9.3 Expected Outcomes of the Selected Remedy

The selected remedy will be protective of human health and the environment by eliminating, reducing, or controlling exposures to human and environmental receptors through all potential exposure pathways currently and in the future. Table 4 summarizes how the selected remedy mitigates risk and achieves RAOs.

2.9.4 Statutory Determinations

In accordance with the NCP, the selected remedy meets the following statutory determinations:

- **Protection of Human Health and the Environment –** The selected remedy will protect diving ducks by eliminating current and potential exposure to lead shot in sediment. Focused dredging and backfill will remove the current complete exposure pathway and site-wide ICs will control potential future exposure. There are no risks to human health at Site 27.

- **Compliance with ARARs –**The remedial alternative selected by the Navy will meet all chemical-, location-, and action-specific ARARs. The ARARs that will be met by the preferred alternatives are summarized in Attachment A.

- **Cost-Effectiveness –** The selected remedy is cost effective. It will provide overall protectiveness proportional to the cost.

- **Use of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable –** The Navy has determined that the selected remedy represents the maximum extent practicable to which permanent solutions can be used in a cost-effective manner. Based on the evaluation of all the alternatives that were considered protective of human health and the environment and that complied with ARARs, the selected remedy will provide the best balance of tradeoffs among long-term effectiveness and permanence, implementability, short-term effectiveness, and cost.

- **Preference for Treatment as a Principal Element –** The selected remedy would not reduce the toxicity, mobility, or volume of hazardous substances through treatment because no treatment is being used.

- **Five-Year Review Requirements –**The effectiveness of the remedy for Site 27 will be reviewed at a minimum of 5-year intervals because the remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure. A statutory five-year review will be conducted within 5 years after initiation of remedial actions to ensure that the remedy continues to be protective of human health and the environment while the contaminants are present at Site 27.

TABLE 4. RISK MITIGATION AND ACHIEVEMENT OF RAOS

ROD/Final RAP, IR Site 27, Former Clipper Cove Skeet Range, Former NAVSTI, TI, San Francisco

Risk	RAO	How Selected Remedy Mitigates Risk and Achieves RAOs
Incidental ingestion of lead shot by diving ducks under current conditions	Prevent or minimize ingestion of lead shot by diving ducks within 75 feet of the shoreline, where there is a complete exposure pathway under current conditions.	Focused dredging within 75 feet of the shoreline will remove lead shot within the top 2.5 feet of sediment where diving ducks could be exposed. Backfill will prevent exposure to lead shot that may be buried deeper than 2.5 feet beneath the sediment surface. Focused dredging and backfill will be completed in approximately 2 months.
Incidental ingestion of lead shot by diving ducks under future conditions	Prevent or minimize ingestion of lead shot by diving ducks site-wide, where there is a potentially complete exposure pathway for diving ducks under future conditions where lead shot is currently buried below at least 2 feet of sediment.	Institutional controls implemented after focused dredging and backfill will restrict activities site-wide that could disturb sediment and resuspend lead shot. A post-construction bathymetric survey, followed by sediment monitoring 1 year after and every 5 years after, will confirm the integrity of the backfill material and sediment profile. The monitoring results for the first year will be presented in an annual review report, and subsequent 5-year monitoring results would be summarized and presented in five-year review reports.

Notes:

IR	Installation Restoration	RAP	Remedial Action Plan
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2.10 COMMUNITY PARTICIPATION

Community participation at Former NAVSTA TI includes a Restoration Advisory Board (RAB), public meetings, public information repositories, newsletters and fact sheets, public notices, and an IR Program website. The May 2008 Final Community Relations Plan for former NAVSTA TI provides detailed information on community participation for the IR Program and documents interests, issues, and concerns raised by the community regarding ongoing investigation and cleanup activities at Former NAVSTA TI.

RAB meetings are held on the first Tuesday of every other month and are open to the public to provide opportunity for public comment and input. Documents and relevant information relied on in the remedy selection process are made available for public review in the information repositories listed below or on the **IR Program website, www.bracpmo.navy.mil(32)**.

San Francisco Public Library
Government Publications Section
100 Larkin Street
San Francisco, California 94102
(415) 557-4400

Navy BRAC Caretaker Support Office
1 Avenue of the Palms, Suite 161
Treasure Island
San Francisco, California 94130
(415) 743-4729

For access to the Administrative Record, contact:

Ms. Diane Silva, Command Records Manager
NAVFAC Southwest DIV Code EV33
NSDB Building 3519
1220 Pacific Highway
San Diego, California 92132
(619) 556-1280
diane.silva@navy.mil

For additional information on the IR Program, contact:

James Sullivan
BRAC Environmental Coordinator
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310
(619) 532-0966
james.b.sullivan2@navy.mil

3.0 RESPONSIVENESS SUMMARY

The responsiveness summary is the third component of a ROD/Final RAP; its purpose is to summarize information about the views of the public and support agencies on both the remedial alternatives and general concerns about the site submitted during the public comment period. The Responsiveness Summary documents in the public record how public comments were integrated into the decision-making process.

In accordance with CERCLA §§ 113 and 117, the Navy provided a public comment period from June 2, 2011, to July 2, 2011, for the proposed remedial action described in the Final Proposed Plan/Draft RAP for Site 27. A public meeting to present the Final Proposed Plan/Draft RAP was held from 6:30 to 8:30 p.m. on June 14, 2011. Public notice of the meeting and availability of documents appeared in the *San Francisco Chronicle* on June 2, 2011. The Final Proposed Plan/Draft RAP is included in Attachment F, and a copy of the newspaper notice that announced the public comment period and the location and time of the public meeting is included in Attachment G.

The participants in the public meeting included community members, RAB members, and representatives of the Navy and DTSC. Questions and concerns received during the meeting were addressed at the meeting and are documented in the meeting transcript. The public meeting attendance roster and the public meeting transcript are included in Attachment G. The Navy's responses to comments provided at the meeting and received during the public comment period are included in the responsiveness summary (Attachment B).

DTSC prepared an Initial Study to evaluate potential impact of the proposed project on the environment in accordance with the California Environmental Quality Act (CEQA). The findings of the Initial Study indicate that the project would not have a significant effect on public health or the environment. Therefore, DTSC prepared a proposed Negative Declaration for the Site 27 cleanup. Both the Initial Study and proposed Negative Declaration were made available for review and comment during the public comment period. No comments were received during the comment period.

ATTACHMENT A
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Federal and State Chemical-Specific[a] Applicable or Relevant and Appropriate Requirements
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 27,
Former Naval Station Treasure Island, San Francisco, California

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
Federal				
Resource Conservation and Recovery Act (Title 42 U.S.C. Chapter 82, §§ 6901-6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on 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	These regulations are applicable to activities that generate waste to determine if the waste is hazardous. The Navy will generate waste during excavation. The Navy will determine whether the waste meets the definition of RCRA hazardous waste when it is generated.
LDRs prohibit disposal of hazardous waste unless treatment standards are met.	Hazardous waste land disposal	Cal. Code Regs. tit. 22, § 66268.1(f)	Applicable	The substantive provisions of this section are ARARs if any hazardous waste is disposed of offsite.
State				
Department of Toxic Substances Control[b]				
Definition of non-RCRA, state regulated hazardous waste.	Waste	Cal. Code Regs. tit. 22, §§ 66261.3(a)(2)(C) or (a)(2)(F), 66261.22(a)(3) and (a)(4), 66261.24(a)(2) – (a)(8), and 66261.101	Applicable	These regulations are applicable to activities that generate waste to determine if the waste is non-RCRA, state-regulated hazardous waste. The Navy accepts the substantive provisions of these requirements as state ARARs and will determine if the excavated soil meets the definition of non-RCRA, state-regulated hazardous waste when it is generated.
State Water Resources Control Board				
Definition of designated waste and nonhazardous waste.	Waste	Cal. Code Regs. tit. 27, §§ 20210 and 20220	Applicable	These regulations are applicable to activities that generate waste to determine if the waste is a regulated waste. The Navy accepts the substantive provisions of these requirements as state ARARs and will determine if the excavated soil meets these definitions when it is generated.

Notes:

a	Many action-specific ARARs contain chemical-specific limitations that are addressed in the action-specific ARAR tables.
b	Only the substantive provisions of the requirements cited in this table are ARARs.
c	Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs. Specific ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered ARARs.
§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
Cal. Code Regs.	California Code of Regulations
LDR	Land disposal restriction
RCRA	Resource Conservation and Recovery Act
TCLP	Toxicity characteristic leaching procedure
tit	Title
U.S.C.	United States Code

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Federal					
Coastal Zone Management Act (16 U.S.C. §§ 1451 through 1464)[b]					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs	Activities affecting the coastal zone, including lands there under and adjacent shore land	16 U.S.C. § 1456(c) 15 CFR § 930	Relevant and Appropriate	The CZMA requires federal agency activities outside the coastal zone (i.e., activities on federal lands) that may affect any land or water use or natural resources of the coastal zone be conducted in a manner that is consistent to the maximum extent practicable with enforceable policies of an approved state management program. The San Francisco Bay Plan is an approved state program. The selected remedial action will comply with the broad goals of the San Francisco Bay Plan.
Migratory Bird Treaty Act of 1918 (16 U.S.C. § 703-712)[b]					
Migratory bird area	Protects almost all species of native birds in the U.S. from unregulated "take" that can include poisoning at hazardous waste sites.	Presence of migratory birds	16 U.S.C. § 703	Relevant and Appropriate	The substantive provisions of this requirement are ARARs because migratory birds are present on site.

Federal and State Location-Specific[a] Applicable or Relevant and Appropriate Requirements
Record of Decision/Final Remedial Action Plan for Installation Restoration Site 27
Former Naval Station Treasure Island, San Francisco California (Continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Endangered Species Act of 1973 (16 U.S.C. §§ 1531–1543)[b]					
Habitat on 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.	Determination of effect on endangered or threatened species or its habitat. Critical habitat on which endangered species or threatened species depend.	16 U.S.C. § 1536(a), (h)(1)(B); 16 U.S.C. § 1538(a)(1)(B) and (G); and 16 U.S.C.	Applicable	Consultation regulations at 50 CFR Part 402 are administrative in nature and are therefore not ARARs. However, they may be TBCs to comply with the substantive provisions of the Endangered Species Act. The substantive provisions of 16 U.S.C. §§ 1531-1543 are ARARs for endangered species present at the site and for response actions at or near threatened or endangered species habitats. The California least tern and the Chinook salmon are federally listed endangered species that may be present at the site.
Marine Mammal Protection Act (16 U.S.C. §§ 1361 through 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)	Applicable	The substantive provisions are ARARs because marine mammals are likely to be found at Clipper Cove.

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Rivers and Harbors Act of 1899 (33 U.S.C. §§ 401 through 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 CFR § 322	Relevant and Appropriate	The substantive provisions of these requirements are relevant and appropriate for the excavation and backfilling at Site 27. CERCLA § 121(e) exempts remedial actions conducted entirely on-site from administrative or procedural permit requirements. However, the Navy will comply with the substantive provisions of these ARARs because it will not deposit excavated sediment in the bay and it will not affect the course, location, condition, or capacity of the bay.
Clean Water Act of 1977, as Amended, § 404 (33 U.S.C. Section 1344)[b]					
Bay	Action to prohibit discharge of dredged or fill material into waters of the United States without permit.	Waters of the United States	33 U.S.C. § 1344	Applicable	The substantive provisions of these requirements are ARARs for excavating and backfilling in the bay. CERCLA § 121(e) exempts remedial actions conducted entirely on-site from obtaining a dredge or fill permit. Therefore, the Navy will not obtain a permit before Site 27 is excavated and backfilled. The Navy will comply with the substantive provisions of the permit as a means to ensure compliance with the substantive provisions of these ARARs.

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
State					
McAteer-Petris Act (California Government Code §§ 66600 through 66661)[b]					
Within the San Francisco Bay (Bay) coastal zone	Reduce fill and disposal of dredged material in the Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the Bay.	Activities affecting the Bay and 100 feet landward of the shoreline.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	Relevant and Appropriate	The Navy has determined that the substantive provisions of the CZMA are relevant and appropriate federal location-specific requirements for Site 27. The CZMA requires federal agency activity be conducted in a manner consistent with approved state management programs to the maximum extent practicable. The McAteer-Petris Act is enabling legislation for the San Francisco Bay Plan, an approved state management program for the bay. Substantive provisions of the McAteer-Petris Act and the San Francisco Bay Plan are relevant and appropriate because their authority is derived from the CZMA, a relevant and appropriate federal requirement. The Navy will conduct its remedial actions in accordance with the substantive provisions of the San Francisco Bay Plan.

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
California Fish and Game Code[b]					
Area used by endangered or threatened species	No person shall take any endangered or threatened species	Threatened or endangered species are present.	Cal. Fish & Game Code § 2080	Relevant and Appropriate	Substantive provisions of this requirement are relevant and appropriate. The California least tern and the Chinook salmon are state listed endangered species that may be present at the site.
Fully protected bird species/habit at	Prohibits the take or possession of listed fully protected birds	Taking of protected birds	Cal. Fish and Game Code § 3511	Relevant and Appropriate	Substantive provisions of this requirement are relevant and appropriate. The California least tern and the California brown pelican are fully protected birds that may be present at the site.
Aquatic habitat	Action must be taken if toxic materials are placed where they can enter the waters of the state.	Materials entering the waters of the state	Cal. Fish and Game Code § 5650(a) & (b)	Relevant and Appropriate	California Fish and Game Code § 5650 is not applicable because the United States of America has not waived sovereign immunity for this State of California requirement. However, the Navy has identified the substantive provisions of these requirements as relevant and appropriate because the remedial action will take place in the waters of the state.

Notes:

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

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

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
Bay	San Francisco Bay
Cal.	California
Cal. Code Regs.	*California Code of Regulations*
CERCLA	Comprehensive, Environmental, Response, Compensation and Liability Act
CFR	Code of Federal Regulations
DFG-OSPR	Department of fish and Game, Office of Spill Prevention and Response
CZMA	Coastal Zone Management Act
TBC	To be considered
tit.	Title
U.S.	United States
U.S.C.	United States Code

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
			Excavation		
Federal					
Resource Conservation and Recovery Act (Title 42 U.S.C., Chapter 82, §§ 6901-6991[i])[a]					
On-site generation of waste	Person who generates waste shall determine if the waste is a hazardous waste.	Generator of waste	Cal. Code Regs. tit. 22, §§ 66262.10(a), and 66262.11	Applicable	These regulations are applicable to any operation that generates waste. The Navy will generate waste during excavation. The Navy will determine whether the waste is RCRA hazardous waste when it is generated.
On-site generation of waste	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste	Cal. Code Regs. tit. 22, § 66264.13(a) and (b)	Applicable	These regulations are applicable to any operation that generates waste. The Navy will generate waste during excavation. The Navy will determine whether the waste is RCRA hazardous waste when it is generated.
State					
State Water Resources Control Board					
Excavation and off-site disposal of soil	Dischargers shall be responsible for accurate characterization of wastes.	Waste.	Cal. Code Regs. tit. 27, § 20200(c)	Applicable	Applicable to operations that generate waste. The Navy will generate waste during excavation. The Navy will accurately characterize waste at the time it is generated.
Off-site disposal of soil	Requires that designated waste as defined at Cal. Water Code § 13173 be discharged to Class I or class II waste management units.	Discharge of designated waste after July 18, 1997 (nonhazardous waste that could cause degradation of surface or ground waters), to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20210	Applicable	Applicable to operations that generate waste. The Navy will generate waste during excavation. The Navy will accurately characterize waste at the time it is generated.

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Off-site disposal of soil	Requires that nonhazardous solid waste as defined at § 20220(a) be discharged to a classified waste management unit.	Discharge of nonhazardous solid waste after July 18, 1997, to land for treatment, storage, or disposal.	Cal. Code Regs. tit. 27, § 20220(b), (c), and (d)	Applicable	Applicable to operations that generate waste. The Navy will generate waste during excavation. The Navy will accurately characterize waste at the time it is generated.
			Institutional Controls		
State					
California Civil Code[a]					
Land use controls	Provides conditions under which land use restrictions will apply to successive owners of land.	Transfer of property to a non-federal agency.	Cal. Civil Code § 1471	Relevant and Appropriate	The Navy will implement land use controls for soil. This section is an ARAR because Site 27 is federal land that may be transferred to a non-federal agency.
Land use controls	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer of property to a non-federal agency.	Cal. Health & Safety Code § 25202.5	Relevant and Appropriate	This section is an ARAR because Site 27 is federal land that may be transferred to a non-federal agency. The substantive provisions of Cal. Health & Safety Code § 25202.5 are the general narrative standards to restrict "present and future uses of all or part of the land on which the . . . facility . . . is located . . ."

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Land use controls	Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions of Cal. Health & Safety Code § 25232(b)(1)(A)–(E).	Transfer of property to a non-federal agency.	Cal. Health & Safety Code §§ 25222.1 and 25355.5(a)(1)(C)	Relevant and Appropriate	This section is an ARAR because Site 27 is federal land that may be transferred to a non-federal agency. Generally, Cal. Health & Safety Code §§ 25222.1 and 25355.5(a)(1)(C) provide the authority for DTSC to enter into voluntary agreements with land owners to restrict the use of property. The agreements run with the land, restricting present and future uses of the land. The substantive requirements of the following Cal. Health & Safety Code § 25222.1 provisions are “relevant and appropriate”: (1) the general narrative standard: “restricting specified uses of the property…” and (2) “…the agreement is irrevocable, and shall be recorded by the owner, …as a hazardous waste easement, covenant, restriction or servitude, or any combination thereof, as appropriate, upon the present and future uses of the land.” The substantive requirements of the following Cal. Health & Safety Code § 25355.5(a)(1)(C) provisions are “relevant and appropriate”: “…execution and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof , as appropriate, upon the present and future uses of the land.”
Land use controls	Provides processes and criteria for obtaining written variances from a land use restriction and for removing a land use restriction	Transfer of property to a non-federal entity	Cal. Health & Safety Code §§ 25233(c) and 25234	Relevant and Appropriate	Cal. Health & Safety Code § 25233(c) sets forth substantive criteria for granting variances based on specified environmental and health criteria. Cal. Health & Safety Code § 25234 sets forth the substantive criteria for the removal of a land use restriction on the grounds that “…the waste no longer creates a significant existing or potential hazard to present or future public health or safety.”

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
California Environmental Protection Agency, Department of Toxic Substances Control[a]					
Land use controls	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken; and hazardous materials, hazardous wastes, or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land.	Transfer of property to a non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1	Relevant and Appropriate	The substantive provisions of this regulation are relevant and appropriate state requirements because Site 27 is federal land that may be transferred to a non-federal agency. This section provides for a land use covenant to be executed and recorded when remedial actions are taken and hazardous substances will remain at the property at concentrations that are unsuitable for unrestricted use of the land.

Notes:

a Statutes and policies, and their citations, are provided as headings to identify general categories of ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as ARARs. Specific ARARs follow each general heading, and only substantive requirements of the specific citations are considered ARARs.

§ Section
§§ Sections
ARAR Applicable or relevant and appropriate requirement
Cal. Code Regs. *California Code of Regulations*
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CFR Code of Federal Regulations
DTSC Department of Toxic Substances Control
EPA U.S. Environmental Protection Agency
LUC Land use control
RCRA Resource Conservation and Recovery Act
ROD Record of Decision
tit. Title
U.S.C. United States Code

ATTACHMENT B
RESPONSIVENESS SUMMARY

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Spoken Comment by Katie Chamberlain with Anchor QEA received at the public meeting held June 14, 2011		
Comment Number	**Comment**	**Response**
1	What is the anticipated upland dredge material on the beneficial reuse site? [The Navy's interpretation of Ms. Chamberlain's question was "What is the anticipated upland beneficial reuse site?"]	Montezuma Wetlands in Solano County, California, accepts contaminated material for confined disposal and requires at least 3 feet of clean cover over it. The lead shot-contaminated sediment dredged from Site 27 will be transported by barge to Montezuma Wetlands, where it will be used as a base layer. Clean sediment will be used to cover the lead shot-contaminated sediment from Site 27 at the reuse site.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Spoken Comment by RAB member Alice Pilram received at the public meeting held June 14, 2011		
Comment Number	**Comment**	**Response**
1	I have a question about the future of Clipper Cove. So if just the area along the shoreline is taken care of, remediated, what happens in the future when they need to dredge the cove, because it is filling up with sediment, and there is going to be a marina there? Whose responsibility will that be, then, because there is shot out there and definitely will be disturbed if the cove is dredged?	In the event that a future owner or developer needs to dredge within the Site 27 boundary, institutional controls (IC) would require that any future owner or developer first consult with the Department of Toxic Substances Control (DTSC). ICs would document the location of the lead shot and would be included in the deed when Site 27 is transferred from the Navy to the Treasure Island Development Authority. The owner or developer would submit a plan for approval that describes the planned dredging activity and incorporates measures to prevent exposure to lead shot by diving ducks.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from Anchor QEA on behalf of Treasure Island Enterprises (TIE) in a letter dated June 28, 2011, via e-mail		
Comment Number	**Comment**	**Response**
1	TIE appreciates the Navy's ongoing willingness in attempting to acknowledge future marina development and operation in the plan (e.g., the Feasibility Study). As you know, TIE feels that the current and historic use of the marina, as well as the planned expanded future use of the marina as approved in the Joint Environmental Impact Statement/Environmental Impact Report for the Disposal and Proposed Reuse of Naval Station Treasure Island, is also a location specific Applicable or Relevant and Appropriate Requirement (ARAR). As such, TIE continues to request that the Navy adjust the final design for the remedial action to accommodate the continued operation of the current and historic use of the marina, as well as construction and operation of the marina as planned. Since the reuse plan includes the marina expansion, the needs of the marina expansion must be considered during final design of the remedial action. TIE is concerned that the placement of 1-foot diameter armor stone in the "nearshore band" of IR Site 27 will interfere with maintenance and operation of the existing marina and preclude (or significantly increase the cost and complexity of construction of the expanded marina. TIE notes that, based on our analysis, additional dredging to provide adequate constructability of the proposed "cap" when considering base and armor layers, overdepth, etc., is likely required, regardless. TIE continues to recommend that the final design takes into account the current and future maintenance dredging needs, prop wash and other scouring forces acting on the proposed cap due to current hydrodynamic conditions and operation of both the current/ historic marina and the proposed expanded facility, and the long-term effectiveness of the proposed "cap" in the marina environment. The final remedial design must ensure that the dredging and backfill is compatible with current, historic, and future uses of the marina. Implementation of Institutional Controls that are designed to protect the "cap" but which diminish the viability of the current/historic marina, and potentially the future	Applicable or relevant and appropriate requirements (ARAR) are defined in the National Contingency Plan (NCP), Title 40 Code of Federal Regulations Section 300.5, as: "promulgated and enforceable federal environmental laws and state environmental or facility siting laws, which are applicable or relevant and appropriate requirements for environmental cleanup..." The "current and historic use of the marina, as well as the planned expanded future use of the marina" under the reuse plan is not an ARAR because it is not a federal environmental law or state environmental or facility siting law or regulation. The city's future land use assumptions are considered in the development of remedial alternatives, but these future land use assumptions are not determinative of the cleanup decision. Consistent with the U.S. Environmental Protection Agency's (EPA) 1995 Office of Solid Waste and Emergency Response (OSWER) guidance "Land Use in the CERCLA Remedy Selection Process" (reaffirmed in the EPA June 2001 "Reuse Assessments: A Tool to Implement the Superfund Land Use Directive"), the goal of realizing reasonably anticipated future land uses is considered along with other factors in the remedy selection process. The remedy must be selected in accordance with the remedy selection criteria established in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the NCP, which include cost, implementability, and short- and long-term effectiveness. As noted in EPA and Department of Defense (DoD) Environmental Restoration Program guidance, in some cases implementability, short-term effectiveness, cost, or technical limitations may limit the ability to conduct a response and thereby limit the reasonably anticipated future land use (see, for example, DoD 2001). DoD and Navy guidance requires that cleanup decisions for Base Realignment and Closure (BRAC) properties should generally be made according to the current use of the property, while adhering to applicable statutory and regulatory authorities, to ensure protection of human health and the environment (DoD 2006). Response actions at levels that support less restricted future reuses of the property are considered a business decision, normally made by the new owner or developer of the property, with the cleanup costs associated with less restricted property usage to be borne by the new owner as part of this property redevelopment (Navy 2007). If future

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from Anchor QEA on behalf of Treasure Island Enterprises (TIE) in a letter dated June 28, 2011, via e-mail		
Comment Number	**Comment**	**Response**
	marina, would not be acceptable and would not be in compliance with the requirement to consider the expanded marina as part of the site baseline. The long-term effectiveness (e.g., adequacy and reliability of the “cap”) is dependent on a meaningful consideration of current, historic, and future site uses, not just controls during construction which are more applicable to short-term effectiveness.	landowners or others decide at a future date to change the land use in such a way that further cleanup is necessary to ensure protectiveness, the Navy’s remedy selection or CERCLA will not prevent them from conducting the cleanup as long as protectiveness of the Navy’s remedy is not compromised. At Site 27, the Navy considers Alternative 2 (focused dredging of 2.5 feet of sediment and backfill in the nearshore area and ICs) to be a viable alternative and in compliance with CERCLA requirements; DTSC and the San Francisco Bay Regional Water Quality Control Board concur. It fully achieves the remedial action objectives (RAO) of protection of diving ducks while minimizing the quantity of dredging and its associated costs and effects on the environment. The majority of Site 27 and Clipper Cove remains undisturbed and is protected by natural sedimentation of the cove.
2	TIE is also concerned that the Navy has made numerous assumptions regarding potential offsite disposal options without initiating realistic measures to develop and analyze the feasibility of these endpoints. Currently, the Navy is intending to dispose of the dredged material from IR Site 27 at an upland landfill location or at a beneficial reuse site. While the Navy does not classify the IR Site 27 material as hazardous waste and has assumed that the dredged material will be acceptable for non-hazardous waste landfill disposal or placement at a beneficial reuse site, the Navy has not, to our knowledge, officially received approval for a given location, and has assumed dewatering would not be required. Based on our observations and studies of sediment at the site, dewatering would be required to transport material to a landfill (the material is extremely fine), and may be too fine for beneficial reuse at Montezuma. Additionally, the Navy would need to coordinate with the San Francisco DMMO on the potential use of the Montezuma Wetlands Upland Disposal Site. The assumptions have a potential significant impact on the Navy’s cost analysis.	The selected remedy includes disposal of dredged lead shot-contaminated sediment from Site 27 at a beneficial reuse site. The planned beneficial reuse facility, Montezuma Wetlands in Solano County, California, was contacted while the feasibility study was being conducted to evaluate the costs and implementability of this disposal option. This site accepts contaminated material for confined disposal and requires at least a 3-foot clean cover on the top (Tetra Tech 2010). Based on the information available, Montezuma Wetlands appears to be a suitable reuse site. The acceptance criteria and capacity of the site will be confirmed during the remedial design. If needed, an alternative beneficial reuse site will be identified. Dewatering of sediment dredged from the nearshore area will not be required. The transport barge will have containment mechanisms in place so that the sediment can be transported without dewatering, or a geotextile membrane in place so that water can drain from the sediment during transport. Finally, although the sediment in Clipper Cove is fine, based on sediment that was sampled during the 2008 nearshore investigation, sediment in the nearshore area is less fine than sediment in other parts of the cove. Montezuma Wetland’s purpose is to accept dredged material from across the San Francisco Bay area to recreate many different habitat types. The different habitats will require sediment of all sizes, so there will likely be a place for sediment dredged from Site 27.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from Anchor QEA on behalf of Treasure Island Enterprises (TIE) in a letter dated June 28, 2011, via e-mail		
Comment Number	**Comment**	**Response**
		The Navy will consult with the Dredged Material Management Office (DMMO) during the remedial design phase. Finally, the Navy's cost analysis cannot account for unlikely failure of the assumptions.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from the State of California Department of Transportation in a letter dated June 28, 2011, via e-mail		
Comment Number	**Comment**	**Response**
1	Project work that requires movement of oversized or excessive load vehicles on state roadways requires a transportation permit that is issued by the Department. To apply, please refer to the following website link for more information. http://www.dot.ca.gov/hq/traffops/permits	Comment noted.

Comment Number	Comment	Response
Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from the San Francisco Bay Conservation and Development Commission (BCDC) in a letter dated July 1, 2011, via e-mail		
Note: The BCDC comment letter refers to the Department of Toxic Substances Control's (DTSC) California Environmental Quality Act Initial Study as the "Initial Study" and the Navy's Proposed Plan/Draft Remedial Action Plan (RAP) for Site 27 (ChaduxTt 2011) as the "Draft Action Plan." In responding, the Navy will use "Proposed Plan/Draft RAP" instead of "Draft Action Plan."		
1	Although the Commission itself has not reviewed the Initial Study or Draft Action Plan the staff comments discussed below are based on the McAteer-Petris Act, the Commission's San Francisco Bay Plan (Bay Plan), the Commission's federally-approved management plan for the San Francisco Bay, and the federal Coastal Zone Management Act (CZMA).	Comment noted.
2	According to the Initial Study and Draft Action Plan, the preferred alternative is Alternative 2b, which includes focused dredging, backfilling with sand and rock armoring, institutional controls, and sediment monitoring within the Site 27 area, and disposal of the dredged sediment outside of the Commission's jurisdiction or at an appropriate authorized beneficial reuse site. Generally, the Initial Study includes more information regarding the details of the remediation project than the Draft Action Plan. The specific details related to dredging, backfilling, institutional controls and sediment monitoring should be incorporated into the Draft Action Plan.	Information contained in the Initial Study was taken from the Final Feasibility Study (FS) for Site 27 (Tetra Tech 2010). Section 2.9.2 of the Record of Decision (ROD)/Final RAP will include a more detailed description of the remedy than the description in the Proposed Plan/Draft RAP. The remedy will be further developed during the remedial design phase for Site 27.
3	The project includes dredging approximately 8,600 cy from an approximate 92,500-square-feet portion of Site 27 (focused dredging area), as shown on Figure 2 in the Initial Study and Figure 5 in the Draft Action Plan. The top 2.5-feet of material within the dredging area will be removed and disposed of at an authorized location. Montezuma Wetlands in Solano County is suggested in the Initial Study as a disposal option. The dredging would be accomplished using a clamshell bucket. The dredged area will be backfilled with "sand and rock armor." Please include these details in the Final Remedial Action Plan.	This information will be added to the remedy description in Section 2.9.2 of the ROD/Final RAP as a hyperlinked reference to the description from Section 4.2.1 of the FS.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from the San Francisco Bay Conservation and Development Commission (BCDC) in a letter dated July 1, 2011, via e-mail		
Comment Number	**Comment**	**Response**
4	As stated in our March 2011 and March 2009 comment letters, the proposed backfill would be considered “fill in the Bay,” as described in the McAteer-Petris Act, and should be analyzed for compliance with applicable Bay Plan policies. These letters are attached for your reference. Please refer to them for a more detailed discussion of this issue. In addition, the Commission staff also recommends that the remediation project use material that replicate the existing bottom type. The San Francisco Bay Subtidal Habitat Goals Report may provide appropriate restoration guidance that could be incorporated into planning for the area. To this end, our March 2011 letter requested additional information to properly analyze the project, including a description of the need to backfill the area with sand and rock, rather than just sand or Bay mud; the volumes of sand and/ or rocks proposed in the project; and the final elevation to be filled. This information was not included in the Initial Study or the Draft Action Plan.	As stated in Appendix D of the Final FS (Tetra Tech 2010), “The Navy will comply with the substantive provisions of the Bay Plan to the maximum extent practicable. Any fill will be the minimum necessary to protect the environment. The Navy believes that for Alternative 2, fill is necessary for the remedy to be fully protective. The proposed fill is consistent with the concept of justifiable filling, which is defined in the Bay Plan as fill that provides ‘substantial public benefits if these same benefits could not be achieved equally well without filling’ (BCDC 2008). In this case, the fill will provide a substantial public benefit by protecting the diving ducks and will disturb a lesser quantity of sediment over a smaller area than Alternative 3, thereby removing fewer benthic organisms.” The nearshore area where the backfill will be implemented is dynamic and subject to periods of erosion and deposition; therefore, applying bay sediment as backfill to replicate the existing bottom type would not guarantee the stability and protectiveness of the remedy. Within the nearshore area, 1-foot-thick rock armor backfill is assumed to be stable under the dynamic conditions of the nearshore area. As stated in Appendix D of the Final FS (Tetra Tech 2010), “The backfill proposed is consistent to the maximum extent practicable with enforceable policies of approved state management policies. The backfill to be used in Alternative 2 would reduce benthic habitat in the short term, but deposition of sediments over the long term is expected to at least partially restore benthic habitat. The backfill would not reduce the volume of water or surface area of the bay, nor would it impair the scenic beauty of the bay. The backfill material was selected because it would maintain the current bathymetry and is expected to remain stable in the dynamic nearshore environment, as opposed to bay sediment, which would be subject to erosion.” The final backfill material and design will be identified during the remedial design phase. Finally, the purpose of the Initial Study and the Proposed Plan/Draft RAP was to present the remedial alternatives that were evaluated in the Final FS (Tetra Tech 2010) on a level that was easily comprehended by the general public, in addition to selecting and presenting the Navy’s preferred remedial alternative. Information such as the volumes of sand and rocks to be used, as well as the final elevation to be filled, are beyond the scope of the Initial Study and Proposed Plan/Draft RAP, and will be determined during the remedial design phase.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from the San Francisco Bay Conservation and Development Commission (BCDC) in a letter dated July 1, 2011, via e-mail		
Comment Number	**Comment**	**Response**
5	To maintain stability of the sediments in the vicinity, the Initial Study states that the side slopes of the dredging footprint will be cut at a 4:1 slope. This will assure that the sides do not slump and expose sediment with lead shots. Also, prior to placement of backfill material, the plan states that confirmation samples are proposed in the area outside the southern perimeter of the dredged area. The samples will be used to analyze if acceptable levels of lead shot are present in the surrounding sediment. Please describe the next steps that will be taken if lead shot is found at high levels in the confirmation samples.	Sediment core confirmation samples will be collected outside the southern perimeter and east and west of the Alternative 2 dredged area before it is backfilled to ensure that the current, complete exposure pathway is removed. If the confirmation samples indicate that lead shot is not present in surrounding sediment where diving ducks could be exposed, the dredged area will be backfilled. If lead shot is found in the confirmation samples in surrounding sediment where diving ducks could be exposed (i.e. in the upper 2 feet of sediment), the excavation would be expanded. However, based on the findings of the 2005 study of sediment deposition rates in Clipper Cove and the 2008 lead shot investigation in the nearshore area, no lead shot is anticipated to be found within the upper 2 feet of sediment in the confirmation samples. The final sampling strategy will be established in the work plan and sampling and analysis plan during the remedial design phase.
6	After backfilling is complete, post-construction monitoring is proposed within the year after project completion and every five years after for up to 30 years to ensure that the remedial action objectives were met. As described in the Initial Study, monitoring will include bathymetric surveys of the area to determine if the backfill material is intact or if further sedimentation has occurred. It may be more appropriate to monitor annually for the first five years to ensure that the remediation measures are effective. If the sediment does move in the region, it would be important to see if lead shot within the sediment is exposed. Commission staff requests periodic sampling be included in the monitoring if surveys show significant sediment movement and would like to review the sampling plan once it is developed. Based on the Initial Study, the project appears to have at least the following proposed Institutional Controls (IC): (1) a deed notice will be recorded to notify the public and future landowners of the existence of the contamination; (2) monitoring and reporting will be completed to assure the effectiveness of dredging; (3) a Remedial Action Work Plan (RAWP) will specify	Sediment monitoring presented in the Final FS (1 year after the remedy is implemented and every 5 years after the remedy has been implemented) is consistent with the five-year review requirement under CERCLA and will ensure the remedy is protective. If a bathymetric survey indicates the backfill had shifted significantly, measures will be taken to stabilize it and ensure the remedy remains protective. Based on the findings of the 2005 study of sediment deposition rates in Clipper Cove and the 2008 lead shot investigation in the nearshore area, lead shot is buried by 2 feet or more of sediment in areas greater than 75 feet from the shoreline. Additionally, the area greater than 150 feet from the shoreline is a depositional environment where sediment accumulates at a rate of approximately 1 to 2 inches per year. It is highly unlikely that sediment would erode to expose lead shot in areas that will remain undredged under Alternative 2. Final ICs will be selected and described in greater detail in the land use control remedial design (LUC RD) during the remedial design phase. A more detailed description of maintenance and monitoring of the implemented remedy will also be provided in the remedial design phase for this site.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from the San Francisco Bay Conservation and Development Commission (BCDC) in a letter dated July 1, 2011, via e-mail		
Comment Number	**Comment**	**Response**
	the roles and responsibilities for implementing, monitoring and enforcing the ICs; (4) Five-year reviews and reporting will ensure the continued effectiveness of the remediation; (5) restrictions on vessel speed; and controls on dredging within the focused dredging area; (6) long-term monitoring of the backfill to understand sediment disturbance and re-suspension in the area; (7) MOU developed between the Navy and DTSC that will describe the land use controls for the site; (8) as part of any sediment dredging or fill, the property would comply with Section 404 of the Clean Water Act; and (9) appropriate regulatory agencies, be contacted and notified of the existence of lead shot in the vicinity. The ICs should be described in more detail in the Final Remedial Action Plan. Specifically, as described in the Initial Study, the monitoring efforts are unclear and confusing. Please clearly describe the monitoring efforts that assure effectiveness of the remediation project. Specifically, please describe any sediment sampling and bathymetry surveys that will be completed as part of the monitoring efforts. Again, the Commission suggests that monitoring occur more frequently in the first five years to better understand the local sediment dynamics.	
7	Section 4 of the Initial Study describes the potential short-term impacts on biological resources in the project area from dredging and backfilling. This section goes on to state in Section 4(e) and Section 4(f) that the project has “no impact” and “less than significant impact” on biological resources because the project implementation will be consistent with the McAteer-Petris Act and the San Francisco Bay Plan. These sections appear to contradict each other. Please clarify the apparent contraction. To reduce impacts to the ecosystem, Commission staff recommends using only sand for backfilling material rather than a mixture of sand and rock armoring.	The following clarification is provided: Section 4 of the Initial Study states that dredging sediment and backfilling will have some short-term impacts on biological resources (the benthic community) because the sediment surface will be removed. Impacts will be temporary and the benthic community is expected to re-establish itself naturally. Section 4(e) states that there will be no impact with regard to “conflict with local policies or ordnances protecting biological resources,” and Section 4(f) states that there will be less than significant impact with regard to “conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan” because the remedy will be consistent with the McAteer-Petris Act and the San Francisco Bay Plan. Please also see response to comment 4, which addresses backfill material.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from the San Francisco Bay Conservation and Development Commission (BCDC) in a letter dated July 1, 2011, via e-mail		
Comment Number	**Comment**	**Response**
8	Section 4(a) and Section 4(b) state that implementation of the project would require concurrence from BCDC and federal and state regulatory agencies. As part of the concurrence request, please include an analysis of the need for rock armoring to secure the sandy material in place.	By agreeing to assist the state regulatory agencies in complying with the State's obligations under the California Environmental Quality Act (CEQA) the Navy does not concede that CEQA governs Navy activities. The Initial Study that supported DTSC's Negative Declaration under CEQA correctly noted that the Navy's proposed cleanup action could not have a significant effect on the environment due to substantive compliance with all identified applicable or relevant and appropriate requirements, but this document erroneously stated that "selection of the backfill materials for the dredged area will require concurrence from the BCDC…" Although BCDC concurrence will not be required, the implementation of the cleanup action will comply with substantive provisions of the Coastal Zone Management Act and the San Francisco Bay Plan. As stated in the response to comment 4, the nearshore area where the backfill will be implemented is dynamic and subject to periods of erosion and deposition. The rock armor is necessary to guarantee the stability and protectiveness of the remedy. The final design of the backfill will be selected during the remedial design phase and will be available to BCDC and federal and state regulatory agencies for review and comment at that time.
9	In order to reduce the potential impacts of the project on migratory fish, the Commission's policies on dredging require that consultations with the resource agencies be completed and the results provided to the Commission. Further the Commission's policies on fish, other aquatic organisms and wildlife seek to avoid or minimize impacts to listed and native species. As part of your planning for this project, you may want to consider proposing to do the in-water work during the environmental work windows established for maintenance dredging projects through the LTMS programmatic biological opinions. Please consult with NOAA fisheries and the U.S. Fish and Wildlife Service to assure protection of endangered or threatened species.	Comment noted. This comment will be considered in the remedial design/remedial action phase. Any work conducted by the Navy will adhere to all applicable laws regarding threatened and endangered species identified as ARARs.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written Comments Received from the San Francisco Bay Conservation and Development Commission (BCDC) in a letter dated July 1, 2011, via e-mail		
Comment Number	**Comment**	**Response**
10	Lastly, because all of San Francisco Bay is Essential Fish Habitat, consultation with NOAA fisheries regarding the Magnuson Steven's Fisheries Management Act may be required. NOAA Fisheries has recently completed a programmatic Essential Fish Habitat Consultation for the LTMS program for maintenance dredging projects. There may be recommendations in that consultation that may be applicable to your proposed project.	Comment noted. The Magnuson Steven's Fisheries Management Act is not an ARAR at Site 27.
11	The Draft Remedial Action Plan is very limited and lacks a lot of important details. The Final Remedial Action Plan should include the details related to the proposed dredging, backfilling, monitoring and institutional controls described in the Initial Study. Furthermore, all relevant regulatory agencies should be notified of the proposed project and have the opportunity to comment on the proposed remediation and monitoring. In addition to the U.S. Army Corps of Engineers and the Commission, the Regional Water Quality Control Board, the EPA, U.S. Fish and Wildlife Service, NOAA Fisheries, CA Fish and Game and local planning agencies should be incorporated into the planning process.	The purpose of the Proposed Plan/Draft RAP was to present the remedial alternatives that were evaluated in detail in the Final FS (Tetra Tech 2010) in language that is easily comprehended by the general public. The level of detail described in the Initial Study was taken from the Final FS. Section 2.9.2 of the ROD/Final RAP will also present the components of the remedy that were described in the Final FS. All relevant regulatory agencies have been notified of the proposed remedy and have been given the opportunity to comment. The remedial action will be more fully developed during the remedial design phase. The remedial design will be available to relevant federal and state regulatory agencies for review and comment at that time. Any work conducted by the Navy will adhere to all applicable laws and regulations identified as ARARs.
12	Commission staff is aware that it is the Navy's position that the CERCLA process exempts federal agencies from Commission review under the federal consistency provisions of the Coastal Zone Management Act (CZMA) because the proposed project is designed to be consistent with the applicable and relevant and appropriate requirements. However, the Commission staff respectfully reserves the right to raise the requirement to review the project under the Commission's CZMA federal consistency authority in the future.	Comment noted. The Navy has identified the substantive provisions of the CZMA as relevant and appropriate requirements. The CZMA requires federal agency activity be conducted in a manner consistent with approved state management programs to the maximum extent practicable. The McAteer-Petris Act is enabling legislation for the San Francisco Bay Plan, an approved state management program for the bay. Substantive provisions of the McAteer-Petris Act and the San Francisco Bay Plan are relevant and appropriate because their authority is derived from the CZMA, a relevant and appropriate federal requirement. The Navy will conduct its remedial actions in accordance with the substantive provisions of the San Francisco Bay Plan.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written comments received from RAB member Dale Smith in a letter dated July 2, 2011, via email		
Comment Number	**Comment**	**Response**
1	I have had difficulty accepting the Comparative Ranking System developed for the CERCLA process for a long time. The weightings seem arbitrary and biased towards the Navy's preferred alternative. RAB members at this base and others have often found that a high cost (usually associated with a more complete clean-up) is automatically rated lower than lesser solutions, including those that leave contamination in place. Cost differences should be accurate. Based on dollar amount alone, the range for the alternatives should be 2b, 2a, 3a, and 3b in order from lowest to highest.	The scores and rankings that were developed and presented in the Final FS (Tetra Tech 2010) were presented to the public in the Final Proposed Plan/Draft RAP (ChaduxTt 2011). Both documents are final and therefore the scores and rankings cannot be revised. While there is some level of subjectivity involved, the scores and ratings are based on the nine NCP criteria for comparison of remedial alternatives under an established federal procedure. For cost comparison, lower scores are assigned to alternatives that are more expensive to execute. Since Alternatives 2a and 2b are similar in cost, they were scored equally (score of 3). Similarly, Alternatives 3a and 3b were scored equally (score of 1). Because Alternatives 3a and 3b are more expensive that Alternatives 2a and 2b, they were scored lower. The ranking presents a balanced comparison because seven criteria contribute to the overall score. The Navy selects the preferred remedial alternative after all remedial alternatives have been compared with each other and does not bias the scores to a particular alternative. DTSC (the primary oversight agency) and EPA reviewed, commented on, and concurred with the Final FS.
2	It doesn't make sense that 3b should have a lower short-term effectiveness, especially when it is of a shorter duration than 2a. Those values should be reversed.	Short-term effectiveness evaluates the capacity of each alternative in protecting human health and the environment during the construction and implementation period of the remedy. The factors considered in evaluating short-term effectiveness include protection of the community during remedial actions, protection of workers during remedial actions, environmental effects that would result from construction or implementation of the alternative, and the time required to complete the remedial action. While Alternative 2a is of longer duration, only up to approximately 2 months of the 1-year time period would be spent dredging, and the remainder of the time would be used to dewater dredged sediment on land before off-site landfill disposal. Under Alternative 3b, a much larger area would be dredged for up to approximately 6 months. Therefore, Alternative 3b is scored lower than Alternative 2a because it would have a longer impact over a larger area of the benthic community and be less protective of the community and workers because of the larger area and longer dredge period. Please also see the response to comment 1 above regarding score revisions.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written comments received from RAB member Dale Smith in a letter dated July 2, 2011, via email		
Comment Number	**Comment**	**Response**
3	Under Implementability 2a should have a lower rating than 3b, again because it requires a longer clean-up period. 3a and 3b are considered less implementable because of the volume of material to be removed. Yet at Seaplane Lagoon where far more sediment (and junk, including anchors) will be removed, none of the alternatives ranked so low. I would raise 2a to 1.5.	Implementability evaluates the technical and administrative feasibility of each alternative and the availability of required resources such as services and materials. As stated in response to comment 2, the dredge time for Alternative 2a would be much shorter than the dredge time for Alternative 3b. Additionally, Alternative 3b would be less implementable because removing a larger amount of sediment would be more technically challenging and require more resources. When remedial alternatives are evaluated, scores are assigned based on comparisons specific to that particular site. Scores that have been assigned to remedial alternatives at other sites such as Seaplane Lagoon do not factor in the scoring and ranking of remedial alternatives for Site 27. Please also see the response to comment 1 regarding score revisions.
4	The Federal government has stated since the start of the RAB process that clean-up will be in keeping with the desired reuse of the property and since the start of the RAB process the City and County of San Francisco has indicated that a marina is the desired reuse. Now the Navy is proposing a clean-up alternative that does not permit unencumbered expansion of the marina and adds a burden of cost to its implementation. Clearly the Navy was responsible for the deposition of lead shot and skeet targets. It should honor the original agreement between the City and the Navy and clean the site up. Otherwise, it seems the Federal government merely wanted the City to incur costs in the process of transfer by developing a plan the Navy does not plan to follow. Filling the Bay with two feet of rock to 75 feet of the shoreline makes building docks incredibly costly and difficult. Additionally, it appears BCDC is also uncomfortable with filling the Bay. Again, the Navy appears to be stating that it is only subject to local ordinances to the extent they are convenient. Between these two it leaves the impression that the Navy will not comply with CERCLA or the Bay Plan.	The Navy has and will continue to comply with CERCLA with regard to the cleanup of Site 27. Additionally, the Navy's selected remedy is consistent with the concept of justifiable filling defined in the Bay Plan. The city's future land use assumptions are considered in the development of remedial alternatives, but these future land use assumptions are not determinative of the cleanup decision. The remedy must be selected in accordance with the remedy selection criteria established under CERCLA and the NCP. Please also see response to Anchor QEA/TIE comment 1 regarding remedy selection under CERCLA and future use of the marina. Please also see the response to BCDC comment 4.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Written comments received from RAB member Dale Smith in a letter dated July 2, 2011, via email		
Comment Number	**Comment**	**Response**
5	I prefer option 3b as a result. It would result in beneficial reuse of the soil, complete clean-up of contamination, satisfy the conditions of the Bay Plan and allow the City to pursue developing a modem marina at Treasure Island.	The Navy selected Alternative 2b as the remedy for Site 27 because it ranked the highest among all the alternatives according to the selection criteria established under the NCP. Alternative 2b is protective of human health and the environment and eliminates, reduces, or controls exposures to human and environmental receptors through all potential exposure pathways currently and in the future. The selected remedy would also result in beneficial reuse of the dredged sediment, to be conducted in accordance with the substantive provisions of the San Francisco Bay Plan, and not prevent future owners or developers from changing land use as long as protectiveness of the remedy is not compromised.

Proposed Plan/Draft Remedial Action Plan for Site 27, Former Naval Station Treasure Island, San Francisco, California		
Spoken Comment by RAB member Nathan Brennan at the RAB Meeting on June 21, 2011, with follow up by e-mail on July 13, 2011		
Comment Number	**Comment**	**Response**
1	Clipper Cove's planned reuse is still a yacht harbor and that will require maintenance dredging. How will the recommended cleanup option allow for maintenance dredging? Can that be done without disturbing or exposing the sequestered lead shot? Is the channel depth requirements such that the sequestered lead is deep enough (well below and needed dredging depth)? If maintenance dredging cannot be accommodated, then the plan is inadequate.	Future construction or maintenance dredge depths will be determined by the future owner. Dredging within the entirety of Site 27 will be accommodated through the ICs. Please see response to Alice Pilram.

REFERENCES

ChaduxTt. 2011. Final Proposed Plan/Draft Remedial Action Plan, Installation Restoration Site 27, Former Clipper Cove Skeet Range, Former Naval Station Treasure Island, San Francisco, California. June.

Department of Defense (DoD). 2001. "Management Guidance for the Defense Environmental Restoration Program." September.

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Tetra Tech EM Inc. 2010. "Final Feasibility Study - Site 27 Clipper Cover Skeet Range." Naval Station Treasure Island, San Francisco, California. August 13.

400 Montgomery Street, Suite 650
San Francisco, California 94104
Phone 415.230.0862
Fax 415.230.0864

June 28, 2011

James Sullivan
Department of the Navy
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

Re: Comments on June 2011 Proposed Plan/Draft Remedial Action Plan (PP/Draft RAP), Installation Restoration Site 27 (IR Site 27), Naval Station Treasure Island, San Francisco, California

Dear Mr. Sullivan:

On behalf of Treasure Island Enterprises (TIE), Anchor QEA, L.P., respectfully submits the following comments on the subject notice. Our comments on the PP/Draft RAP for IR Site 27 are provided below.

TIE appreciates the Navy's ongoing willingness in attempting to acknowledge future marina development and operation in the plan (e.g., the Feasibility Study). As you know, TIE feels that the current and historic use of the marina, as well as the planned expanded future use of the marina as approved in the Joint Environmental Impact Statement/Environmental Impact Report for the Disposal and Proposed Reuse of Naval Station Treasure Island, is also a location specific Applicable or Relevant and Appropriate Requirement (ARAR). As such, TIE continues to request that the Navy adjust the final design for the remedial action to accommodate the continued operation of the current and historic use of the marina, as well as construction and operation of the marina as planned. Since the reuse plan includes the marina expansion, the needs of the marina expansion must be considered during final design of the remedial action. TIE is concerned that the placement of 1-foot diameter armor stone in the "nearshore band" of IR Site 27 will interfere with maintenance and operation of the existing marina and preclude (or significantly increase the cost and complexity of) construction of the expanded marina. TIE notes that, based on our analysis, additional dredging to provide adequate constructability of the proposed "cap" when considering base and armor layers, overdepth, etc., is likely required, regardless.

TIE continues to recommend that the final design takes into account the current and future maintenance dredging needs, prop wash and other scouring forces acting on the proposed cap due to current hydrodynamic conditions and operation of both the current/ historic marina and the proposed expanded facility, and the long-term effectiveness of the proposed "cap" in the marina environment. The final remedial design must ensure that the dredging and backfill is compatible with current, historic, and future uses of the marina. Implementation of Institutional Controls that are designed to protect the "cap" but which diminish the viability of the current/historic marina, and potentially the future marina, would not be acceptable and would not be in compliance with the requirement to consider the expanded marina as part of the site baseline. The long-term effectiveness (e.g., adequacy and reliability of the "cap") is dependent on a meaningful consideration of current, historic, and future site uses, not just controls during construction which are more applicable to short-term effectiveness.

TIE is also concerned that the Navy has made numerous assumptions regarding potential offsite disposal options without initiating realistic measures to develop and analyze the feasibility of these endpoints. Currently, the Navy is intending to dispose of the dredged material from IR Site 27 at an upland landfill location or at a beneficial reuse site. While the Navy does not classify the IR Site 27 material as hazardous waste and has assumed that the dredged material will be acceptable for non-hazardous waste landfill disposal or placement at a beneficial reuse site, the Navy has not, to our knowledge, officially received approval for a given location, and has assumed dewatering would not be required. Based on our observations and studies of sediment at the site, dewatering would be required to transport material to a landfill (the material is extremely fine), and may be too fine for beneficial reuse at Montezuma. Additionally, the Navy would need to coordinate with the San Francisco DMMO on the potential use of the Montezuma Wetlands Upland Disposal Site. The assumptions have a potential significant impact on the Navy's cost analysis.

TIE appreciates the Navy's offer to include TIE in the final design process to ensure that the needs of the current, historic, and future marina are met. We appreciate the opportunity to review the subject document and look forward to our continuing coordination on this project. Please feel free to contact me if you have any questions at (949) 347-2780 or via email at jburnam@anchorqea.com.

Sincerely,

Josh Burnam

Joshua Burnam, MPH, D.Env.
Anchor QEA, L.P.

Cc: Mr. Randy Short, TIE
Mr. Jay Wallace, Jay Wallace Associates

STATE OF CALIFORNIA
GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH
STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

June 30, 2011

Remedios Sunga
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, CA 94710

Subject: Remedial Action Plan for TI Site 27/Former Clipper Cove Skeet Range
SCH#: 2011052082

Dear Remedios Sunga:

The State Clearinghouse submitted the above named Negative Declaration to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on June 29, 2011, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
SITE MITIGATION BRANCH
BERKELEY
JUL 01 2011
STATE OF CALIFORNIA
EPA
RECEIVED

Document Details Report
State Clearinghouse Data Base

SCH# **2011052082**
Project Title Remedial Action Plan for TI Site 27/Former Clipper Cove Skeet Range
Lead Agency Toxic Substances Control, Department of

Type **Neg** Negative Declaration

Description DTSC is proposing to approve a draft Remedial Action Plan pursuant to authority granted under Chapter 6.8, Division 20, CA Health & Safety Code (H&SC). The purpose of this RAP is to implement remedial actions for Site 27 that are protective of public health and safety and the environment. Site 27 is the shot fall zone at the former naval skeet range and consists of about 19 acres off shore in Clipper Cove. The remedial action objective is to prevent or minimize ingestion of lead shot by diving ducks within 75 feet of the shoreline where there is a complete exposure pathway under current conditions. The RAP accomplishes the remedial action objective by implementing the following activities: focused dredging and backfill, off-site disposal of sediment, Institutional Controls (ICs), and sediment monitoring. No human health risk is associated with Site 27; therefore, there are no remedial action objectives for human health.

Lead Agency Contact

Name Remedios Sunga
Agency Department of Toxic Substances Control
Phone 510 540 3840 ***Fax***
email
Address 700 Heinz Avenue
City Berkeley ***State*** CA ***Zip*** 94710

Project Location

County San Francisco
City San Francisco
Region
Lat / Long 37° 48' 59.997" N / 122° 22' 2.5458" W
Cross Streets Avenue D
Parcel No.
Township ***Range*** ***Section*** ***Base***

Proximity to:

Highways I-80
Airports
Railways
Waterways San Francisco Bay
Schools US Job Corps, Life Learning Academy
Land Use Recreation

Project Issues Air Quality; Noise; Geologic/Seismic; Solid Waste; Toxic/Hazardous; Public Services; Recreation/Parks; Wildlife; Landuse; Traffic/Circulation; Water Quality; Water Supply; Wetland/Riparian; Population/Housing Balance; Soil Erosion/Compaction/Grading; Cumulative Effects

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Reviewing Agencies Resources Agency; Department of Fish and Game, Region 3; Office of Historic Preservation; Department of Parks and Recreation; San Francisco Bay Conservation and Development Commission; Department of Water Resources; Resources, Recycling and Recovery; California Highway Patrol; Caltrans, District 4; Regional Water Quality Control Board, Region 2; Native American Heritage Commission; State Lands Commission

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Date Received 05/27/2011 ***Start of Review*** 05/31/2011 ***End of Review*** 06/29/2011

Note: Blanks in data fields result from insufficient information provided by lead agency.

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY EDMUND G. BROWN JR., Governor

DEPARTMENT OF TRANSPORTATION
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Flex your power!
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June 28, 2011

SF080151
SF-80-7.72
SCH#2011052082

Mr. Remedios Sunga
Department of Toxic Substance
700 Heinz Avenue
Berkeley, CA 94710

Dear Mr. Sunga:

Remedial Action Plan for TI Site 27/Former Clipper Cove Skeet Range /Former Clipper Cove Skeet Range – Negative Declaration

Thank you for including the California Department of Transportation (Department) in the environmental review process for the Remedial Action Plan for TI Site 27/Former Clipper Cove Skeet Range Project. The following comments are based on the Negative Declaration.

Transportation Permit
Project work that requires movement of oversized or excessive load vehicles on state roadways requires a transportation permit that is issued by the Department. To apply, please see refer to the following website link for more information. http://www/dot.ca.gov/hq/traffops/permits

Should you have any questions regarding this letter, please call Yatman Kwan of my staff at (510) 622-1670.

Sincerely,

GARY ARNOLD
District Branch Chief
Local Development - Intergovernmental Review

c: State Clearinghouse

Making San Francisco Bay Better

July 1, 2011

Ms. Remedios Sunga
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, CA 94710

and

Mr. James Sullivan
Department of the Navy
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

SUBJECT: Comments on Initial Study and Draft Remedial Action Plan for Site 27 at the Clipper Cove Skeet Range at the Naval Station on Treasure Island

Dear Ms. Sunga and Mr. Sullivan:

On June 6, 2011, the San Francisco Bay Conservation and Development Commission (Commission) staff received the DTSC California Environmental Quality Act Initial Study (Initial Study) for the remediation project at Site 27/Former Clipper Cove Skeet Range and in June 2011, the Commission also received the U.S. Navy's Proposed Plan/Draft Remedial Action Plan for the Former Naval Station on Treasure Island Public Notice (Draft Action Plan) for the remediation of Site 27 at the Former Clipper Cove Skeet Range on Treasure Island, located in the City and County of San Francisco. Site 27 is a portion of Clipper Cove that was formerly used as a naval skeet range from 1979 to 1989. As described in the documents, clay targets were launched from the shoreline. Naval personnel fired lead shots at the targets, which subsequently landed in the Bay. The lead shot currently in Bay sediments have been identified as a contaminant source with potentially harmful effects on wildlife, particularly diving ducks. As proposed, the project includes dredging approximately 8,600 cubic yards (cy) from a portion of Site 27 from the shoreline to 75 feet off shore to a depth of 2.5 feet and then backfilling the area with sand and/or rock armoring, off-site disposal of sediment to an upland beneficial reuse site, institutional controls and sediment monitoring.

Although the Commission itself has not reviewed the Initial Study or Draft Action Plan, the staff comments discussed below are based on the McAteer-Petris Act, the Commission's *San Francisco Bay Plan* (Bay Plan), the Commission's federally-approved management plan for the San Francisco Bay, and the federal Coastal Zone Management Act (CZMA).

Background

In August 2010, a Final Feasibility Study for Site 27 Clipper Cove Skeet Range (Feasibility Study) was issued as a requirement of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Feasibility Study developed and evaluated three remedial alternatives for lead shot in the sediments. The first alternative was the no action alternative, which would leave all contaminants in place on site. The second alternative, which is the preferred alternative, included dredging approximately 8,600 cubic yards of material from the shoreline to 75 feet off shore to a depth of minus 2.5 feet Mean Lower Low Water (MLLW) and backfilling the area with clean sand and rock armoring. The third alternative included dredging the entire Site 27 area, as shown in Figure 5 in the Draft Remediation Action Plan, to a depth of minus 7 feet MLLW to remove most of the sediment with lead shot.

The San Francisco Bay Conservation and Development Commission (BCDC) submitted comments on the Final Feasibility Report in a letter, dated March 11, 2011, that summarized the *San Francisco Bay Plan* policies that would be applicable to the proposed project. The March 2011 letter incorporated comments submitted to the Navy for the Draft Feasibility Study in a letter, dated March 9, 2009.

Proposed Remediation

According to the Initial Study and Draft Action Plan, the preferred alternative is Alternative 2b, which includes focused dredging, backfilling with sand and rock armoring, institutional controls, and sediment monitoring within the Site 27 area, and disposal of the dredged sediment outside of the Commission's jurisdiction or at an appropriate authorized beneficial reuse site. Generally, the Initial Study includes more information regarding the details of the remediation project than the Draft Action Plan. The specific details related to dredging, backfilling, institutional controls and sediment monitoring should be incorporated into the Draft Action Plan.

Focused Dredging. The project includes dredging approximately 8,600 cy from an approximate 92,500-square-feet portion of Site 27 (focused dredging area), as shown on Figure 2 in the Initial Study and Figure 5 in the Draft Action Plan. The top 2.5-feet of material within the dredging area will be removed and disposed of at an authorized location. Montezuma Wetlands in Solano County is suggested in the Initial Study as a disposal option. The dredging would be accomplished using a clamshell bucket. The dredged area will be backfilled with "sand and rock armor." Please include these details in the Final Remedial Action Plan.

As stated in our March 2011 and March 2009 comment letters, the proposed backfill would be considered "fill in the Bay," as described in the McAteer-Petris Act, and should be analyzed for compliance with applicable Bay Plan policies. These letters are attached for your reference. Please refer to them for a more detailed discussion of this issue. In addition, the Commission staff also recommends that the remediation project use material that replicate the existing bottom type. The San Francisco Bay Subtidal Habitat Goals Report may provide appropriate restoration guidance that could be incorporated into planning for the area. To this end, our March 2011 letter requested additional information to properly analyze the project, including a description of the need to backfill the area with sand and rock, rather than just sand or Bay mud; the volumes of sand and/or rocks proposed in the project; and the final elevation to be filled. This information was not included in the Initial Study or the Draft Action Plan.

To maintain stability of the sediments in the vicinity, the Initial Study states that the side slopes of the dredging footprint will be cute at a 4:1 slope. This will assure that the sides do not slump and expose sediment with lead shots. Also, prior to placement of backfill material, the plan states that confirmation samples are proposed in the area outside the southern perimeter of the dredged area. The samples will be used to analyze if acceptable levels of lead shot area present in the surrounding sediment. Please describe the next steps that will be taken if lead shot is found at high levels in the confirmation samples.

Monitoring. After backfilling is complete, post-construction monitoring is proposed within the year after project completion and every five years after for up to 30 years to ensure that the remedial action objectives were met. As described in the Initial Study, monitoring will include bathymetric surveys of the area to determine if the backfill material is intact or if further sedimentation has occurred. It may be more appropriate to monitor annually for the first five years to ensure that the remediation measures are effective. If the sediment does move in the region, it would be important to see if lead shot within the sediment is exposed. Commission staff requests periodic sampling be included in the monitoring if surveys show significant sediment movement and would like to review the sampling plan once it is developed.

Proposed Institutional Controls

Based on the Initial Study, the project appears to have at least the following proposed Institutional Controls (IC): (1) a deed notice will be recorded to notify the public and future landowners of the existence of the contamination; (2) monitoring and reporting will be completed to assure the effectiveness of dredging; (3) a Remedial Action Work Plan (RAWP) will specify the roles and responsibilities for implementing, monitoring and enforcing the ICs; (4) Five-year reviews and reporting will ensure the continued effectiveness of the remediation; (5) restrictions on vessel speed; and controls on dredging within the focused dredging area; (6) long-term monitoring of the backfill to understand sediment disturbance and re-suspension in the area; (7) MOU developed between the Navy and DTSC that will describe the land use controls for the site; (8) as part of any sediment dredging or fill, the property would comply with Section 404 of the Clean Water Act; and (9) appropriate regulatory agencies, be contacted and notified of the existence of lead shot in the vicinity.

The ICs should be described and described in more detail in the Final Remedial Action Plan. Specifically, as described in the Initial Study, the monitoring efforts are unclear and confusing. Please clearly describe the monitoring efforts that assure effectiveness of the remediation project. Specifically, please describe any sediment sampling and bathymetry surveys that will be completed as part of the monitoring efforts. Again, the Commission suggests that monitoring occur more frequently in the first five years to better understand the local sediment dynamics.

Initial Study Comments

Below are comments specific to the Initial Study conducted for the remediation project. Many of these comments should be incorporated into the Final Remedial Action Plan for the project.

Biological Resources. Section 4 of the Initial Study describes the potential short-term impacts on biological resources in the project area from dredging and backfilling. This section goes on to state in Section 4(e) and Section 4(f) that the project has "no impact" and "less than significant impact" on biological resources because the project implementation will be consistent with the McAteer-Petris Act and the San Francisco Bay Plan. These sections appear to contradict each other. Please clarify the apparent contraction. To reduce impacts to the ecosystem, Commission staff recommends using only sand for backfilling material rather than a mixture of sand and rock armoring.

Section 4(a) and Section 4(b) state that implementation of the project would require concurrence from BCDC and federal and state regulatory agencies. As part of the concurrence request, please include an analysis of the need for rock armoring to secure the sandy material in place.

In order to reduce the potential impacts of the project on migratory fish, the Commission's policies on dredging require that consultations with the resource agencies be completed and the results provided to the Commission. Further the Commission's policies on fish, other aquatic organisms and wild seek to avoid or minimize impacts to listed and native species. As part of your planning for this project, you may want to consider proposing to do the in-water work during the environmental work windows established for maintenance dredging projects through the LTMS programmatic biological opinions. Please consult with NOAA fisheries and the U.S. Fish and Wildlife Service to assure protection of endangered or threatened species.

Lastly, because all of San Francisco Bay is Essential Fish Habitat, consultation with NOAA fisheries regarding the Magnuson Steven's Fisheries Management Act may be required. NOAA Fisheries has recently completed a programmatic Essential Fish Habitat Consultation for the LTMS program for maintenance dredging projects. There may be recommendations in that consultation that may be applicable to your proposed project.

Draft Remedial Action Plan Comments

The Draft Remedial Action Plan is very limited and lacks a lot of important details. The Final Remedial Action Plan should include the details related to the proposed dredging, backfilling, monitoring and institutional controls described in the Initial Study. Furthermore, all relevant regulatory agencies should be notified of the proposed project and have the opportunity to comment on the proposed remediation and monitoring. In addition to the U.S. Army Corps of Engineers and the Commission, the Regional Water Quality Control Board, the EPA, U.S. Fish and Wildlife Service, NOAA Fisheries, CA Fish and Game and local planning agencies should be incorporated into the planning process.

Thank you for providing staff with the opportunity to review the Initial Study and Draft Remedial Action Plan for Site 27 on Treasure Island. We recognize the importance of this project and are more than happy to assist you. Commission staff is aware that it is the Navy's position that the CERCLA process exempts federal agencies from Commission review under the federal consistency provisions of the Coastal Zone Management Act (CZMA) because the proposed project is designed to be consistent with the applicable and relevant and appropriate requirements. However, the Commission staff respectfully reserves the right to raise the requirement to review the project under the Commission's CZMA federal consistency authority in the future.

Please feel free to contact me at (415) 352-3624 or email me at cbox@bcdc.ca.gov or Brenda Goeden at (415) 352-3623 or brendag@bcdc.ca.gov if you have any questions regarding this letter or the Commission's policies and permitting process.

Sincerely,

CAROLYNN BOX
Coastal Program Analyst

Inc.

Making San Francisco Bay Better

COPY

March 11, 2011

Mr. James Sullivan
Department of the Navy
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

SUBJECT: Draft Proposed Plan/Draft Remedial Action Plan for Site 27 at the Clipper Cove Skeet Range at the Naval Station on Treasure Island

Dear Mr. Sullivan:

Thank you for the opportunity to comment on the Draft Proposed Plan/Draft Remedial Action Plan for Site 27 at the Clipper Cover Skeet Range (Draft Remedial Action Plan) at the Naval Station on Treasure Island in San Francisco, California. Site 27 is a portion of Clipper Cove that was formerly used as a naval skeet range from 1979 to 1989. As described in the document, clay targets were launched from the shoreline. Naval personnel fired lead shots at the targets, which subsequently landed in the Bay. The lead shot currently in Bay sediments have been identified as a contaminant source with potentially harmful effects on wildlife, particularly diving ducks.

Background

In August 2010, a Final Feasibility Study for Site 27 Clipper Cove Skeet Range (Feasibility Study) was issued in August 2010 as a requirement of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Feasibility Study developed and evaluated three remedial alternatives for lead shot in the sediments. The first alternative is the no action alternative, which would leave all contaminants in place on site. The second alternative includes dredging the area from the shoreline to 75 feet off shore to a depth of minus 2.5 feet Mean Lower Low Water (MLLW) and then backfilling this area with clean material. The third alternative includes dredging the entire Site 27 area, as shown in Figure 5 in the Draft Remediation Action Plan, to a depth of minus 7 feet MLLW to remove most of the material with lead shot.

The San Francisco Bay Conservation and Development Commission (BCDC) submitted comments, dated March 9, 2009 that summarized the *San Francisco Bay Plan* policies that would be applicable to the proposed project. Although the Commission itself has not reviewed the Draft Proposed Plan/Draft Remedial Action Plan for Site 27 on Treasure Island, the staff comments discussed below are based on the Commission's law, the McAteer-Petris Act, the Commission's *San Francisco Bay Plan* (Bay Plan), the Commission's federally–approved coastal management plan for the San Francisco Bay, and the amended federal Coastal Zone Management Act (CZMA).

Proposed Preferred Alternative

According to the Draft Remedial Action Plan, the preferred alternative is Alternative 2b, which includes focused dredging and backfilling, placement of sediment as a protective cap, institutional controls, and sediment monitoring within the Site 27 area, and disposal of the dredged sediment outside of the Commission's jurisdiction or at an authorized upland location. Section 7.0 in the Draft Remedial Action Plan states that Alternative 2b would be implemented by removing contaminated sediments where there is a current complete exposure pathway to wildlife and backfilling the area to prevent exposure to diving ducks. The steps to remediate this area are described on Page 33 of the Final Feasibility Study as: (1) removal of at least the top 2.5 feet of sediment from within the designated area; and (2) capping the remaining lead shot in the area with at least 2 feet of sediment. Further, Section 7.0 in the Draft Remedial Action Plan states that restrictions on vessel speed, controls on dredging within the boundary of Site 27, and long-term monitoring of the backfill would be required to reduce the likelihood of activities that might disturb sediment and re-suspend buried lead shot at the site. Section 7.0 also states that the remedial design will also take into account the relevant hydrodynamic conditions and would consider proposed, current and historical uses of the marina, including maintenance dredging.

Commission Laws and Policies

Applicable San Francisco Bay Plan policies are described in the BCDC letter, dated March 9, 2009. As the letter notes, the proposed backfill would be considered "fill in the Bay," as described in the McAteer-Petris Act, and should be analyzed for compliance with applicable Bay Plan policies. According to the McAteer-Petris Act "fill in the Bay" can only be authorized if there is no feasible upland alternative, is the minimum amount necessary to achieve the project, and the public benefits clearly exceed the public detriments.

The March 9, 2009 letter also described the applicable Bay Plan policies. Specifically, the Commission recommends that the backfill only be placed to the current elevation. This will assure that there is no excess fill associated with the project. In addition, the Commission also recommends that the project attempt to replicate the existing bottom type in the vicinity. The recommendations within the San Francisco Bay Subtidal Habitat Goals Report may be appropriate to incorporate into future planning for the area. In order to properly analyze the project, please describe the needs for backfilling with sand and rock if either of these two aggregates would be used; the volumes of sand and/or rocks; and the final elevation to be filled. Also, please provide an analysis of the project with removal of sediment to minus 7 feet MLLW without backfill or with limited backfill. The dredging method and disposal location should also be fully described.

As discussed during a conference call on January 12, 2010, the Commission Staff is concerned that based on the available scientific information collected for the project, the proposed project depth will leave significant lead shot in the Bay. The data collected only analyzes the lead shot to a depth of minus 7 feet MLLW and does not delineate or describe the lead shot contamination below 7-feet MLLW. Furthermore, the Feasibility Study indicated that the highest concentration of lead shot was below the surface between 3.5 feet and 5 feet; however, the proposed project only includes removal of the top 2.5 feet of sediment. The Commission supports removal as much of this material as possible.

In addition, the Commission's laws and policies on Subtidal Areas and Fish, Other Aquatic Organisms and Wildlife require that the habitats needed to conserve or increase an endangered or threatened plant, fish, or other aquatic organism or wildlife species be protected. Specifically, environmental work windows for maintenance dredging have been established by programmatic biological opinions, issued by the NOAA Fisheries and the California Fish and Wildlife Service. While the programmatic biological opinions are for maintenance dredging projects authorized, similar environmental windows may be applicable to your proposed project. Please work with NOAA fisheries and the California Fish and Wildlife Service to understand how your proposed project should move forward to assure protection of endangered or threatened species.

Furthermore, as stated in the Department of Fish and Game (DFG) comment letter, dated June 25, 2009, the longfin smelt (Spirinchus thaleichthys) was recently declared a threatened species under the California Endangered Species Act. As a result, if the project would take longfin smelt, a take permit would be required from DFG.

Lastly, if eelgrass or other protected habitats are found to be present at the site or in the vicinity, an Essential Fish Habitat consultation with NOAA fisheries may be required. NOAA Fisheries is in the process of finalizing a Programmatic Essential Fish Habitat Consultation for the LTMS program, including only maintenance dredging, and developing conservation recommendations that may be applicable to your proposed project to help mitigate any potential impacts to protected habitat.

Thank you for providing staff with the opportunity to review the Draft Proposed Plan/Draft Remedial Action Plan for Site 27 on Treasure Island. We recognize the importance of this project and are more than happy to assist you. Commission staff is aware that it is the Navy's position that the CERCLA process exempts federal agencies from Commission review under the federal consistency provisions of the Coastal Zone Management Act (CZMA) because the proposed project is designed to be consistent with the applicable and relevant and appropriate requirements. However, the Commission staff respectfully reserves the right to raise the requirement to review the project under the Commission's CZMA federal consistency authority in the future.

Please feel free to contact me at (415) 352-3624 or email me at cbox@bcdc.ca.gov if you have any questions regarding this letter or the Commission's policies and permitting process.

Sincerely,

CAROLYNN BOX
Coastal Program Analyst

CB/rca

cc: State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825

Mr. Ryan Miya
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2737

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COPY

March 9, 2009

Mr. James Sullivan
Department of the Navy
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

SUBJECT: Second Revised Draft Feasibility Study for Site 27 at the Clipper Cove Skeet Range at the Naval Station on Treasure Island

Dear Mr. Sulivan:

Thank you for the opportunity to comment on the Second Revised Draft Feasibility Study for Site 27 at the Clipper Cover Skeet Range (Feasibility Study) at the Naval Station on Treasure Island in San Francisco, California. Site 27 is a portion of Clipper Cove that was formerly used as a naval skeet range from 1979 to 1989. As described in the document, clay targets were launched from the shoreline. Naval personnel fired lead shots at the targets, which subsequently landed in the Bay.

In 1993, the San Francisco Water Quality Control Board identified Site 27 as a site of potential environmental concern and issued a Board Order that outlined specific compliance requirements and tasks. As a result, the Navy conducted a sediment characterization study that determined the extent of the lead in the off shore sediments. The study showed that the lead shot is present no more than 750 feet from the shoreline. Past investigations have determined that highest concentrations of lead were generally found in core samples between 3-5 feet below the surface of the sediment.

The Feasibility Study was prepared as a requirement of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and presents the existing information about the site and develops and evaluates three remedial alternatives for lead shot in the sediments. The first alternative is the no action alternative, which would leave contaminants in place on site. The second alternative includes dredging the area from the shoreline to 75 feet off shore to a depth of 2.5 feet and then backfilling this area with clean material. The third alternative includes dredging the entire Site 27 area to a depth of 7 feet to remove most of the material with lead shot.

Although the Commission itself has not reviewed the Second Revised Draft Feasibility Study for Site 27 on Treasure Island the staff comments discussed below are based on the Commission's law, the McAteer-Petris Act, the Commission's *San Francisco Bay Plan* (Bay Plan), the Commission's federally–approved coastal management plan for the San Francisco Bay, and the amended federal Coastal Zone Management Act (CZMA).

BCDC Authority and Jurisdiction

The Commission's jurisdiction includes all tidal areas of the Bay up to the line of mean high tide (up to five feet above mean sea level or the upper edge of marsh vegetation in marshland), all areas formerly subject to tidal action that have been filled since September 17, 1965, and the shoreline band, which extends 100 feet inland from and parallel to the Bay shoreline. Site 27 is located only within the Commission's Bay jurisdiction and therefore needs a federal consistency determination.

Proposed Activities

For all proposed alternatives, subsection Section 3.2 should include a discussion of the consistency determination requirements and disposal options for each proposed action. On page 28, the discussion includes the option of beneficially reusing the dredged material at sites such as Montezuma Wetlands. This site seems to be appropriate for foundation material placement. However, you may want to have Dredged Material Management Office (DMMO) review the test results for disposal options. For your information, The DMMO website is www.spn.usace.army.mil/conops/dmmo.htm.

Alternative Two involves dredging a portion of Area 27 and backfilling with "clean material." On page 30 the backfill material is described as sand and rock armor. The back fill would be considered "Fill in the Bay" as described in the Bay Plan and should be analyzed for compliance with these policies. Backfilling the subtidal habitat with rock armoring may be difficult for the Commission to approve.

Alternative Three involves dredging the entire site to a depth of 7-feet MLLW. Though the Feasibility Study includes a significant amount of information and past scientific studies, there is not a discussion of the full extent of the lead contamination below -7-feet MLLW. Therefore it is possible that additional information would be required prior to authorizing work under Alternative Three.

In either case, if a marina is a potential future use under consideration, the Navy may want to do additional testing of the sediment to the potential design depth and over dredged depth allowance to prevent costs and clean up in the future.

Bay Plan Policies

In addition to the above listed issues, the following Bay Plan policies may apply to activities within your project area:

1. **Water Quality.** These policies address water quality issues related to dredging. Policy No. Three requires new projects be sited, designed, constructed and maintained to prevent or minimize the discharge of pollutants in the Bay by controlling pollutant sources at the project site, using appropriate construction materials, and applying best management practices. If activities related to the clean up at Site 27 have the potential to affect water quality in the region, or if water is discharged from the sites, you may be required to obtain a water quality certification or waste discharge requirements from the Regional Water Quality Control Board.

2. **Dredging.** The policies in this section discuss disposal of dredged material. This is applicable to your project because Alternative Two and Three include dredging within Site 27 and disposal of dredged material.

3. **Fill and Public Trust Policies** The policies in this section discuss that fill can be authorized on land granted in trust by the Legislature to a public agency and the Commission finds that the filling and use proposed on the fill is consistent with the Public Trust Doctrine. In addition, the Commission will need to determine that the fill is the minimum necessary to complete the project, that the fill is for a water-oriented use, and that there is no upland alternative. These policies are applicable to the backfilling described in Alternative Two.

Existing BCDC Permit for Adjacent Site

The dredging history at Clipper Cove section on Page 3 of the Feasibility Study discusses past dredging activities at Treasure Island adjacent to Site 27 in Clipper Cove. It appears that maintenance dredging was authorized by BCDC Consistency Determination No. CN3-84. This information may be valuable to include in the Feasibility Study for future reference.

Thank you for providing staff with the opportunity to review the Second Revised Draft Feasibility Study for Site 27 at the Clipper Cover Skeet Range (Feasibility Study) on Treasure Island. We recognize the importance of this project and are more than happy to assist you with consistency determination requirements. Please feel free to contact me at (415) 352-3624 or email me at cbox@bcdc.ca.gov if you have any questions regarding this letter or the Commission's policies and permitting process.

Sincerely,

CAROLYNN BOX
Coastal Program Analyst

CB/rca

cc: State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825

Mr. Ryan Miya
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2737

Mr. James Sullivan
Base Realignment and Closure, Program Management Office West
1455 Frazee Road
San Diego 92108

July 2, 2011
Re: Comments on the Proposed Plan/Draft Remedial Action Plan, IR Site 27 Clipper Cove Skeet Range

Dear Mr. Sullivan,

Thank you for the opportunity to comment on the above document.

I reviewed the proposed plan in conjunction with the Feasibility Study to have a complete understanding of the situation and the remedies.

I have had difficulty accepting the Comparative Ranking System developed for the CERCLA process for a long time. The weightings seem arbitrary and biased towards the Navy's preferred alternative. RAB members at this base and others have often found that a high cost (usually associated with a more complete clean-up) is automatically rated lower than lesser solutions, including those that leave contamination in place. Cost differences should be accurate. Based on dollar amount alone, the range for the alternatives should be 2b, 2a, 3a and 3b in order from lowest to highest.

It doesn't make sense that 3b should have a lower short-term effectiveness, especially when it is of a shorter duration than 2a. Those values should be reversed.

Under Implementability 2a should have a lower rating than 3b, again because it requires a longer clean-up period. 3a and 3b are considered less implementable because of the volume of material to be removed. Yet at Seaplane Lagoon where far more sediment (and junk, including anchors) will be removed, none of the alternatives ranked so low. I would raise 2a to 1.5.

The Federal government has stated since the start of the RAB process that clean-up will be in keeping with the desired reuse of the property and since the start of the RAB process the City and County of San Francisco has indicated that a marina is the desired reuse. Now the Navy is proposing a clean-up alternative that does not permit unencumbered expansion of the marina and adds a burden of cost to its implementation. Clearly the Navy was responsible for the deposition of lead shot and skeet targets. It should honor the original agreement between the City and the Navy and clean the site up. Otherwise, it seems the Federal government merely wanted the City to incur costs in the process of transfer by developing a plan the Navy does not plan to follow. Filling the Bay with two feet of rock to 75 feet of the shoreline makes building docks incredibly costly and difficult. Additionally, it appears BCDC is also uncomfortable with filling the Bay. Again, the Navy appears to be stating that it is only subject to local ordinances to the extent they are convenient. Between these two it leaves the impression that the Navy will not comply with CERCLA or the Bay Plan.

I prefer option 3b as a result. It would result in beneficial reuse of the soil, complete clean-up of contamination, satisfy the conditions of the Bay Plan and allow the City to pursue developing a modern marina at Treasure Island.

Again, thank you for the opportunity to comment.

Sincerely yours,

Dale Smith

Dale Smith

Dale Smith
Naval Station Treasure Island Restoration Advisory Board
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510 841 2115 dale2smith@yahoo.com

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01 JUL 2011 PM 3 L

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ATTACHMENT C
REFERENCES

(Reference Documents Provided on CD Only)

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
1	**naval skeet range**	Section 2.1	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 1.2.2 and Figures 3 and 4. Tetra Tech EM Inc. (Tetra Tech). August 13, 2010.
2	**original boundary for Site 27**	Section 2.1	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Figure 2. Tetra Tech. August 13, 2010.
3	**boundary for Site 27**	Section 2.1	Final Point Paper For Redefining Boundary of Installation Restoration Site 27, Naval Station Treasure Island, San Francisco, California. August 20, 2010.
4	**Proposed Plan/Draft RAP**	Section 2.1	Final Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 27, Former Clipper Cove Skeet Range, Former Naval Station Treasure Island, San Francisco, California. Page 2 (Figure 1) and Page 3 (3rd paragraph). June 2011.
5	**circulation**	Section 2.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 2.4.1. Tetra Tech. December 28, 2001.
6	**sediment deposition in San Francisco Bay**	Section 2.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 2.4.3. Tetra Tech. December 28, 2001.
7	**deposition is minimal**	Section 2.2	Point Paper for Installation Restoration Site 27, Clipper Cove Skeet Range, Evaluation of Sediment Deposition – Revision 1. Tetra Tech. November 30, 2005.
8	**sediment deposition in Clipper Cove**	Section 2.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 1.2.4, second through fourth paragraphs. Tetra Tech. August 13, 2010.
9	**ecology**	Section 2.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Sections 3.0 through 3.4, Tables 3-1 through 3-5, and Figures 3-1 and 3-2. Tetra Tech. December 28, 2001.
10	**Screening values**	Section 2.3	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 1.3.1.1. Tetra Tech. August 13, 2010.
11	**lead, lead shot**	Table 1	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Sections 6.4 through 6.4.4. Tetra Tech. December 28, 2001.
12	**PAHs**	Table 1	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 7.4. Tetra Tech. December 28, 2001.
13	**ERA**	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections 1.3.2 through 1.3.2.2. Tetra Tech. August 13, 2010.
14	**secondary evaluation**	Section 2.5.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 10.0. Tetra Tech. December 28, 2001.
15	**lead as a COEC**	Section 2.5.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 10.1. Tetra Tech. December 28, 2001.
16	**toxic effects**	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section A1.0, fourth paragraph. Tetra Tech. August 13, 2010.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
17	**investigation of the nearshore area**	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section A2.0. Tetra Tech. August 13, 2010.
18	**Lead shot was detected**	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections A3.0 and A4.0. Tetra Tech. August 13, 2010.
19	**eight of 30 locations**	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Figure A-1. Tetra Tech. August 13, 2010.
20	**conceptual site model**	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Attachment 2a. Tetra Tech. August 13, 2010.
21	**general response actions (GRA)**	Section 2.8	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections 2.3 and 3.3. Tetra Tech. August 13, 2010.
22	**Present-Value Cost: $2.9 million**	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-1. Tetra Tech. August 13, 2010.
23	**Present-Value Cost: $2.2 million**	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-2. Tetra Tech. August 13, 2010.
24	**Present-Value Cost: $21.0 million**	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-3. Tetra Tech. August 13, 2010.
25	**Present-Value Cost: $23.9 million**	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-4. Tetra Tech. August 13, 2010.
26	**nine evaluation criteria**	Section 2.8.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections 5.2 through 5.3.7. Tetra Tech. August 13, 2010.
27	**focused dredging and backfill**	Section 2.9	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Figure 13. Tetra Tech. August 13, 2010.
28	**removing sediment**	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.1. Tetra Tech. August 13, 2010.
29	**beneficial reuse**	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.2.2. Tetra Tech. August 13, 2010.
30	**sediment monitoring**	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.3. Tetra Tech. August 13, 2010.
31	**site-wide ICs**	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.4. Tetra Tech. August 13, 2010.
32	**IR Program website, www.bracpmo.navy.mil**	Section 2.10	http://www.bracpmo.navy.mil/

[1] **Bold blue** text indicates hyperlinks available on the reference CD detailed site information contained in the publicly available Administrative Record.

For access to information contained in the Administrative Record for Naval Station Treasure Island, please contact:

Commanding Officer
Naval Facilities Engineering Command, Southwest
Attn: Ms. Diane Silva, Command Records Manager, Code EV33
1220 Pacific Highway (NBSD Building 3519)
San Diego, California 92132
(619) 556-1280
diane.silva@navy.mil

Please call in advance for an appointment Monday through Friday between 8:30 a.m. and 4:30 p.m.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[i]
1	**naval skeet range**	Section 2.1	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 1.2.2 and Figures 3 and 4. Tetra Tech EM Inc. (Tetra Tech). August 13, 2010.

NAVSTA TI lies in San Francisco Bay, midway between San Francisco and Oakland, California (Figure 1). The facility consists of two contiguous islands: Treasure Island (TI), which is about 403 acres, and Yerba Buena Island (YBI), which is about 147 acres. TI is a manmade island constructed of materials dredged from San Francisco Bay, while YBI is a natural island. Clipper Cove is situated between the two islands and includes the offshore area of Site 27 (Figure 2). Site 27 projects outward into Clipper Cove in a fan shape from the middle of the northern shoreline of TI (Figure 2). The offshore area included within Site 27 is about 19 acres, while the onshore area of the site is less than 1 acre. The total acreage of Clipper Cove is about 130 acres.

Military activities at NAVSTA TI date back to about 1866, when the U.S. government took possession of YBI for defensive fortifications; TI had not yet been constructed. The U.S. Army occupied YBI until 1896, when the Navy assumed control. TI was built between 1936 and 1937 on the shoals of YBI, a sand spit extending from the northwest point of YBI. It was initially used for the Golden Gate International Exposition in 1939. TI was leased to the Navy in 1941. The Navy operated the facility for various activities, including the Naval Technical Training Center, waterfront facilities, troop and family housing, personnel support, a Navy jail, and a Navy and Marine Corps museum. Naval operations ceased at NAVSTA TI in 1997. The City of San Francisco and TIDA currently coordinate reuse of the property.

1.2.2 Clipper Cove Skeet Range Description and History

The skeet range operated from about 1979 to 1989. Clay targets (skeet) were launched from two skeet fields (see Figure 3), and lead pellets from shotguns were discharged into Clipper Cove. The positions of the shooters and the angles the skeet targets were thrown resulted in a fan-shaped shot fall zone (Figure 2). A historical search for operational information on the skeet range was conducted for this FS and included a search of past dredging, previous range masters, commanding officers, and past users. Information on past dredging is discussed in Section 1.2.3. Information on past users of the skeet range was limited, however. One person stationed at NAVSTA TI when the skeet range was operational was contacted; however, he had no recollection of the skeet range. The only reference to use of the skeet range was a 1985 seawall repair construction drawing, which stated the contractor must keep the skeet range open on weekends.

The following text describes the layout and activities at an active range based on International Shooting Sport Federation (ISSF) technical rules (ISSF 2001) for background on the operations of a typical skeet range. The skeet field is laid out on a semicircle (or half "clock") with eight stations (Figure 4). Seven stations are positioned at equal distances on the perimeter of the "clock," with the eighth in the middle on a line between position one and seven. (Station one would be the numeral 12 on a clock; position seven would be the numeral 6.) High targets are thrown from station one at one end of the semicircle; low targets are thrown from station seven at the other end. Trap houses house the machines that throw the targets. The trap house at station one is called the "high house," and the trap house at station seven is called the "low house." Targets are always thrown in the same pattern of flight, but the angle of the shot varies because the shooter changes position as the skeet squad moves from station to station. Two targets are shot from each of the eight stations, one from each house; doubles, where targets are thrown simultaneously from both houses, are shot at stations 1, 2, 6, and 7. The last shot is the shooter's choice. The average skeet squad, or group of shooters, is composed of five people, each of whom shoots a round of 25 shots.

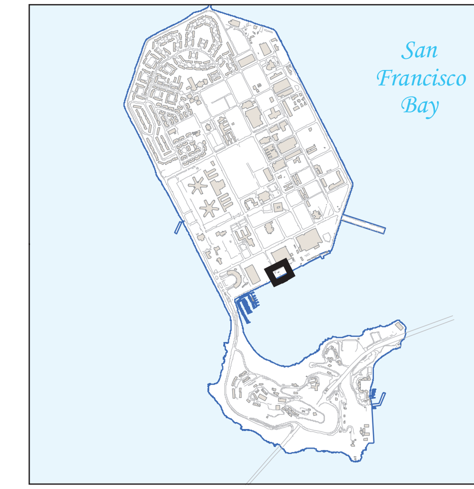
Site 27 was identified as a potential environmental concern in 1993, based on an order from the Water Board (Water Board 1993). The Sampling and Analysis Plan for the Phase II Ecological Risk Assessment at Site 27 was developed in 1996 in cooperation with the regulatory agencies and was based on the shot fall zone (PRC 1996a). Originally, the shot fall zone was estimated to be 300 to 500 feet from each firing point based on a study at a similar site (Levine Fricke 1992); however, based on the type and weight of shot used (shot No. 7-1/2, 8, or 9), it was concluded that the zone could extend as far as 900 feet from the firing point (PRC 1994). Sampling locations were placed using a 100-foot grid system, with locations concentrated in the expected shot fall zone (0 to 500 feet). Samples were also collected to 900 feet from the firing point to assure the horizontal extent of contamination was fully characterized and delineated.

The original site boundary was established based on the onshore location of one skeet range. The boundary of Site 27 was revised in August 2004, in cooperation with the City of San Francisco and the regulatory agencies, to include a second adjacent skeet range, the onshore area of Site 27, and to reflect the full shot fall zone based on information from the Interstate Technology Regulatory Council (ITRC) (ITRC 2003). The ITRC states that typical lead skeet loads can reach nearly 680 feet from the shooter. To be conservative, the boundary was therefore set to extend 750 feet offshore from each firing point (Attachment 3, Figure 2). Although the site boundary was expanded, only locations where the highest density of lead shot would be expected (ITRC 2003) were sampled during the Site 27 offshore RI.

1.2.3 Dredging History at NAVSTA TI

Sediment was removed from a 3-mile stretch of channel adjacent to the northern and eastern shores of NAVSTA TI during dredging around NAVSTA TI between 1970 and 1993 (EPA and others 1996). The channel extends southward 3,000 feet beyond the southern tip of YBI and is thought to be between 1,000 and 1,500 feet wide. This outer channel does not extend into Clipper Cove, however. This channel was dredged about every 11.5 years over a 23-year period (EPA and others 1996). Maintenance dredging was conducted in 1953 (238,000 cubic yards [cy]), in 1970 (272,000 cy), and in 1985 (457,000 cy). The 1985 dredging was the last maintenance dredging conducted at Treasure Island (Navy Public Notice dated 24 June 1991 for Permit No. 18965S48). The public notice indicated that the relatively strong currents and deep water surrounding Treasure Island discouraged shoaling in the existing berthing areas, and a relatively small amount of maintenance dredging had been required at TI compared with other Navy facilities in the bay.

On April 19, 1993, the U.S. Army Corps of Engineers issued Permit No. 18965S48 to the Navy for maintenance dredging at TI for a period ending on April 1, 1997. The permit authorized the Navy to remove 400,000 cy of sediment during the first year and 50,000 cy of sediment during each of the next 4 years. The quantities were based on dredging the entrance channel, turning basin and berthing areas at NAVSTA TI to maintain a depth of –10 feet mean lower low water (MLLW) to –35 feet MLLW, with a 2-foot overdredge allowance. The entrance channel is 100 feet wide and extends from Pier 1 to the marina. The project depths were –35 feet MLLW at



Former Skeet Range Firing Station
Investigation Site

Aerial photograph taken by Air Flight Serivce for Tetra Tech Inc. on May 15, 2009

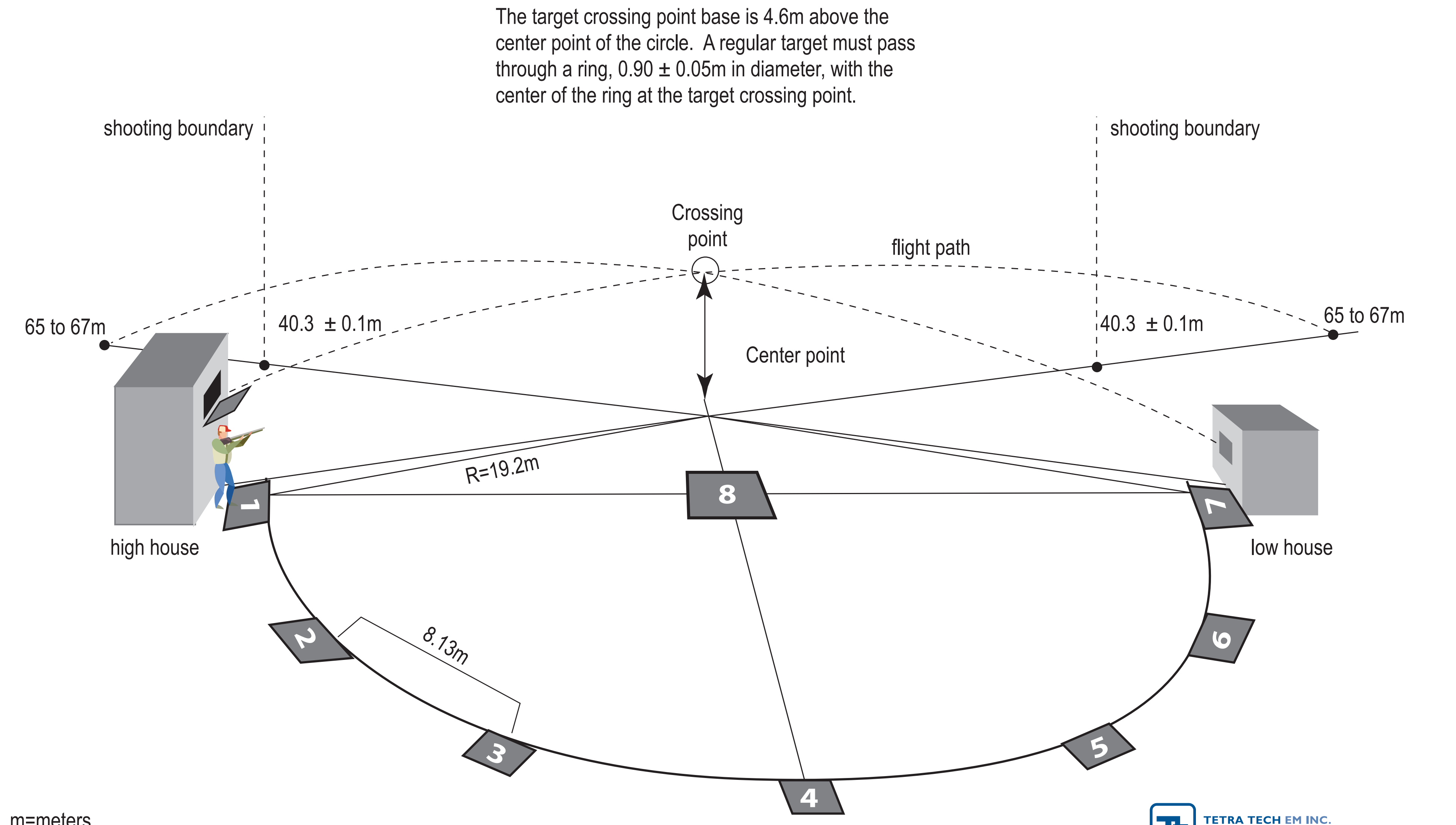
30 0 30
Feet

TETRA TECH EM INC.

Naval Station Treasure Island
Department of the Navy, BRAC PMO West, San Diego, CA

FIGURE 3
SITE 27
SKEET RANGE LAYOUT

Clipper Cove Skeet Range Feasibility Study



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Naval Station Treasure Island
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FIGURE 4
GENERAL SKEET RANGE LAYOUT

Clipper Cove Skeet Range Feasibility Study

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[ii]
2	original boundary for Site 27	Section 2.1	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Figure 2. Tetra Tech EM Inc. (Tetra Tech). August 13, 2010.

Naval Station Treasure Island
Department of the Navy, BRAC PMO West, San Diego, CA

FIGURE 2
CLIPPER COVE SKEET RANGE
SITE 27

Clipper Cove Skeet Range Feasibility Study

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[iii]
3	boundary for Site 27	Section 2.1	Final Point Paper For Redefining Boundary of Installation Restoration Site 27, Naval Station Treasure Island, San Francisco, California. August 20, 2010.

POINT PAPER FOR REDEFINIG BOUNDARY OF INSTALLATION RESTORATION SITE 27 UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT, NAVAL STATION TREASURE ISLAND, CALIFORNIA

INTRODUCTION

This point paper documents the Department of the Navy's proposal to redefine the boundary for Installation Restoration (IR) Site 27 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The site is located at the former Naval Station Treasure Island (NAVSTA TI), San Francisco, California. This change is proposed to allow transfer of the upland portions of Site 27 before regulatory closure of the remainder of the site.

The redefinition of the Site 27 CERCLA boundary (shown on Figure 1) proposes to exclude the upland portion (landward of the mean high water line) of the site, where polycyclic aromatic hydrocarbons (PAH) and lead detected in soil have been found to not pose an unacceptable risk to human health or the environment.

BACKGROUND AND HISTORY

The offshore sediments of Site 27 were not part of the original preliminary assessment/site inspection at NAVSTA TI, but were added after discussions with the Regional Water Quality Control Board (Water Board) resulted in Order No. 93-130, requiring the Navy to investigate and manage contamination attributable to the skeet range in the Clipper Cove area of NAVSTA TI (Water Board 1993). The onshore area was later included as part of the site after an adjustment in 2004 extended the boundary to encompass the upland portions of the skeet range. At that time, there was a perceived potential for lead and PAH contamination from the lead shot fired from firing stations and from skeet fragments; PAHs were known to have been used in manufacturing the skeet (Interstate Technology Regulatory Council 2003). The spatial extent of the onshore area was established based on modeling the areas where lead shot and skeet fragments may have been distributed. The upland area of potential distribution was less than 1 acre and consists mainly of paved surfaces. There is also a narrow strip of dirt where the former Causeway pipeline transected the site. South of the onshore portion of the skeet range is the rip-rap covered shoreline.

The upland area of Site 27 was further investigated after the area had been included in the site boundary, and the results of that investigation were documented in the second revised draft feasibility study (FS) for Site 27 (Tetra Tech EM Inc. 2010). Based on the additional investigation and analysis, it was concluded that no further action for the onshore area of Site 27 is necessary because there is no unacceptable risk to human health or the environment, as documented in the Final FS (Tetra Tech EM Inc. 2010).

TECHNICAL JUSTICIFACTION FOR REDEFINING THE SITE 27 BOUNDARY

The proposed boundary of Site 27 will be revised to exclude the onshore portion of the site, as shown on Figure 1. This is based on Final FS recommendation for no further action for the onshore area of Site 27 given that there is no unacceptable risk to human health or the environment (Tetra Tech EM Inc. 2010). The risk evaluation was conducted using the soil cleanup levels that have been established for Naval Station Treasure Island for residential or unrestricted use. This adjustment will be reflected in future site maps and documents. This is preferred because it allows the Navy to transfer the onshore portion of the site while the offshore portion of Site 27 continues through the CERCLA process. The technical justification for no further action provided in the FS is based on an evaluation of data collected during previous sampling events conducted as part of the Phase I and Phase IIB remedial investigations (PRC Environmental Management, Inc 1993, 1995), the Causeway pipeline investigation (IT Corporation 2003), the environmental baseline survey (EBS) data gaps investigation (Shaw 2005), and the screening-level ecological risk assessment (SLERA) for multiple sites at NAVSTA TI (SulTech 2007).

To assess potential risk to human health, concentrations of lead measured in soil were compared with residential and industrial preliminary remediation goals (PRG); only one sample location exceeded the residential PRG and no concentrations of lead exceeded the industrial PRG (Tetra Tech EM Inc. 2010). The 95 percent upper confidence limit of the mean did not exceed the residential PRG. Concentrations of PAHs were compared with a benzo(a)pyrene equivalent concentration of 0.62 mg/kg that represents an incremental cancer risk of $1x10^{-5}$, which was only slightly exceeded at one location (0.6258 mg/kg).

A SLERA was conducted for eight sites at NAVSTA TI (SulTech 2007). Although Site 27 was not included in the SLERA, most of the onshore portion of Site 27 is paved; therefore, the land features are generally similar to nearby Site 21, which is similarly situated along the shoreline and is completely paved. Therefore, there is no complete exposure pathway for ecological receptors. The conclusion for each of the sites evaluated in the SLERA is that there are no complete exposure pathways to ecologically relevant ecosystems or receptors (no exposure) and thus no unacceptable risk; therefore, there is no unacceptable risk posed to ecological receptors in the onshore portion of Site 27.

Based on this evaluation of risk to human health and the environment, a recommendation of no further action for the onshore area was made (Tetra Tech EM Inc. 2010).

CONCLUSION

Based on an evaluation of the data, concentrations of PAHs and lead measured in soil at the onshore area of Site 27 do not pose an unacceptable risk to human health or the environment. The FS recommended no further action at the onshore area of the site; therefore, no remedial alternatives for the onshore area were planned. As a result, the Navy proposes to adjust the boundary of Site 27 to exclude the onshore portion of the site. The new site boundary will be utilized for all future site documentation, including the forthcoming Site 27 Proposed Plan.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[1]
4	**Proposed Plan/Draft RAP**	Section 2.1	Final Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 27, Former Clipper Cove Skeet Range, Former Naval Station Treasure Island, San Francisco, California. Page 2 (Figure 1) and Page 3 (3rd paragraph). June 2011.

ABOUT THIS PROPOSED PLAN/ DRAFT RAP

The Navy is issuing this Proposed Plan/Draft RAP as part of its public participation responsibilities under Section 117(a) of CERCLA, Section 300.430(f)(2) of the ***National Oil and Hazardous Substances Pollution Contingency Plan (NCP)***, and Chapter 6.8 of the California Health and Safety Code (HSC). Figure 2 illustrates the status of Site 27 in the CERCLA and California Health and Safety Code Section 25356.1 Process.

This Proposed Plan/Draft RAP summarizes information detailed in the ***remedial investigation (RI)*** report and ***feasibility study (FS)*** report, along with other documents contained in the administrative record file for Site 27. The administrative record contains the reports and historical documents used to select remedial alternatives. The Navy encourages the public to review these documents to gain an understanding of Site 27 and the environmental assessments and investigations that have been conducted. The documents are available for public review at the locations listed on page 13.

A public comment period will be held from June 2 through July 2, 2011. Public comments can be submitted by mail, fax, or e-mail throughout the comment period to James Sullivan, BRAC Environmental Coordinator, BRAC Program Management Office West, 1455 Frazee Road, Suite 900, San Diego, California 92108-4310, (619) 532-0983 (fax), james.b.sullivan2@navy.mil. A public meeting will be held from 6:30 to 8:30 p.m. on June 14, 2011 at the Casa de la Vista, Building 271, Treasure Island. Members of the public may also submit written and oral comments on this Proposed Plan/Draft RAP at the public meeting.

In consultation with the regulatory agencies, the Navy may modify the preferred remedial alternative or select another remedial alternative based on feedback from the community or new information. Therefore, the community is encouraged to review and comment on this Proposed Plan/Draft RAP. A final decision on the remedy to be implemented will be documented in the ROD/Final RAP.

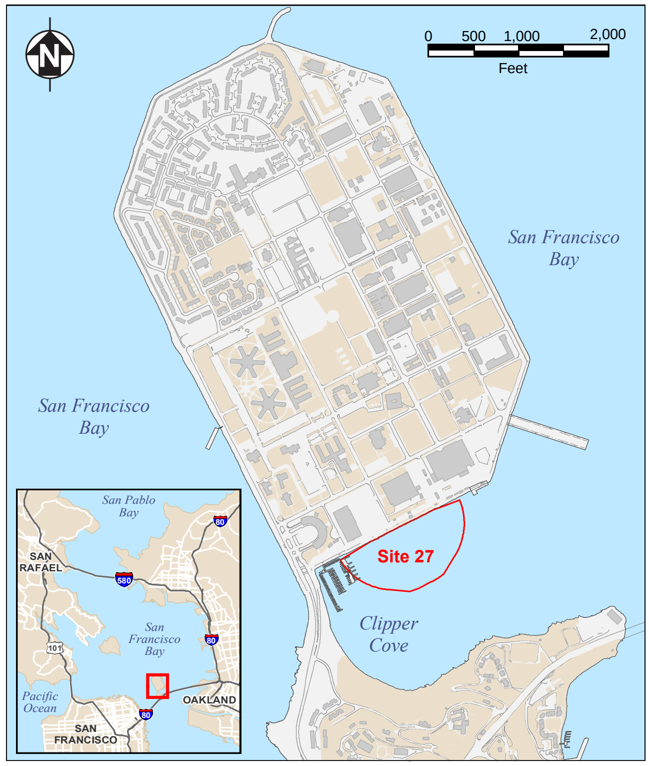


Figure 1. Location of Former Naval Station Treasure Island and Site 27

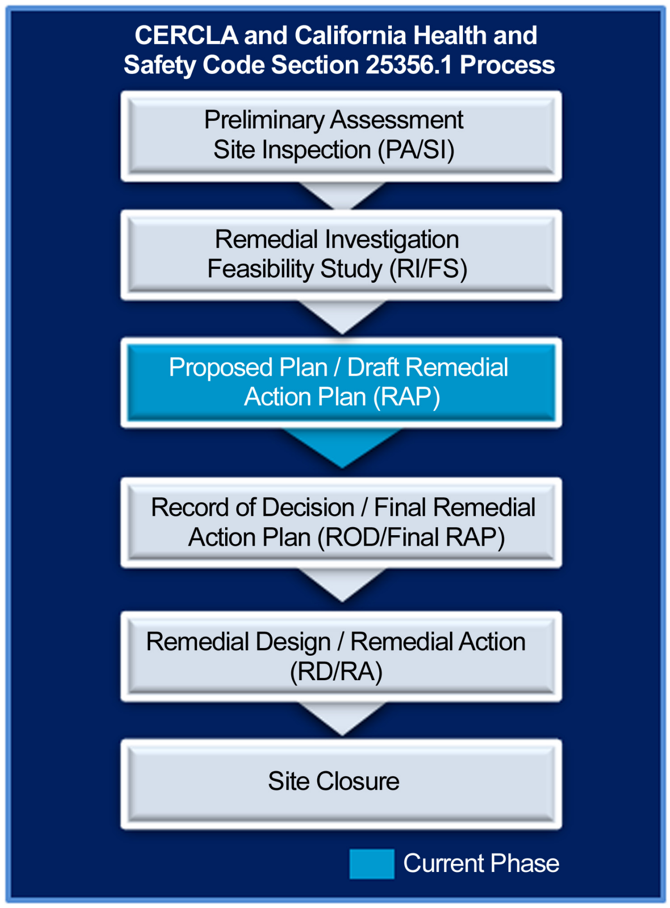


Figure 2. The CERCLA and California Health and Safety Code Section 25356.1 Process

2.0 SITE BACKGROUND

Former NAVSTA TI lies in San Francisco Bay (Figure 1) and consists of two contiguous islands: Treasure Island (TI) and Yerba Buena Island (YBI). TI was constructed on the shoals of YBI with San Francisco Bay fill between 1936 and 1937 for use as an airport for the City of San Francisco. It was also the site of the 1939 Golden Gate International Exposition. Navy operations at the island began in 1941, primarily for training, administration, housing, and other support services to the U.S. Pacific Fleet. In 1993, the Defense Base Closure and Realignment Commission recommended closure of NAVSTA TI; the facility was subsequently closed on September 30, 1997.

Clipper Cove is located directly between TI and YBI (Figure 1). A portion of Clipper Cove was used as a naval skeet range until 1989. As clay targets (skeet) were launched from the shoreline, naval personnel fired lead shot over the water, which resulted in a fan–shaped shot fall zone. The original boundary of Site 27 was established based on the onshore location of one skeet range. The boundary of Site 27 was revised in August 2004 to include a second adjacent skeet range, the onshore area of Site 27, and the full shot fall zone. The extent of lead shot contamination was determined to be no more than 750 feet from the firing point.

The onshore area of Site 27 was investigated further after the area had been included in the site boundary; however, no unacceptable risk to human health or the environment was found. In 2010, the Navy redefined the boundary for Site 27 under CERCLA because no further action is necessary for the onshore portion. The redefinition of the Site 27 CERCLA boundary excluded the onshore portion of the site (less than 1 acre landward of the mean high water line), so that Site 27 currently consists of approximately 19 offshore acres (Figure 1). The new site boundary will be used for this Proposed Plan/Draft RAP and all future site documentation. As a result, the former onshore portion of Site 27 is not discussed further in this document.

Currently, a small portion of the southwestern section of Site 27 is part of the marina (Figure 1). The remainder of Site 27 consists of sediment and open water. According to the Treasure Island and Yerba Buena Island Design for Development, Site 27 will be used as a marina in the future.

Previous Investigations

In 1993, the Water Board issued Order No. 93-130, requiring the Navy to investigate and manage contamination attributable to the skeet range in the Clipper Cove area of NAVSTA TI. The order set forth specific compliance requirements and tasks. The Navy subsequently conducted sampling investigations at Site 27 to comply with the substantive requirements of the order. The following sections describe the investigations previously performed at Site 27.

The Phase I and Phase II investigations were not limited to Site 27 and also included Site 13. Site 13 consists of stormwater outfall areas surrounding former NAVSTA TI within Navy property. Even though sediment samples were collected and analyzed from both sites, only samples from Site 27 were evaluated to help characterize chemicals thought to be associated with the former skeet range. These chemicals included lead shot, lead, and ***polycyclic aromatic hydrocarbons (PAH)*** (a component of the skeet target), which were targeted as potential ***chemicals of concern (COC)*** at Site 27.

Previous Investigations at Site 27

- Phase I Remedial Investigation Offshore Sampling (1993)
- Site 27 Clipper Cove Skeet Range Offshore Investigation (1996)
- Phase II Remedial Investigation for Offshore Sediments (1997)
- Lead Shot Investigation in the Nearshore Area of Site 27 (conducted during Feasibility Study) (2008)
- Feasibility Study (2001–2010)

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[v]
5	circulation	Section 2.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 2.4.1. Tetra Tech. December 28, 2001.

2.3.2 Yerba Buena Island Hydrogeology

The Franciscan bedrock on YBI is relatively impervious, with the exception of localized fracturing. As a result, the bedrock serves as a boundary to groundwater flow (Blum 1993; Philips and others 1992). Before YBI was developed, there were small springs on the northern slope of the island. The probable origin of the former springs was precipitation that infiltrated down through the permeable colluvium/eolian sands to the impervious Franciscan bedrock, flowed along the bedrock, and outcropped at the exposed interface between the sand deposit and bedrock. The majority of precipitation on YBI is now collected on the surface of roads and other improved areas and drained artificially. Consequently, the small springs no longer occur on YBI (Navy 1949 as cited in Dames and Moore 1988).

During geotechnical and environmental investigations on YBI, groundwater was encountered in both the colluvium and the artificial fill. The majority of groundwater monitoring wells on YBI are located in artificial fill at Site 11 (YBI Landfill); however, additional monitoring wells near Site 11 are located in the Franciscan bedrock.

Groundwater recharge at YBI occurs primarily from infiltration of precipitation, with some contribution from landscape irrigation. Perched groundwater conditions above the shallow water table may exist locally as a result of the presence of relatively impermeable silt and clay lenses.

2.4 PHYSICAL OCEANOGRAPHY

The hydrodynamics of the San Francisco Bay involve complex interactions of tides, winds, salinity, freshwater inflows, and bottom configuration (U.S. Geological Survey [USGS] 1990). All of these oceanographic characteristics affect circulation and sediment deposition in San Francisco Bay and are discussed below.

2.4.1 Bay Circulation

San Francisco Bay comprises separate embayments including a deeper central region near the City of San Francisco (Central Bay), and shallower regions (Suisun Bay, San Pablo Bay, and South Bay).

NAVSTA TI is in the Central Bay region. The average depth of San Francisco Bay is about 6 meters at mean lower low water, while the median depth is about 2 meters (Conomos and others 1985 as cited in Nichols and Pamatmat 1988). There are marked differences in circulation patterns within the regions of the estuary (Flegal and others 1991). The morphology and bathymetry of the bay allow for a tidally driven exchange of water between the north and south portions of the bay.

Tidal currents, which create a flushing effect, drive mixing among the four embayments. During one tidal cycle, up to 24 percent of the bay's water volume is exchanged. The tides are mixed semidiurnally, with two lows and two highs approximately every 24 hours. The greatest tidal exposure occurs at night in the winter and during the day in the spring and summer. The increased light availability during tidal exposure accelerates plant growth. Tides affect biological productivity in intertidal and subtidal sediments by (1) moving and mixing water masses and associated organisms and (2) varying the height of the water column above the bay floor (Nichols and Pamatmat 1988).

The bay system receives fresh water from the watersheds of the Sacramento and San Joaquin Rivers. After diversion, storage, and consumption within the delta, the balance of the water enters the bay at the eastern end of Suisun Bay. The physical force of these low salinity surface currents coupled with the higher salinity bottom currents causes the North and Central Bay areas to remain partially mixed (Conomos 1979). Salinity ranges from less than 2 parts per thousand (ppt) in the eastern end of San Pablo Bay to at least 30 ppt and above in Central Bay during summer. During winter, salinity decreases to 18 ppt in the Central Bay.

Water circulation and mixing are strongly influenced by seasonal winds. During the summer, strong west and northwest winds generate complex baywide water circulation patterns. This circulation is superimposed on tide- and river-induced circulation, which drives resuspension and mixing of sedimentary material. Another result of the intense water circulation is oxygenation of surface sediments.

2.4.2 Bay Sediments

Bay sediments are primarily alluvial deposits classified as Older Bay Mud Formation, Sand Deposits, and Younger Bay Mud Formation. The Older Bay Mud Formation is composed of firm clay with varying amounts of silt, sand, and gravel. The upper portion of the Older Bay Mud is interfingered

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[vi]
6	sediment deposition in San Francisco Bay	Section 2.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 2.4.3. Tetra Tech. December 28, 2001.

silt and clayey sandy clay. The Sand Deposits may or may not be covered with Younger Bay Mud. The Younger Bay Mud Formation overlies the Older Bay Mud and Sand Deposits and consists of soft, plastic, silty clay, clayey silt with minor organic material, and clayey fine sand (U.S. Army Corps of Engineers [COE] 1979).

2.4.3 Bay Sediment Deposition

The current understanding of processes governing sediment transport in the bay is largely qualitative. Approximately 80 to 90 percent of sediment entering the bay system is a product of soil erosion in the Sacramento and San Joaquin Rivers drainage basins (McDonald and Cheng 1993; Krone 1979); the remainder of sediment is a result of erosion of lands adjacent to the bay system.

Sediment deposition in the bay is a dynamic system where sediment inflow, outflow, and redistribution depend on numerous variables including the accumulation process, particle size, and energy gradients. Suspended and bedload material are generally transported from high-energy areas to low-energy areas. Consequently, horizontal variation in grain size of bay sediments generally correlates with wave energy; as wave energy decreases, coarse particles are deposited in high-energy areas with finer particles deposited in areas of lowest wave energy (McDonald and Cheng 1993).

The markedly different circulation patterns within the three regions of the estuary strongly influence the distribution of materials, including chemicals dissolved in water or adsorbed to particles (Flegal and others 1991). Tidal currents provide the dominant mechanism of sediment transport in the deeper channels of the bay (McDonald and Cheng 1993; Krone 1979). McDonald and Cheng demonstrated that during the more energetic spring tide, suspended sediment concentration increases. This phenomenon is especially marked during the ebb tides preceding lower low water, when the current speed is highest. When current speeds are lower, sediment resuspension is reduced. The data also indicate a 3- to 5-hour delay between maximum current speed and maximum suspended sediment concentrations at a given sampling location.

A 1979 COE report (COE 1979) provides the results of a study showing the net differences between bathymetric surveys taken 35 years apart in the San Francisco Bay and delta system. The results presented in the COE report (1979) and the net bathymetric changes between 1955 and 1990, depicted in Figure 2-1 from the long-term management study (EPA and others 1996), show that the shoreline along the northern, eastern, and southern regions of TI and YBI are net depositional areas, while the western shoreline, with the exception of an area immediately north of the San Francisco - Oakland Bay Bridge, is a net erosional area (Figure 2-1).

As expected, wind affects sediment transport in the shallows of the bay but not in the deeper channels (McDonald and Cheng 1993; Krone 1979). Wind-generated waves in the shallow bays cause resuspension of sediment. McDonald and Cheng (1993) suggested that there was little mixing between the shallow bays and deeper channels. Krone (1979) also reported that sediment settling velocity is positively related to increasing salinity, suggesting that sediment-associated chemicals would tend to settle out of suspension at a faster rate in more saline waters.

COE (1979) also indicates that sediment placed at in-bay disposal sites is resuspended by wave action and transported around the bay. The COE Waterways Experiment Station modeled the dispersion of dredged sediments that are disposed of at existing in-bay sites, and estimated that, in all cases, the disposed sediment could migrate into "virtually every major sub-basin of San Francisco Bay" (EPA and others 1996).

Studies conducted by the USGS provide information on the mechanisms of sediment transport in San Francisco Bay. In one study, dye was distributed in the leading edge of a sediment plume and the movement was observed from a helicopter while in situ measurements were taken to estimate the depth of the sediment plume in the water (Carlson and McCulloch 1974). This study was conducted during a period of high riverine discharge out of the Sacramento-San Joaquin River Delta. The researchers estimated the plume to be 120 million cubic meters, and its rate of migration at 1.25 meters per second.

Based on U.S. Coast Guard and USGS reconnaissance of the bay between 1955 and 1956 (as cited in COE 1979), the estimated total deposit of bay sediments is 16 million cubic yards. Generally, the bay experiences cycles of both deposition and erosion; the greatest deposition took place during the hydraulic mining era in the Sierra Nevada Mountains. Bay sediment inflow and outflow volumes have been estimated by several agencies using varying methods. Estimates of annual sediment inflow to the bay range from 6.9 to 8.13 million cubic yards from alluvial sources and from 1.1 to 2.4 million cubic yards from dredging and other sources. Annual sediment outflow estimates of bay sediments range from 4.2 to 8.1 million cubic yards. Net annual deposition of sediment in the bay ranges from 2.4 to 5.2 million cubic yards (COE 1979).

In contrast, another study by the USGS (USGS 1998) found a sediment deficit in the San Pablo Bay, which may result in an overall diminished sediment supply throughout San Francisco Bay. From 1856 until at least the late 1800s hydraulic mining debris filled the San Pablo Bay. Over two-thirds of the total volume of sediment deposited in the San Pablo Bay was debris from hydraulic mining that accumulated from 1856 to 1887. During the early 1900s sedimentation slowed, and from 1951 to 1983, San Pablo Bay lost sediment. One possible reason for the change from sediment accumulation to erosion is a decrease in sediment supply. The decrease in sediment supply is likely the result of upstream flood control and water distribution projects that have reduced peak flows (conditions when most sediment is transported).

2.5 HISTORICAL DISTRIBUTION OF CHEMICALS IN SAN FRANCISCO BAY

This section discusses (1) changes in the bay-delta ecosystem and (2) sediment contamination studies in the bay conducted about the time NAVSTA TI offshore data were collected, to provide background information for the evaluation of ecological risk due to chemical stressors. Certain human activities have collectively contributed to fundamental changes in the bay-delta ecosystem (Nichols and others 1986 as cited in Davis and others 1991):

- Hydraulic mining that produced more than 1.5 billion tons of soil and rock debris washed from the Sierra Nevada Mountains from about 1849 through 1884 (Whitney 1979); mining practices resulted in heavy sedimentation in the basin which contributed to elevated concentrations of metals in basin sediments (such as mercury which was used in the mining process)
- Discharge of pollutants into the estuary
- Introduction of exotic species of finfish, shellfish, and their associated symbiotic and parasitic fauna
- Diking of tidal marshes
- Filling of the margins of the bay
- Storage of surface runoff in the basin and the diversion of large quantities of freshwater from the Delta

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[vii]
7	deposition is minimal	Section 2.2	Point Paper for Installation Restoration Site 27, Clipper Cove Skeet Range, Evaluation of Sediment Deposition – Revision 1. Tetra Tech. November 30, 2005.

HYDROGRAPHIC EVALUATION

Hydrographic surveys from 1985, 1989, 2002, and 2005 (Figures 6, 7, 8, and 9, respectively) were compared to more precisely identify areas of net sediment accretion or erosion in the Skeet Range. The hydrographic surveys needed to share a common coordinate system however, to allow direct overlay analysis. Both the NAVSTA TI base map and the 2002 and 2005 hydrographic surveys use the State Plane Coordinate System, California Zone 3, North American Datum (NAD) of 1983. The other two hydrographic surveys were reprojected to match in the following manner: the 1989 hydrographic survey bears tic marks in an earlier state plane coordinate system that references NAD 1927. The coordinates of the tic marks were reprojected to use the NAD 1983 datum, and the scanned map was aligned to the tic marks. No coordinate tics were present on the 1985 hydrographic survey map; therefore, the overlay was created by aligning four identifiable points along the shoreline.

Four transects parallel to the shoreline were established to evaluate sedimentation patterns in the Skeet Range area (Figure 2). Depth soundings were evaluated in 50-foot increments for all transects. For each of the transect locations, the hydrographic survey depth measurements were evaluated (1985, 1989, 2002, and 2005) as shown on Figures 10 to 13, respectively. Detailed information for each transect is provided below:

Transect	Distance from Shoreline (feet)	Years Evaluated	Comments
TI	50	1985, 2002, 2005	Between grid locations 4 to 20, Figure 10 shows the steady state condition of the sediment over a 20 year period. Deposition is occurring east of grid location 20.
T2	200	1989, 2002, 2005	1985 hydrographic survey data was not used due to the irregularity of the grid squares. The 1989 hydrographic survey provides higher quality data during the year the skeet range closed
T3	350	1985, 1989, 2002, 2005	Transect in 100-foot channel
T4	550	1985, 2002, 2005	1989 hydrographic survey data was not available for this location

POTENTIAL FOR BURIAL OF LEAD SHOT

Information on site hydrodynamic characteristics and estimated sediment accumulation rates was used to quantitatively evaluate the potential for sediment burial of lead shot at the Skeet Range. The results of the comparisons of hydrographic surveys conducted in 1985, 1989, 2002, and, 2005 are summarized in the table below. Tabular and graphical data for individual transects are provided on Figures 10 to 13.

Transect	2005 Average Depth to Sediment Below Water Surface (feet)	2002 Average Depth to Sediment Below Water Surface (feet)	1989 Average Depth to Sediment Below Water Surface (feet)	1985 Average Depth to Sediment Below Water Surface (feet)	Sediment Deposition Inches per Year (1989 to 2005)	Average Total Deposition 1989 to 2005 (feet)
T1 (50 feet)	5.4	5.5	NA	6.1	0.4*	0.7*
T2 (200 feet)	14	14.6	17.2	NA	1.9	3.2
T3 (350 feet	15.1	15.7	18	18.6	2.1	2.9
T4 (500 feet)	14.9	15.6	NA	19.1	2.5*	4.2*

Notes:

* For T1 and T4, estimated inches per year and average deposition are from 1985 to 2005

NA Not available

CONCLUSIONS

With the exception of the area of the Skeet Range within 150 feet of the shoreline, the fine-grained, uniform sediment texture and hydrographic data support a low-energy, depositional environment. The estimated net sediment accumulation rate for the Skeet Range between 1985 and 2005, based on site-specific hydrographic surveys, is greater than 1.5 inches per year, with a total deposition of more than 2 feet. Transect data support an estimated 2 feet of sediment accumulation for most of the Skeet Range since operations ceased in 1989. This accretion rate, which is based on site-specific information, also corresponds to the average sediment accumulation rate of 1 to 2 inches per year for Clipper Cove previously identified by the USCOE in 1996 (EPA and others 1996).

A comparison of the hydrographic survey data collected between 1985 and 2005 indicate minimal deposition occurring within 150 feet of the shoreline. Overall, hydrographic survey data show steady state conditions, with the depth to sediment remaining relatively constant over the past 20 years. Possible contributing factors include:

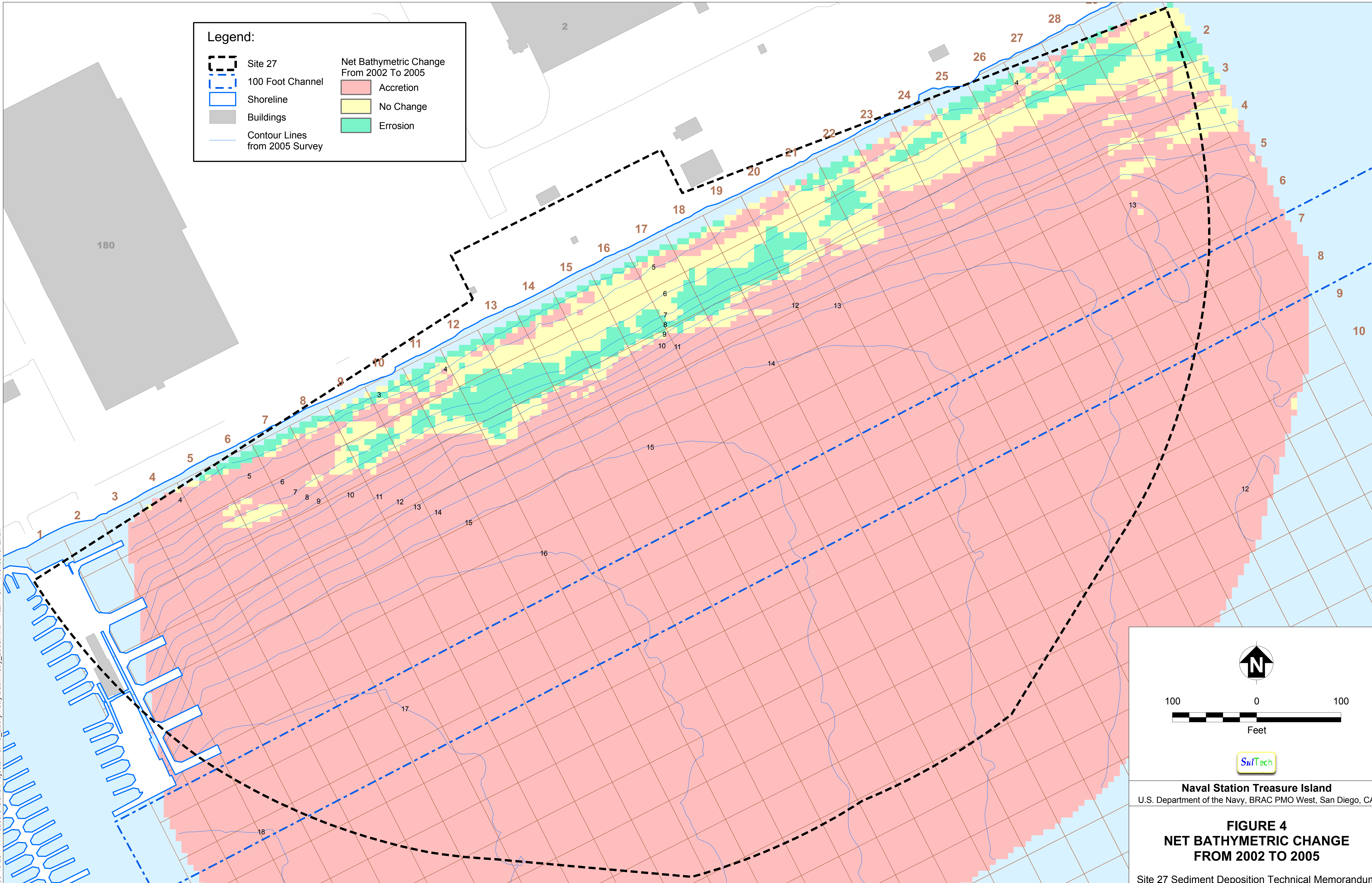
- Slope steepness - Sediment deposition/erosion has reached a steady state condition due to the sudden drop-off of the shoreline (Figure 4 contours).

- Wave and current action – The effects of wave and current action may be a depositional limiting factor due to the shallower water depths (Figures 8 and 9).

RECOMMENDATIONS

A review of the sediment data collected during the 1996 RI for Site 27 show only one sample was collected for lead shot analysis within 150 feet of the shoreline (Figure 14). Due to the limited data and because lead shot was detected in the surface sediment, the Navy proposes conducting an additional investigation within 150 feet of the shoreline to further characterize the sediment for lead shot. The Navy will work with the regulatory agencies to develop the sampling and analysis plan.

Hydrographic data for the rest of the Site 27 Skeet Range, areas beyond 150 of the shoreline, show ongoing sediment deposition supporting that current conditions are protective of the environment. Therefore, no additional lead shot sediment investigation is proposed for the area beyond 150 feet.



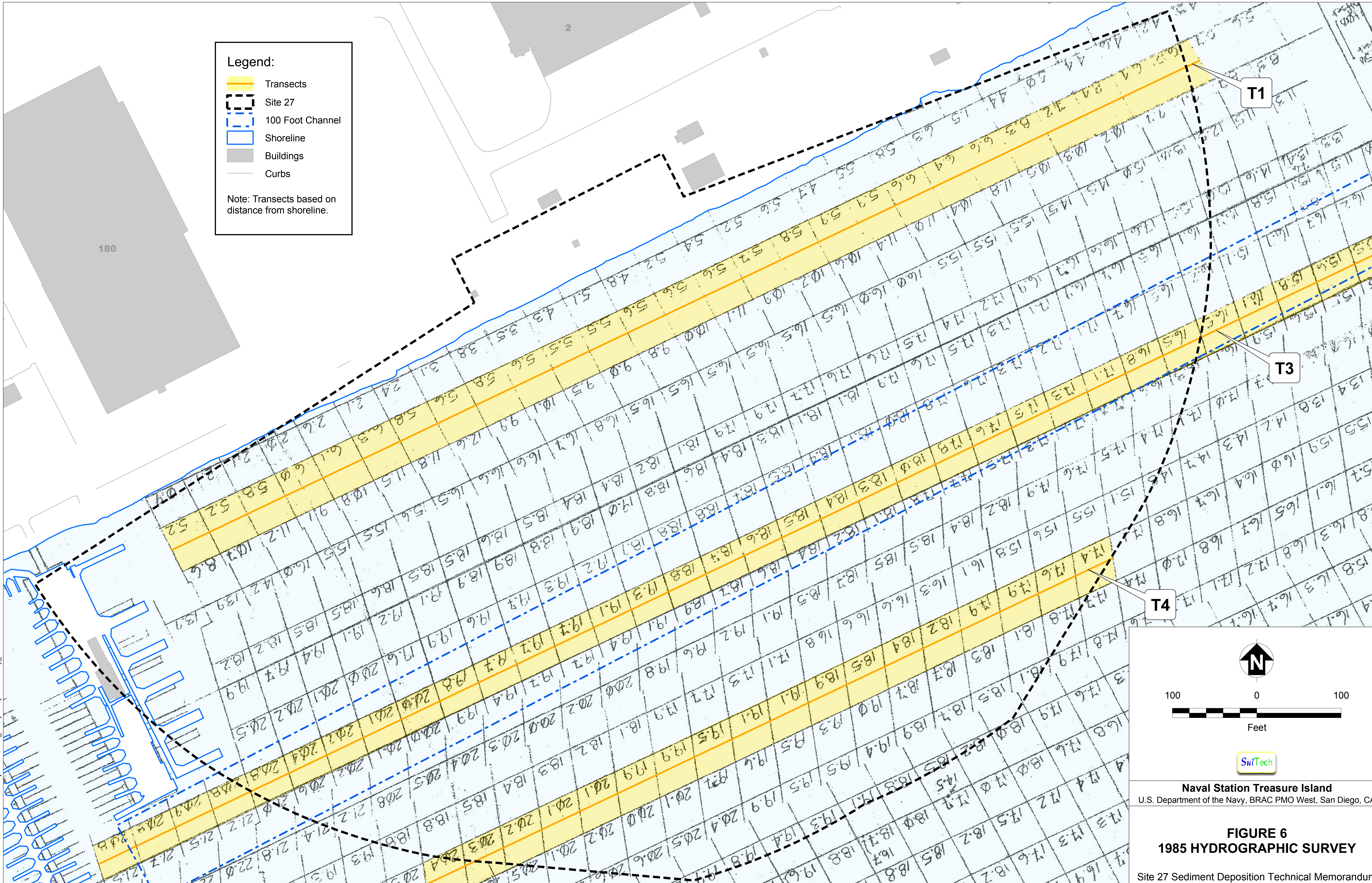
Naval Station Treasure Island

U.S. Department of the Navy, BRAC PMO West, San Diego, CA

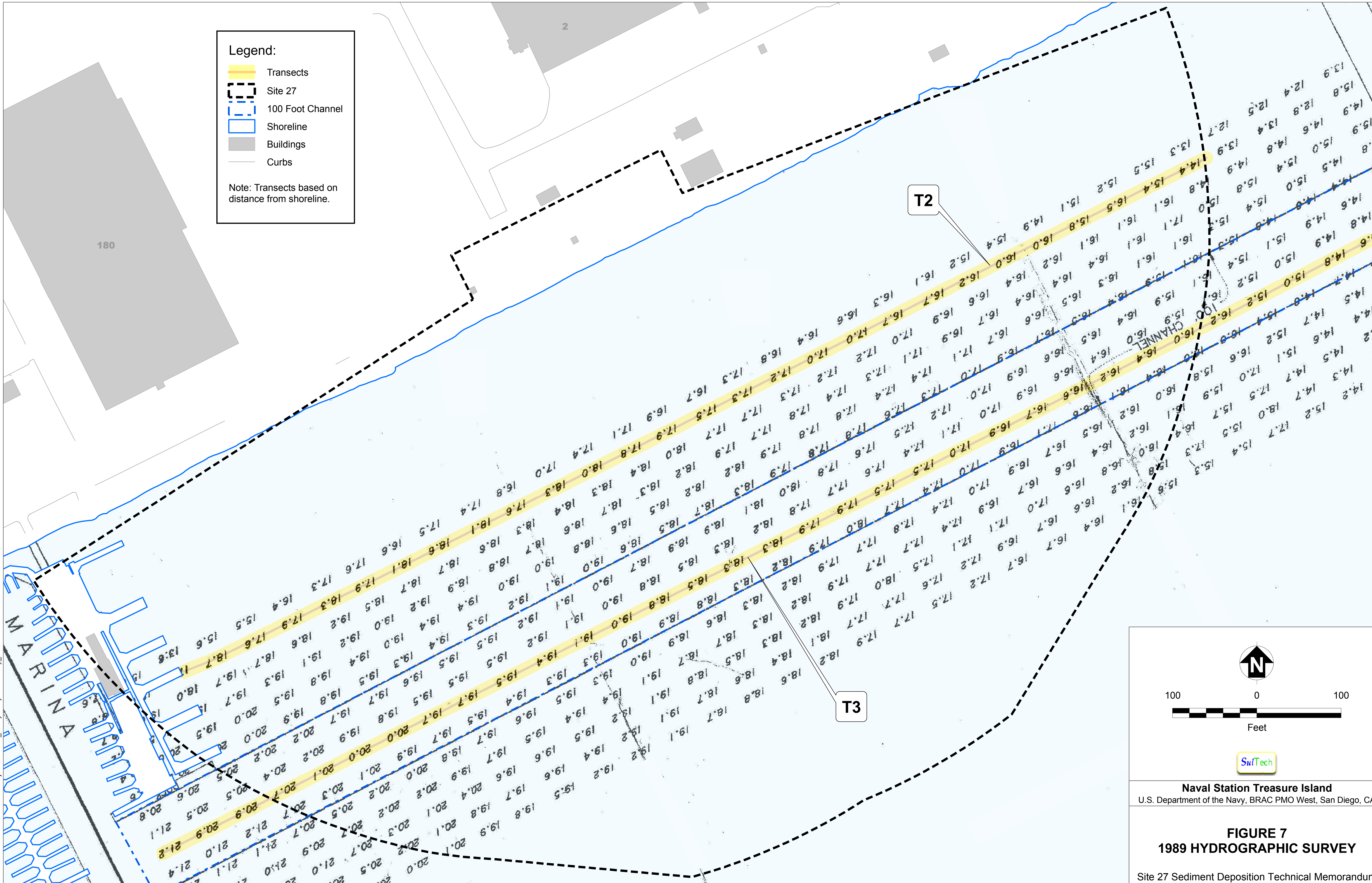
FIGURE 4
NET BATHYMETRIC CHANGE FROM 2002 TO 2005

Site 27 Sediment Deposition Technical Memorandum

2005-10-25 V:\Treasure Island\Projects\Marina_Bathymetry\Bathimetry_2002.mxd TtEMI-SF Aleksandr Zhuk



2005-11-30 V:\Treasure Island\Projects\Marina_Bathymetry\Bathymetry_1985.mxd TtEMI-SF Aleksandr Zhuk



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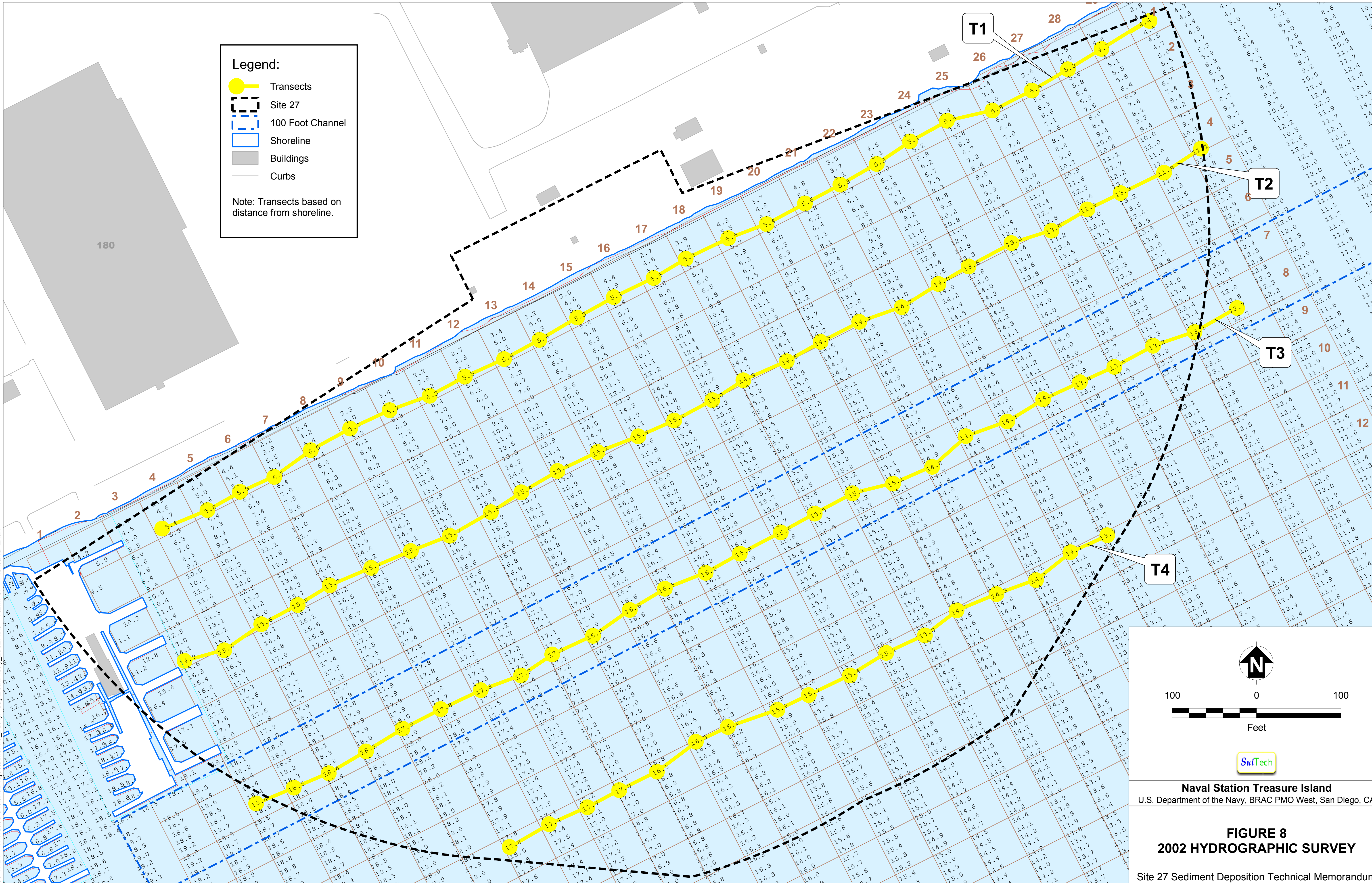
U.S. Department of the Navy, BRAC PMO West, San Diego, CA

FIGURE 7
1989 HYDROGRAPHIC SURVEY

Site 27 Sediment Deposition Technical Memorandum

2005-11-21 V:\Treasure Island\Projects\Marina_Bathymetry\Bathymetry_1989.mxd TtEMI-SF Aleksandr Zhuk



Naval Station Treasure Island
U.S. Department of the Navy, BRAC PMO West, San Diego, CA

FIGURE 8
2002 HYDROGRAPHIC SURVEY

Site 27 Sediment Deposition Technical Memorandum

2005-11-21 V:\Treasure Island\Projects\Marina_Bathymetry\Bathimetry_2002.mxd TtEMI-SF Aleksandr Zhuk

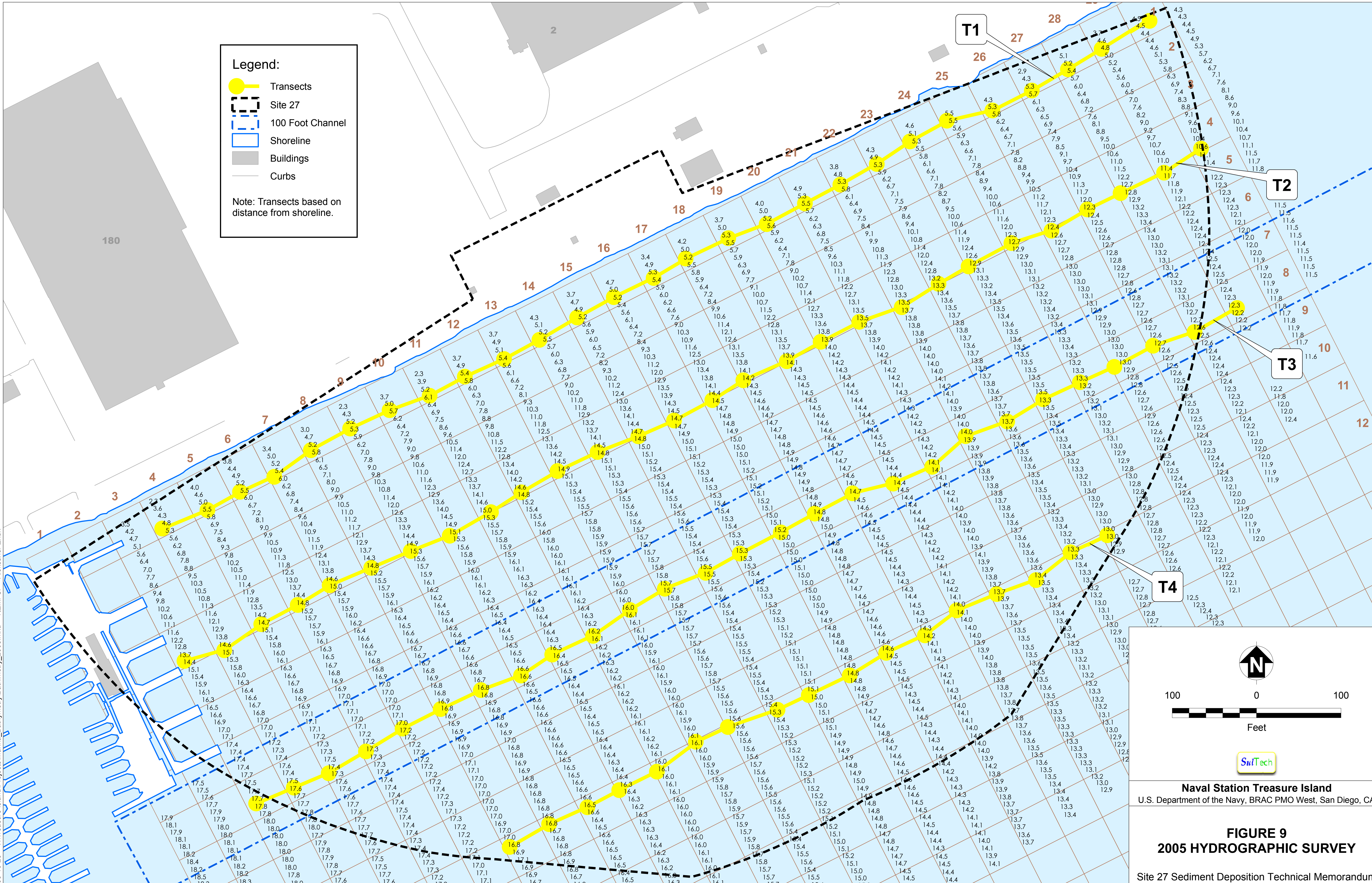


FIGURE 9
2005 HYDROGRAPHIC SURVEY

Site 27 Sediment Deposition Technical Memorandum

2005-10-25 V:\Treasure Island\Projects\Marina_Bathymetry\Bathimetry_2005.mxd TtEMI-SF Aleksandr Zhuk

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[viii]
8	sediment deposition in Clipper Cove	Section 2.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 1.2.4, second through fourth paragraphs. Tetra Tech. August 13, 2010.

records are not clear whether the entrance and marina channel were dredged in 1985. The 1985 permit was mainly for the construction of a new pier (Pier 1) and removal of Piers 14 and 15, which was authorized by the Bay Conservation and Development Commission (BCDC) in consistency determination CN3-84 (Attachment 4). The 1993 permit was the only record found of a planned dredging event for the marina channel at NAVSTA TI.

1.2.4 Sediment Deposition in Clipper Cove

Sediment deposition in the San Francisco Bay is a dynamic process, where sediment inflow, outflow, and redistribution depend on numerous variables such as sediment loading rates, particle sizes, and energy gradients. The most recent hydrographic surveys of Clipper Cove were conducted in 2002 and 2005. A comparison of hydrographic survey data collected between 1985 and 2005 indicates that, with the exception of the area of the skeet range within 150 feet of the shoreline, Site 27 is a low-energy depositional environment (SulTech 2005). However, deposition is minimal in the area of Site 27 nearest to the shore (see Figure 5). Deposition in the nearshore area may be limited by wave action and currents as a result of the shallower water.

Before the 2005 survey, previous reports had described sediment deposition in Clipper Cove. Based on surveys conducted between 1955 and 1990, sediments appeared to be accumulating in all areas of the cove except for a small area in the southwestern corner (Figure 6). Between 1955 and 1990, about 3 to 6 feet of sediment accumulated in the vicinity of Site 27, or about 1 to 2 inches per year (EPA and others 1996). Hydrographic surveys conducted in Clipper Cove between 1966 and 1989 also indicated that sediment deposition is occurring. The marina channel, which extends from Pier 1 to the marina, is located about 300 feet from the eastern shoreline of TI. A hydrographic survey conducted in 1966 indicated depths in the area of the 100 foot channel ranged from -21 to -24 feet MLLW (Navy 1966). A 1977 general development map showed sounding depths from 1970 of -16 to -21 MLLW in the channel area (Earthdata 1977), and a 1989 hydrographic survey indicated depths of –9 feet MLLW to –12 feet MLLW in the channel (Towill 1989). Assuming that the channel was not dredged during this period, these maps suggest a sediment deposition rate of about 3 to 9 feet every 10 years. The total deposition between 1989 and 2005 ranged from 0.7 foot at a distance of 50 feet from the shoreline to 4.2 feet at a distance of 500 feet from the shoreline (SulTech 2005), which corresponds to an average deposition of 0.4 to 2.5 inches per year.

Based on the available hydrographic data, the sediment deposition rate during operation of the skeet range from 1979 to 1989 was approximately 0.17 to 0.21 foot per year of operation, for a total of 1.7 to 2.1 feet. The total amount of sediment deposited between 1979 and 2005 is expected to be about 2.4 to 6.3 feet.

Lead shot is not expected to occur in any location at a depth greater than 9.4 feet from the sediment surface as of 2009 based on the maximum deposition between 1979 and 2005 of 8.4 feet and the maximum estimated rate of 2.5 inches per year since 2005. This maximum depth assumed for lead shot to be present is conservative because it is based on the maximum deposition rates. Closer to the shore, where sediment both accretes and erodes, the lead shot is found within the top 2 feet of sediment and is not expected to be found at or below the 7-foot depth because of the lower rate of sediment deposition over time; based on the dynamic nature of the nearshore area, the layer of sediment contaminated by lead shot is expected to be thinner because less sediment would accrete than in the rest of Clipper Cove.

1.3 PREVIOUS INVESTIGATIONS AND RISK CHARACTERIZATION

In 1993, the Water Board issued Order No. 93-130, requiring the Navy to investigate and manage contamination attributable to the skeet range in the Clipper Cove area of NAVSTA TI (Water Board 1993). The order set forth specific compliance requirements and tasks. The Navy has complied with the substantive requirements of the order through the CERCLA process, which included sediment and biological characterization as part of the RI and additional characterization of lead shot in nearshore sediments as part of this FS. Attachment 1 presents the requirements of Water Board Order 93-130 and the CERCLA documents that fulfill them. Once a remedial action plan is implemented, the Navy will have met all provisions of the order.

The following sections summarize the sampling investigations conducted at Site 27. Complete investigation results for sediments at Site 27 are provided in the RI for the Offshore Sediments OU (Tetra Tech 2001) and in Appendix A of this FS. The Phase I and Phase II RIs were not specific to Site 27; however, samples collected in Clipper Cove were used to help further delineate the nature and extent of lead and polycyclic aromatic hydrocarbons (PAH) at Site 27 (Tetra Tech 2001). Chemicals associated with the skeet range (lead shot, lead in sediment, and PAHs) were targeted as potential chemicals of concern at Site 27. A separate offshore sediment investigation was conducted within the boundary of Site 27 in 1996. Data for onshore soil were collected under the Phase IIB RI (Tetra Tech 1997), the Causeway Pipeline investigation (IT Corp. 2003), and the Building 454 EBS data gaps investigation (Shaw 2004). Previous investigations conducted at Site 27 and the results are summarized in Attachment 5.

1.3.1 Site 27 Offshore Investigations

The offshore portion of Site 27 was evaluated in past investigations of the offshore area of Treasure Island as well as under investigations specific to IR Site 27. The results of those investigations are summarized in the following sections. Phase I and Phase II investigations were not limited to Site 27; however, samples were evaluated to help characterize lead and PAHs related to the area associated with the former skeet range activities at Site 27 because the samples were collected in Clipper Cove. The results of the Phase I and Phase II RIs are summarized below and are detailed in the RI for the Offshore Sediments OU (Tetra Tech 2001). The 2008 field investigation of lead shot in the nearshore area is also summarized below and is presented in greater detail in Appendix A. Sample locations from 2008 and previous investigations in Clipper Cove are shown on Figure 7.

1.3.1.1 Sediment Screening Values

Analytical results for sediment samples collected at Site 27 were compared with ambient chemical concentrations in San Francisco Bay sediments. Ambient values developed by the Water Board were used for these comparisons (Water Board 1998). In addition, the sediment

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[2]
9	ecology	Section 2.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Sections 3.0 through 3.4, Tables 3-1 through 3-5, and Figures 3-1 and 3-2. Tetra Tech. December 28, 2001.

3.0 ECOLOGICAL CHARACTERIZATION

This chapter characterizes the ecology of offshore NAVSTA TI, beginning with an overview of sources of information and methods of characterization. The characterization includes a description of each habitat, examples of the plant and animal species observed or expected in each habitat, special-status species, and a food web for the offshore habitat.

3.1 OVERVIEW OF CHARACTERIZATION SOURCES AND METHODS

This characterization of the ecology of offshore NAVSTA TI is based on natural history literature and surveys of the San Francisco Bay area. No formal surveys of either the flora or fauna of NAVSTA TI were conducted for this report, but surveys conducted previously by the Navy and the Audubon Society were utilized. Natural history information for species that potentially occur at NAVSTA TI was compiled from published literature (See Tables 3-1 through 3-5).

3.2 HABITAT DESCRIPTIONS

This section describes the predominant habitat types of offshore NAVSTA TI and identifies some of the plants and animals that commonly occur in these habitats.

3.2.1 Habitat Types

NAVSTA TI is an island in San Francisco Bay, which is the largest estuary on the Pacific coast of the United States. Figure 3-1 shows the habitats along the shoreline of TI and YBI. The predominant marine habitat surrounding NAVSTA TI is subtidal with hard-bottom and soft-bottom mud substrate. Figure 3-2 shows the water depths offshore of NAVSTA TI. A limited intertidal habitat composed of riprap, docks, and pier pilings is present along the entire perimeter of TI. A sandy beach/mudflat intertidal shoreline is present at the base of Clipper Cove and a portion of the southeastern and southwestern shores of YBI. Intertidal mudflats are inundated and exposed twice a day by tidal action and occur in a zone between 2.5 feet below the mean lower low water and mean tide level in central San Francisco Bay (SFEP 1992). Most of the YBI shoreline on the south and west portions of the island is composed of rocky intertidal habitat. There are no freshwater or wetland habitats on NAVSTA TI (WESTDIV 1990).

3.2.2 Typical Species of Central San Francisco Bay

Central San Francisco Bay is host to a wide variety of marine associated species. The following sections describe the typical species that occur in the Central Bay.

Phytoplankton

Phytoplankton are small algae that are typically suspended in the water column and form the foundation of many food webs. As primary producers, phytoplankton take up basic nutrients and convert energy from sunlight into food. Phytoplankton have very limited powers of locomotion and are generally distributed by water currents.

Planktonic diatoms are the dominant phytoplankton that occur in central San Francisco Bay. The most abundant diatoms during spring blooms include *Cyclotella* spp., *Thalassiosira* spp., and *Skeletonema costatum*. During other times of the year, dinoflagellates may be the dominant plankton, including *Chroomanas, Cryptomonas*, and *Pyramimonas* (U.S. Fish and Wildlife Service [FWS] 1992a). These phytoplankton species provide an important food source for many organisms, including fish in the early life stages.

In recent years, the biomass of phytoplankton in central San Francisco Bay has declined substantially due, in part, to the accidental introduction of the filter-feeding Asian clam (*Potamocorbula amurensis*) in the mid-1980s (FWS 1992a). Before this clam was introduced, much of the annual phytoplankton growth in the Central Bay occurred during blooms in the spring and summer. Since 1986, the frequency and intensity of plankton blooms have greatly declined (FWS 1992a). For more information on the Asian clam, see the discussion on benthic invertebrates below.

Algae and Plants

The dominant benthic primary producers in rocky intertidal and intertidal mudflat habitats are algae (FWS 1992a). The dominant algae species in these habitat types include sea lettuce (*Ulva fenestrata*), gigartina (*Gigartina* spp.), green algae (*Enteromorpha intestinalis)*, red algae (*Ralfsia* spp. and *Gracilaria sjoestedtii*), and diatoms. Eel grass (*Zostera marina*) is a plant species found in shallow waters. A list of potential plant and algae species occurring offshore of NAVSTA TI is presented in Table 3-1.

Zooplankton

Zooplankton are very small animals that typically occur in the water column. Zooplankton feed on phytoplankton and detritus and in turn are eaten by fish and other invertebrates. The three predominant groups of zooplankton in the Central Bay include rotifers (*Synchaeta* spp.), copepods (*Acartia* spp. and *Oithona davisae*), and shrimp. Ghost shrimp larvae (*Callianassa californiensis*) are also common in the Central Bay; oceanic species of krill including *Nematoscelis difficilis*, *Thysanoessa gregaria*, and *Nyctiphanes simplex* have been found in the Central Bay when outflow is high (FWS 1992a).

Benthic Invertebrates

Species diversity in the soft-bottom invertebrate community of the Central Bay is high (Nichols and Pamatmat 1988). Typical benthic invertebrate species of central San Francisco Bay include (1) amphipods such as *Ampelisca abdita*, which have been found in densities of 10,000 to 50,000 individuals per square meter (Nichols and Pamatmat 1988); (2) mollusks such as the bay mussel (*Mytilus edulis*), California mactra (*Mactra californica*), and common littleneck (*Protothaca staminea*); (3) polychaetes such as *Capitella capitata*; and (4) crustaceans such as copepods, and several species of crab and bay shrimp. The most abundant crab species known to occur near NAVSTA TI include the graceful rock crab (*Cancer gracilis*), Dungeness crab (*C. magister*), and red rock crab (*Cancer productus*) (Hieb 1998). The most abundant shrimp species include the California bay shrimp (*Crangon franciscorum*), black-spotted bay shrimp (*Crangon nigrimaculata*), black-tailed bay shrimp (*C. nigricauda*), and Stimpson coastal shrimp (*Hetacarpus stimpsoni*) (Hieb 1998). Other native benthic invertebrates of central San Francisco Bay include the polychaete *Glycinde picta* and bivalves such as *Macoma nasuta* (Hopkins 1986). A complete list of invertebrate species that occur and potentially occur at NAVSTA TI is presented in Table 3-2.

Dozens of introduced, or exotic, invertebrate species have altered the native invertebrate communities of the San Francisco Bay Estuary. In recent years, the introduction of the Asian clam has resulted in substantial declines in the abundance of phytoplankton, some zooplankters, and other native invertebrates in San Francisco Bay.

The Asian clam is believed to have been introduced into San Francisco Bay through the release of seawater ballast in the mid-1980s. It is a suspension feeder on phytoplankton and zooplankton

(Peterson 1996) and in recent years has become one of the most abundant benthic invertebrates in the bay (Hymanson and others 1994). Since the appearance of the Asian clam, seasonal phytoplankton blooms have become scarce, and chlorophyll *a* and copepod densities have been documented at record low levels in parts of the bay. Although this introduced clam competes with native phytoplanton and zooplankton species in the bay, it also provides a new food source for bottom feeding birds, fish, and crabs (Carlton and others 1990; Hymanson and others 1994).

Other introduced benthic invertebrates include crustaceans such as *Corophium* spp. and *Palaemon macrodactylus*, polychaetes such as *Capitella capitata*, *Eteone* spp., *Heteromastus filiformis*, and *Streblospio benedict*, and bivalves such as *Musculus senhousia* and *Macoma baltica* (Hopkins 1986).

Fish

Central San Francisco Bay provides habitat for a large number of native and introduced fish species (see Table 3-3 for a list of species observed or potentially present offshore of NAVSTA TI). These species include anadromous and marine fishes. In recent years, the abundance of many native species and some introduced species has declined for a variety of reasons including water diversions, reduced freshwater inflow, habitat loss, pollution, overfishing, reduced prey abundance, and competition from dozens of introduced species.

In general, the fish community of central San Francisco Bay includes benthic (bottom-dwelling) fish and pelagic species (those species that generally inhabit the middle and upper portions of the water column). Fish trawl data collected by the California Department of Fish and Game's (CDFG) Interagency Ecological Program for the San Francisco Estuary from two offshore locations (located 0.5 miles north and south of YBI) and from one beach seine station in Clipper Cove were used to characterize the fish assemblages occurring offshore of NAVSTA TI (Hieb 1998).

Several benthic fish species occur in central San Francisco Bay. These bottom-dwelling fish tend to be in continuous contact with the sediment and feed on the benthos. Typical native benthic fish species of Central Bay include the leopard shark (*Triakis semifasciata*), big skate (*Raja binoculata*), bat ray (*Myliobatis californica*), spotted cusk-eel (*Chilara taylori*), California lizardfish (*Synodus lucioceps*), plainfin midshipman (*Porichthys notatus*), jacksmelt (*Athernopsis californiensis*), California halibut (*Paralicthys californicus*), speckled sanddab (*Citharichthys stigmaeus*), Pacific staghorn sculpin (*Leptocottus armatus*), and pygmy poacher (*Odontopyxis trispinosa*). Nonnative benthic fish in the Central Bay include the inland silverside (*Menidia beryllina*), yellowfin goby (*Acanthogobius flavimanus*), chameleon goby (*Tridentiger trigonocephalus*), and arrow goby (*Clevelabdia ios*).

Typical native pelagic fish species that occur in the Central Bay include Pacific lamprey (*Lampetra tridentata tridentata*), river lamprey (*L. ayresi*), American shad (*Alosa sapidissima*), Pacific herring (*Clupea harengus pallasi*), northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), shiner surfperch (*Cymastogaster aggregata*), bay pipefish (*Syngnathus leptorhynchus*), longfin smelt (*Spirinchus thaleichthys*), rockfish (*Sebastes* spp.), and white croaker (*Genyonemus lineatus*). Nonnative pelagic fish that occur in the Central Bay include threadfin shad (*Dorosoma petenense*) and striped bass (*Morone saxatilis*).

Some of these species are resident fish that remain in the bay throughout all or most of their life cycle; others use the bay as a migration corridor. Migratory species include chinook salmon (*Oncorhynchus tshawytscha*), Pacific lamprey, river lamprey, longfin smelt, threadfin shad, American shad (*Alosa sapidissima*), and striped bass. In general, most anadromous species migrate relatively rapidly through the bay, and do not feed extensively during migration. Section 3.3.2 provides additional information on chinook salmon, river lamprey, and longfin smelt, which are special-status species. The most abundant fish species near NAVSTA TI include northern anchovy, shiner surfperch, Pacific herring, and white croaker (Hieb 1998).

Birds

Central San Francisco Bay provides open water habitat for diving and dabbling waterfowl and shallow-water habitat for shorebirds. Two informal bird surveys were conducted on NAVSTA TI on June 15, 1994 and June 22, 1994 by representatives from the Navy, EPA, RWQCB, and DTSC. A complete list of birds potentially occurring offshore NAVSTA TI is included in Table 3-4.

Birds that commonly occur in open water habitats in central San Francisco Bay include loons, grebes, the California brown pelican *(Pelecanus occidentalis californicus*), mallard (*Anas platyrhynchos*), cormorants, diving ducks such as the canvasback (*Aythya valisineria*), bufflehead (*Bucephala* *clangula*), and scaups, surf scoter (*Melanitta perspicillata*), American coot (*Fulica americana*), gulls, and terns (FWS 1992b).

Most of these species also use the shoreline areas of YBI. Shorebirds that feed on invertebrates found in rocky shore habitat in central San Francisco Bay include the ruddy turnstone (*Arenaria interpres*), black turnstone (*A. melanocephala*), surfbird (*Aphriza virgata*), willet (*Catoptrophorus semipalmatus*), black-bellied plover (*Pluvialis squatarola*), wandering tattler (*Heteroscelus incanum*), and black oystercatcher (*Haematopus bachmani*).

Top avian predators that hunt in the Central Bay habitat include the California brown pelican, red-tailed hawk (*Buteo jamaicensis*), and peregrine falcon (*Falco peregrinus*).

Mammals

The harbor seal (*Phoca vitulina*) and the California sea lion (*Zalophus californianus*) are the only mammals known to use the open water habitat offshore of NAVSTA TI (see Table 3-5). The total population of harbor seals in San Francisco Bay, estimated at 700 individuals, has not changed significantly since the 1970s (FWS 1992a). In winter of 1989-90, YBI supported an estimated population of 195 seals when herring schools were present. YBI is considered one of five primary haul-out sites used in the bay; hauling out is important in the seals' thermal regulation process and for nursing young pups in the breeding season. The main haul-out area is located on the southwestern and western shoreline of YBI on U.S. Coast Guard property. Between 1989 and 1992, an average of 76 harbor seals used the YBI haul-out site; peak harbor seal numbers were observed during winter (Kopec and Harvey 1995). According to Harvey and Torok (1994), YBI is also one of the main feeding areas for harbor seals in San Francisco Bay. Harbor seals feed mostly on plainfin midshipman and yellowfin goby (Harvey and Torok 1994).

Populations of California sea lions have increased since the early 1970s; approximately 400 to 500 sea lions enter north and central San Francisco Bay to feed during anchovy and herring runs (FWS 1992a). It is not known whether sea lions haul out at YBI shoreline areas.

3.3 SPECIAL-STATUS SPECIES

Species that are threatened or endangered according to state and federal laws and guidelines, including California species of special concern, are discussed in this section. Several species of federal or state special conservation status, including listed and candidate species, occur or potentially occur offshore at NAVSTA TI. A site walk to assess threatened and endangered species was conducted on both TI and YBI on June 15 and 22, 1994 by representatives from the Navy, EPA, RWQCB, and DTSC.

3.3.1 Special-Status Plants and Invertebrates

No threatened or endangered plants or invertebrates are known or suspected to occur offshore at NAVSTA TI.

3.3.2 Special-Status Fish

Three special-status fish species are known to occur in the offshore area of NAVSTA TI, including one federally protected species (chinook salmon), one state-protected species (longfin smelt), and one state species of special concern (river lamprey). The delta smelt (*Hypomesus transpacificus*), a state- and federally protected species, does not typically occur in the Central Bay but could be an infrequent visitor in periods of high outflow. Likewise, the green sturgeon (*Acipenser medirostris*), a species of special concern, may visit NAVSTA TI but has not been recorded in the area. These special-status fish that are known to or may occur offshore at NAVSTA TI are discussed below.

Chinook Salmon. Chinook salmon (*Oncorhynchus tshawytscha*) have been taken in fish trawls 0.5 miles north and south of NAVSTA TI and in the Clipper Cove beach seine station catch (Hieb 1998). Four races of chinook salmon that occur in the Sacramento-San Joaquin River drainage are distinguished by the timing of their upstream adult migration through the estuary: winter, spring, fall, and late-fall runs. The winter run chinook salmon is both a state and federal endangered species. The fall and late-fall runs are federally proposed as threatened, and the spring run chinook salmon are classified as a 'state candidate endangered' and 'federally proposed endangered' species. Chinook salmon use the Central Bay primarily as a migration corridor during upstream adult migration and downstream juvenile migration. Abundances of all four races have been declining in recent years. Winter-run salmon comprise less than 5 percent of the adult chinook salmon returning to the Sacramento-San Joaquin Basin.

Adult winter-run salmon migrate from the ocean upstream through the Central Bay between November and May. During both upstream and downstream migration, winter-run salmon are believed to migrate rapidly through the delta and San Francisco Bay (Hallock and Fisher 1985; CDFG 1987; Brown and Greene 1992). Due to differences in the timing of the adult upstream migrations and in juvenile rearing habits of the various runs, at least one run of chinook is probably passing through the Central Bay during all months of the year.

The juveniles migrate from upstream natal areas to downstream reaches after rearing in fresh water for a short period of time. During downstream migration, juveniles feed on zooplankton (Moyle and others 1995). Juveniles undergo moltification, the physiological process that allows young salmon to make the transition from fresh water to salt water, just prior to entering saline waters.

Chinook salmon were present in fish trawls near NAVSTA TI as recently as 1995 (Hieb 1998). Chinook numbers in trawl catches ranged from six fish in 1981 to zero fish in 1996. In eight Clipper Cove beach seine samples collected from 1980 to 1987, chinook salmon were present in numbers ranging from zero to eight fish in 1982 (Hieb 1998). These data indicate that chinook salmon occur offshore NAVSTA TI but are not abundant.

Longfin Smelt. Longfin smelt (*Sprinichus thaleichthys*) is a federal species of special concern and a California endangered species. It is an anadromous carnivore that occurs mainly in fresh water, although it has been found at salinities ranging from fresh water to full sea water. Adults and juveniles typically occupy the middle or bottom of the water column and larval smelt occupy the upper part of the water column. There is a strong positive correlation between winter and spring delta outflow and longfin smelt abundance the following year. In low outflow years, longfin smelt populations are concentrated in Suisun Bay and the delta; adults have been known to occur seasonally as far downstream as the South Bay in higher flow years. Longfin smelt eat mainly opossum shrimp (*Neomysis mercedis*), copepods, and other crustaceans. They are a major food source for harbor seals, predatory fishes, birds, and other marine mammals (Moyle and others 1995).

Longfin smelt were once one of the most abundant fish in the San Francisco Bay Delta, but populations have plummeted since the early 1980s, reaching the lowest levels during drought years. The causes for the population decline include reduction in outflows, entrainment losses to water diversions, climatic variation, toxic substances, predation, and introduced species (Moyle and others 1995).

Longfin smelt were present in every fish trawl collected 0.5 miles north and south of YBI (from 1980 to 1996), at numbers ranging from one fish in 1991 to 742 fish in 1995 (Hieb 1998). In eight Clipper Cove beach seine samples collected from 1980 to 1987, longfin smelt were detected only in 1982 (16 fish were collected) (Hieb 1998). These data indicate that longfin smelt are abundant offshore fr om NAVSTA TI, but not in Clipper Cove.

River Lamprey. The river lamprey (*Lampetra ayresi*) is a California species of special concern (CSC) that was not present in any fish trawls collected near NAVSTA TI, but it is known to occur in the Central Bay (Moyle and others 1995). Trends in river lamprey populations are unknown in California, but populations have most likely declined due to alteration of rivers and tributaries in the San Francisco Bay-Delta (Moyle and others 1995). River lampreys are anadromou s; they are coastal residents for 3 or 4 months before spawning, in fresh water, and spend the rest of their lifetime in small tributary streams. They are carnivores that feed in either fresh or salt water, mainly on herring and salmon, by attaching to the back of the host fish and feeding on muscle tissue. Little is known about the biology of river lampreys in California (Moyle and others 1995).

River lampreys were present in two of 17 fish trawls collected 0.5 miles north of YBI (one in 1984 and one in 1991) and two of 17 fish trawls collected 0.5 miles south of YBI (one in 1985 and one in 1990) (Hieb 1998). They were not present in eight Clipper Cove beach seine samples collected from 1980 to 1987. River lampreys are considered infrequent visitors to the offshore NAVSTA TI area.

Delta Smelt. The delta smelt is a small, pelagic, plankton-feeding resident of the San Francisco estuary. Currently, the delta smelt is classified at the federal and state levels as threatened. Delta smelt do not usually occur in the Central Bay because they generally inhabit a salinity range of less than 2 ppt (Moyle and others 1992). However, during periods of high delta outflow, transient populations of delta smelt may occur in the Central Bay. CDFG fish trawls near NA VSTA TI have no records of delta smelt occurring in this region (Hieb 1998). Juvenile and adult delta smelt commonly occur in the surface and shoal waters of the Sacramento River below Isleton, the San Joaquin River below Mossdale, throughout the delta, and in Suisun Bay (Moyle 1976; Moyle and others 1992). Delta smelt generally have a 1-year life span and typically die after spawning (Moyle 1976).

Delta smelt spawn in fresh or slightly brackish water upstream of the freshwater and saltwater mixing zone (Wang 1991). In years of moderate to high delta outflow, spawning typically occurs from sloughs of Suisun Marsh upstream to the Sacramento and San Joaquin rivers (Wang 1991). In years of low delta outflow, spawning occurs upstream in various portions of the delta and Sacramento River.

Recent declines in the delta smelt population have been attributed to a general movement of the entrapment zone from the relatively productive waters of Suisun Bay to the less productive waters of the western delta as a result of reduced freshwater outflow and increased water diversions (Moyle and others 1995). However, according to Mattern and others (1994), this species has become somewhat more abundant since the mid-1980s when it was nearly absent from surveys.

Green Sturgeon. The green sturgeon (*Acipenser medirostris*) is both a California and federal species of special concern. It was not present in trawl catches taken near NAVSTA TI but is an anadromous fish that could occur offshore at NAVSTA TI as a coastal migrant. Adults spawn in the Sacramento River from March to July and juveniles migrate out to sea before 2 years of age during the summer and fall. Green sturgeon are benthic feeders that take mainly opossum shrimp and amphipods (*Corophium* spp.), although they are known to feed occasionally on anchovies and clams. Populations of green sturgeon are believed to be reduced, but the reduction has not been well documented. The expected decline in populations is mainly attributed to fisheries, modification of spawning habitat, entrainment, and toxic substances (Moyle and others 1995).

Green sturgeon did not appear in any fish trawls collected near NAVSTA TI or in the beach seine station in Clipper Cove (Hieb 1998). According to NOAA, green sturgeon are known to occur in Central San Francisco Bay (NOAA 1991a).

3.3.3 Special-Status Birds

Three species of birds classified as rare and endangered by both the state and federal governments have been reported to intermittently forage or roost at NAVSTA TI (WESTDIV 1990): the peregrine falcon (*Falco peregrinus*), California least tern (*Sterna antillarum*), and California brown pelican. A number of CSC birds potentially occur offshore at NAVSTA TI and YBI, including the common loon

(*Gavia immer*), American white pelican (*Pelecanus erythrorhynchos*), double-crested cormorant (*Phalacrocorax auritus*), Barrow's goldeneye (*Bucephala islandica*), osprey (*Pandion haliaetus*), western snowy plover (*Charadrius alexandrinus nivosus*), long-billed curlew (*Numenius americanus*), and California gull (*Larus argentatus*). Of these birds, the presence of the double-crested cormorant, the common loon, and the California gull has been confirmed at NAVSTA TI during the past 10 years (CDFG 1997; Audubon Society 1996; Bailey 1992).

Peregrine Falcon. The peregrine falcon was fairly common in California before 1947, with at least 100 nesting pairs counted (FWS 1992b). Increased application of organochlorine pesticides is considered largely responsible for reproductive failures in the peregrine falcon populat ion. In 1970, the peregrine falcon was placed on the federal endangered species list, when fewer than five pairs were believed to nest in California. Since the 1970s, peregrine falcon populations in North America have recovered to the point that the USFWS has removed the species from the federal endangered species list (CFR 1999). However, the peregrine falcon is still considered a state endangered species by the CDFG.

Today, an estimated 10 to 20 peregrine falcons range over the San Francisco Bay area and delta region. Two peregrine falcon nests are known to exist on the Oakland Bay Bridge: one on the support structure east of YBI and one on the central support structure of the bridge between YBI and San Francisco (Bell and others 1996).

The year-round territory of the Bay Bridge-East peregrines encompasses an area of about 39 km2 (square kilometers) and includes a small group of skyscrapers in downtown Oakland and several buildings at the Emeryville Crescent (Bell and others 1996). The territory of the Bay Bridge-West peregrines extends from an eastern boundary at YBI west to buildings at Van Ness Avenue and Fell Street in San Francisco, and from Nob Hill in the north of San Francisco south to the Islais Creek Channel, an area of about 32 km2 (Bell and others 1996).

From July through October, the Bay Bridge-East Bay peregrines tend to occupy the downtown Oakland area and from November through January, the Emeryville Crescent, where they prey on wintering shorebirds along the nearby mudflats. The West Bay peregrines move to the tall skyscrapers of the Financial District in San Francisco from August through December. During the breeding season (mid-January through July), both the East and West Bay peregrines center their activities at the bridge and spend considerable time perching, eating, and roosting, with hunting forays launched from the bridge (Bell and others 1996).

The peregrine falcon feeds opportunistically on birds of small to medium size, including pigeons, doves, blackbirds, starlings, sparrows, and shorebirds, often by swooping down on prey in flight (Bell and others 1996, Ehrlich and others 1988). Prey species are taken mainly according to their availability, and the bulk of the food of any particular breeding pair is drawn from common bird species in the immediate vicinity. The spectrum of prey thus tends to reflect the composition of the local bird population at the time and varies according to habitat, geographical location, and season.

Prey items of the Bay Bridge peregrines, based on either collected prey remains or observed hunting episodes, are listed in Bell and others 1996. Of the species listed, those most likely to occur in the peregrine diet are the rock dove (*Columba livia*) and mourning dove (*Zenaida macroura*). According to Walton (SCPBRG 1997), 95 percent of the contamination reaching peregrine falcons that nest on the Bay Bridge is likely to come from prey that did not originate from NAVSTA TI. This is because "local prey items become 'habituated' to peregrine presence and may be less 'available' than nonresident breeders or birds farther from the nests of the falcons" (SCPBRG 1997). Other factors include the large home range of the peregrines, and the fact that they often eat migratory waterfowl and shorebirds that may not visit or spend significant amounts of time at NAVSTA TI, especially in the nonbreeding season.

California Least Tern. In the last 40 years, the California least tern has been reduced from an estimated several thousand birds to slightly more than 1,000 nesting pairs in California (FWS 1992b). This decline has been caused by coastal development, introduced predators, and human disturbance. In 1970, the least tern was placed on the federal and state endangered species lists.

The California least tern is found in the Central Bay region at the former Alameda Naval Air Station, where major nesting efforts occur; 128 pairs were reported nesting at Alameda Naval Air Station in 1993. A smaller population nests at the Oakland International Airport. The least tern feeds on small fish in nearshore environments, including marshes, estuaries, bays, and along the surf line. Least terns have occasionally been observed in nearshore waters surrounding TI and YBI. They are colonial nesters in scrapes on open sandy beaches or gravel bars (Peterson 1990). No least tern nesting colonies have been recorded on YBI (WESTDIV 1990). The tern's foraging range can be up to 3 miles from their nesting site, so it is possible that terns nesting at the former Alameda Naval Air Station forage offshore NAVSTA TI (Collins 1998).

California Brown Pelican. The California brown pelican is a common post breeding resident (May through November) of the open waters of the Central Bay and San Pablo Bay (FWS 1992b). Because of a major population decline beginning in the 1950s that was related to pesticide-induced eggshell thinning, oil spills, human disturbance, and fishing gear entanglement, the species was included on the federal endangered species list in 1970.

During recent seabird surveys, as many as 130 birds have been observed at disturbance-free roost sites such as breakwaters and pilings in the Central Bay and San Pablo Bay, including Hunters Point, Alameda, Angel Island, East Sister Island, West Brother Island, and the Brooks Island and Mare Island breakwaters (FWS 1992a). Year-to-year variations in counts may be related to the timing and success of nesting in Gulf of California colonies and to the availability of their main prey, the northern anchovy. The California brown pelican has not been observed foraging extensively in nearshore areas at NAVSTA TI.

Double-crested Cormorant. Cormorants have no federal or state threatened or endangered species status; however, they are considered a species of special concern by CDFG. Cormorants nest on cliffs on sequestered islets and artificial structures such as the San Francisco-Oakland Bay bridge. The San Francisco-Oakland Bay Bridge hosts the second largest colony of cormorants on the northern and central California coast; 465 breeding pairs of cormorants nested on the Bay Bridge in 1990 (FWS 1992b). The Bay Bridge nesting site is located near the southeastern portion of YBI, near the Coast Guard Reservation property. Little is known about this nesting site (CDFG 1997).

3.3.4 Special-Status Mammals

No threatened or endangered mammals are known to occur offshore NAVSTA TI. However, all marine mammals are protected under the Marine Mammal Protection Act of 1972.

3.4 OFFSHORE HABITAT FOOD WEB

The offshore habitats of NAVSTA TI support a well-developed food web. Nutrient-releasing decaying organic matter and primary producers, such as phytoplankton and benthic algae, form the foundation of the aquatic food web. Primary consumers, such as zooplankton, crustaceans (amphipods, isopods, and decapods), annelids (polychaetes and oligochaetes), bivalves, and burrowing fish form an integral prey base for shorebirds, ducks, and fish. Shorebirds found feeding at NAVSTA TI include the willet (*Catoptrophorus semipalmatus*) and the black-bellied plover (*Pluvialis squatarola*). Ducks found feeding in the intertidal and subtidal areas include mallard (*Anas platyrhynchos*) and bufflehead (*Bucephala albeola*). Typical fish that prey on invertebrates are benthic fish, such as Pacific staghorn sculpin (*Leptocottus armatus*) and speckled sanddab (*Citharichthys stigmaeus*). Pelagic fish such as northern anchovy and Pacific herring consume zooplankton. The benthic and pelagic fish, in turn, are consumed by piscivorous birds and fish. Top predators feeding in the aquatic environment include the peregrine falcon, California brown pelican, red-tailed hawk (*Buteo jamaicensis*), California halibut (*Paralicthys californicus*), and harbor seal.

TABLE 3-1

LIST OF POTENTIAL PLANT AND ALGAL SPECIES OFFSHORE NAVSTA TI

Common Name	Scientific Name
Green algae	*Enteromorpha* spp.[1]
Red algae	*Gracilaria sjoestedtii*[1]
Sea lettuce	*Ulva* spp.[1]
Gigartina	*Gigartina* spp.
Eel grass	*Zostera marina*[1]

Reference:
1. U.S. Department of Interior Fish and Wildlife Service (FWS) 1992a. "Status and Trends Report on Wildlife of the San Francisco Estuary." San Francisco Estuary Project. January.

TABLE 3-2
LIST OF POTENTIAL INVERTEBRATE SPECIES OFFSHORE NAVSTA TI

COMMON NAME	SCIENTIFIC NAME	NATIVE SPECIES
Atlantic boring sponge	*Cliona sp.*[9,10]	No
Redbeard sponge	*Microciona prolifera*[10]	Undetermined
Hydroid	*Corymorpha palma*[10]	Undetermined
Hydroid	*Sarsia tubulos*[9]	No
Hydroid	*Tubularia crocea*[9,10]	No
Sea anemone	*Pachycerianthus fimbriatus*[10]	Yes
Sea pen	*Stylatula elongata*[10]	Yes
Flatworm (Nemertean worm)	*Cerebratulas californiensis*[6,10]	Yes
Oligochaete	*Tubificoides brownae*[5]	Undetermined
Atlantic bamboo worm (polychaete)	*Asychis elongatus*[5,9]	No
Atlantic worm (polychaete)	*Marenzelleria viridis*[9]	No
Lug worm (polychaete)	*Arenicola brasiliensis*[10]	No
Polychaete	*Capitella capitata*[5,10]	No
Polychaete	*Eteone sp*[5]	No
Polychaete	*Glycera americana*[10]	Undetermined
Polychaete	*Glycinde picta*[5,8]	Yes
Polychaete	*Harmothoe imbricata*[6,10]	Yes
Polychaete	*Heteromastus filiformis*[5]	No
Polychaete	*Limnodrilus hoffmeisteri*[8]	No
Polychaete	*Nephtys caecoides*[5,10]	Yes
Polychaete	*Nereis succinea*[9]	No
Polychaete	*Platynereis bicanaliculata*[10]	Undetermined
Polychaete	*Polydora ligni*[9]	No
Polychaete	*Streblospio benedict*[5]	No
Phoronida	*Phoronis architecta*[5,10]	Yes
Sand dollar	*Dendraster excentricus*[10]	Yes
Star fish	*Pisaster brevispinus*[10]	Yes
Asian clam	*Potamocorbula amurensis*[1,9]	No
Atlantic gem clam	*Gemma gemma*[8,9,10]	No
Basket cockle	*Clinocardium nuttallii*[10]	Yes
Bay mussel	*Mytilus edulis*[4,8,10]	Yes
Baltic clam	*Macoma balthica*[1,8,9,10]	No
Bent nose clam	*Macoma nasuta*[8,10]	Yes
Bivalve	*Corbicula fluminea*[1,8]	No
California jackknife clam	*Tagelus californianus*[4,10]	Yes
California mactra (clam)	*Mactra californica*[1]	Yes
Horse mussel	*Ischadium demissa*[6,8,10]	No
Japanese Littleneck, Manila clam	*Venerupis japonica*[1,4,8,9,10]	No
Japanese Mussel	*Musculus senhousia*[1,9]	No
Native Oyster	*Ostrea lurida*[1,10]	Yes
Horse clam	*Tresus capax*[10]	Yes
Pacific gaper	*Tresus nuttallii*[4,10]	Yes
Pacific littleneck clam	*Protothaca staminea*[4,10]	Yes

TABLE 3-2
LIST OF POTENTIAL INVERTEBRATE SPECIES OFFSHORE NAVSTA TI (Continued)

COMMON NAME	SCIENTIFIC NAME	NATIVE SPECIES
Pacific oyster	*Crassostrea gigas*[4,8,9,10]	No
Soft shell clam	*Mya arenaria*[4,8,9,10]	No
Batillaria snail	*Batillaria attramentaria*[10]	No
Bubble snail	*Haminoea vesicula*[10]	Yes
Channeled whelk	*Busycotypus canaliculatus*[8]	Yes
Covered-lip nassa	*Nassarius tegula*[10]	Yes
Horn snail	*Cerithidea californica*[8,10]	Yes
Lean nassa	*Nassarius mendicus*[10]	Yes
Moon snail	*Polinices lewisii*[10]	Yes
Mud snail	*Nassarius obsoleta*[8,9,10]	No
Market squid	*Loligo opalescens*[10]	Yes
Amphipod	*Photis californica*[5,8]	No
Amphipod	*Ampelisca abdita*[5,8]	No
Amphipod	*Corophium sp.*[5,8]	No
Amphipod	*Grandidierella japonica*[8]	No
Burrowing isopod	*Sphaeroma quoyama*[8]	No
Isopod	*Gnorimosphaeroma luteum*[10]	Yes
Isopod	*Idotea resecata*[10]	Yes
Isopod	*Idotea wosnesenskii*[10]	Yes
Barnacle	*Balanus glandula*[6,10]	Yes
Barnacle	*Balanus improvisus*[9,10]	No
Mysid	*Neomysis mercedis*[1]	Yes
Bataeus	*Betaeus sp.*[*,2,10]	Undetermined
California bay shrimp	*Crangon franciscorum*[*,2,3,4,6]	Yes
Black-tailed bay shrimp	*Crangon nigricauda*[*,2]	Yes
Black spotted bay shrimp	*Crangon nigrimaculata*[*,1,2,8]	Yes
Dock shrimp	*Pandalus danae*[*,2]	Yes
Grass shrimp	*Hippolyte californiensis*[10]	Yes
Miniature springhead	*Mesocrangon munitella*[*,2]	Undetermined
Oriental shrimp	*Palaemon macrodactylus*[*,2,C]	No
Redbanded clear shrimp	*Heptacarpus pictus*[*,2]	Undetermined
Smooth bay shrimp	*Lissocrangon stylirostris*[*,2]	Yes
Stimpson coastal shrimp	*Heptacarpus stimpsoni*[*,2]	Yes
Taylor coastal shrimp	*Heptacarpus taylori*[*,2]	Yes
Brackish-water crab	*Rhithropanopeus harrisii*[10]	Yes
Chinese mitten crab	*Eriocheir sinensis*[9]	No
Dungeness crab	*Cancer magister*[*,2,3,10]	Yes
Graceful rock crab	*Cancer gracilis*[*,2,3,10]	Yes
Graceful kelp crab	*Pugettia gracilus*[10]	Yes
Red rock crab	*Cancer productus*[*,2,3,10]	Yes
Yellow shore crab (Mudflat crab)	*Hemigrapus oregonensis*[6,8,10]	Yes
Purple shore crab	*Hemigrapus nudus*[11]	Yes
Leptostracan	*Nebalia pugettensis*[10]	Yes
Tunicate	*Mogula manhattensis*[10]	No

TABLE 3-2
LIST OF POTENTIAL INVERTEBRATE SPECIES OFFSHORE NAVSTA TI (Continued)

Notes:

* = Presence confirmed at NAVSTA TI
C = Presence confirmed in Clipper Cove
Undetermined = limited or inconclusive information on native species status

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1. U.S. Department of Interior Fish and Wildlife Service (FWS) 1992a. "Status and Trends Report on Wildlife of the San Francisco Estuary." San Francisco Estuary Project. January.

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10. Morris, R.H, D.P. Abbott, and E.C. Haderlie. 1980. *Intertidal Invertebrates of California*. Stanford University Press. Stanford, California.

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TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR
AT NAVSTA TI

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
FAMILY PETROMYZONTIDAE						
Pacific Lamprey*[,1] *Lampetra tridentata tridentata*	FSC	Yes	Anadromous/ Coastal	Rivers and tributaries	Inshore, Bay/ Sed, SW	Carnivore (Pacific herring, salmon)
River Lamprey*[,1] *Lampetra ayresi*	CSC, FSC	Yes	Anadromous/ Coastal for 3 or 4 months before spawning	Small tributary streams	Inshore, Bay/ Sed, SW	Carnivore (Pacific herring, Pacific salmon)
FAMILY CARCHARHINIDAE						
Brown Smoothhound*[,1] *Mustelus henlei*	None	Yes	Shallow waters; Depth to 210 feet	Viviparous	Inshore, Bay, Midwater/ Sed, SW	Carnivore (crustaceans, small fishes, sea squirts)
Leopard Shark*[,1,2] *Triakis semifasciata*	HS	Yes	Coastal migrant/ Marine and estuarine resident; Reside in SF Bay Mar-Sep	Ovoviviparous; Estuaries used as pupping, feeding and rearing areas; Give birth Mar-Aug	Inshore, Bay, Coastal Benthic/ Sed, SW	Carnivore (benthic and epibenthic crustaceans, pelagic fish)
Thresher Shark*[,1] *Aliopias vulpinus*	HS	Yes	Coastal migrant	Viviparous	Bay, Coastal, Pelagic/SW	Carnivore (anchovy, herring, pilchard)
FAMILY RAJIDAE						
Big Skate*[,1] *Raja binoculata*	None	Yes	Marine; Depth 10 to 360 feet	Oviparous; Tough permeable eggcase deposited on the ocean floor	Inshore, Bay, Benthic/ Sed, SW	Carnivore (crustaceans, fishes)
FAMILY MYLIOBATIDAE						
Bat Ray*[,1] *Myliobatis californica*	HS	Yes	Marine, estuarine; Common in bays and shallow sandy areas	Viviparous; Brood size low, fecundity low	Inshore, Bay, Benthic/ Sed, SW	Carnivore (uses excavation and suction as feeding strategy; invertebrates and fishes)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
FAMILY ACIPENSERIDAE						
Green Sturgeon[2] *Acipenser medirostris*	CSC,FSC, HS	Yes	Anadromous; Coastal migrant/ Surface to 400 feet in ocean	Broadcast spawn; Sacramento and San Joaquin Rivers	Inshore, Bay, Offshore, Benthic/ Sed, SW	Carnivore (bottom invertebrates, small fish, opossum shrimp, amphipods)
White Sturgeon[2] *Acipenser transmontanus*	HS	Yes	Anadromous; Coastal migrant	Broadcast spawn; Sacramento and San Joaquin Rivers	Inshore, Bay, Offshore, Benthic/ Sed, SW	Carnivore (bottom invertebrates, small fish, opossum shrimp, amphipods)
FAMILY CLUPIDAE						
Pacific Sardine*[C,1] *Sardinops sagax*	HS	Yes	Schooling species/ Epipelagic	Pelagic larvae	Midwater/ SW	Planktivore (crustaceans, plankton)
Threadfin Shad*[1] *Dorosoma petenense*	HS	No	Anadromous/ Rare in ocean	Broadcast spawn; Sacramento and San Joaquin Rivers	Midwater/ SW	Planktivore (zooplankton, phytoplankton, detritus)
American Shad*[1,2] *Alosa sapidissima*	HS	No	Anadromous; Coastal, ocean migrant/ To 600 feet in ocean	Broadcast spawn; Sacramento and San Joaquin Rivers	Inshore, Bay, Offshore, Midwater/ SW	Planktivore (zooplankton, copepods, amphipods, surface insects)
Pacific Herring*[C,1,2] *Clupea harengus pallasii*	HS	Yes	Coastal, ocean migrant/ Marine, estuarine resident	Broadcast spawn, estuaries; Eggs harvested by commercial fishermen	Inshore, Bay, Coastal, Offshore, Midwater/ SW	Planktivore (planktonic organisms)
FAMILY ENGRAULIDAE						
Northern Anchovy*[C,1,2] *Engraulis mordax*	HS	Yes	Coastal migrant/ Estuarine, marine resident	Broadcast spawn, ocean	Inshore, Bay, Coastal, Offshore, Midwater/SW	Planktivore (crustaceans, plankton)
FAMILY SALMONIDAE						
Steelhead, Rainbow Trout[2] *Oncorhynchus mykiss*	HS	Yes	Anadromous; Coastal, ocean migrant	Nest builder; Sacramento and San Joaquin Rivers	Inshore, Coastal, Midwater/SW	Carnivore (anchovies, euphausids, herring, squid, larval crabs)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
Chinook Salmon*[,C,1,2] *Oncorhynchus tshawytscha*	CE, FE (winter run); CSC, FPT (late fall run); CCE, FPE (spring run)	Yes	Anadromous; Coastal, ocean migrant	Nest builder; Sacramento and San Joaquin Rivers (rare)	Inshore, Coastal, Midwater/ SW	Carnivore (anchovies, rock cods, euphausids, herring, squid, larval crabs)
FAMILY OSMERIDAE						
Longfin Smelt*[,C,1,2] *Spirinchus thaleichthys*	CSC, FSC	Yes	Anadromous; Coastal migrant/ FW, marine, estuarine resident	Broadcast spawn; upper end of Suisun Bay, Lower Sacramento River	Inshore, Bay, Coastal, Offshore, Midwater/ SW	Carnivore, Planktivore (opossum shrimp, copepods, and other crustaceans)
Night Smelt*[,1] *Spirinchus starksi*	HS	Yes	Coastal migrant/ Marine, estuarine resident	Broadcast spawn in surf	Inshore, Bay, Offshore, Midwater/SW	Carnivore, Planktivore (copepods, crustacean larvae, larval fish)
Whitebait Smelt*[,1] *Allosmerus elongatus*	HS	Yes	limited life history information; marine, estuarine resident	limited life history information; probably ocean subtidal areas	limited life history information	Carnivore, Planktivore (copepods, crustacean larvae, larval fish)
Surf Smelt*[,C,1,2] *Hypomesus pretiosus*	HS	Yes	Coastal migrant/ Marine, estuarine resident	Broadcast spawn in surf	Inshore, Bay, Offshore, Midwater/SW	Carnivore, Planktivore (amphipods, copepods, crustacean larvae, larval fish)
Delta Smelt *Hypomesus transpacificus*	CT, FT	Yes	Found only in portions of brackish and fresh water of Sacramento and San Joaquin River systems	Broadcast spawn; Sloughs of Delta	Bay, Midwater/SW	Carnivore, Planktivore (planktonic copepods, cladocerans, amphipods, insect larvae, opossum shrimp)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
FAMILY GADIDAE						
Pacific Tomcod*[,1,2] *Microdagus proximus*	HS	Yes	Marine, estuarine resident; Depth 40 to 200 feet	Broadcast spawn; Oceans, estuaries	Inshore, Coastal, Offshore, Benthic/ Sed, SW	Carnivore (mostly shrimp, also other bottom crustaceans, and small fish)
FAMILY OPHIDIIDAE						
Spotted Cusk-eel*[,1] *Chilara taylori*	None	Yes	Marine, estuarine resident	Broadcast spawn; Bays and estuaries	Benthic/ Sed, SW	Carnivore
FAMILY SYNODONTIDAE						
California Lizardfish*[,1] *Synodus lucioceps*	None	Yes	Marine; Depth 5 to 150 feet	Spawn in sandy bottom areas.	Benthic/ Sed, SW	Carnivore (other fish, squid)
FAMILY BATRACHOIDIAE						
Plainfin Midshipman*[,1] *Porichthys notatus*	None	Yes	Marine; Depth surface to 1000 feet. Prefer muddy bottom areas, burrow.	Intertidal coastal streams	Inshore, Benthic/ Sed, SW	Carnivore (crustaceans, fish - anchovies)
FAMILY ATHERINIDAE						
Jacksmelt*[,C,1,2] *Athernopsis californiensis*	HS	Yes	Coastal migrant/ Marine, estuarine resident	Broadcast spawn; Oceans, estuaries	Inshore, Bay, Coastal, Offshore Benthic/Sed, SW	Omnivore, Planktivore (algae, benthic diatoms, crustaceans, detritus)
Topsmelt*[,C,1,2] *Atherinops affinis*	HS	Yes	Coastal migrant/ Marine, estuarine resident	Broadcast spawn; Oceans, estuaries	Inshore, Bay, Coastal, Offshore Benthic/ SW, Sed	Omnivore, Planktivore (diatoms, filamentous algae, detritus, midge larvae, amphipods)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
Inland Silverside*[C,1] *Menidia beryllina*	None	No	Coastal migrant/ Marine, estuarine resident	Broadcast spawn, bays, estuaries	Inshore, Bay, Benthic/ SW, Sed	Omnivore, Planktivore (diatoms, filamentous algae, detritus, midge larvae, amphipods)
FAMILY SYNGNATHIDAE						
Bay Pipefish*[C,1] *Syngnathus leptorhynchus*	None	Yes	Mostly marine; Also tidal areas of coastal streams	Male brood pouch	Inshore, Bay, Midwater/SW	Carnivore (mysids, small shrimp, amphipods)
FAMILY PERCICTHYDAE						
Striped Bass*[C,1,2] *Morone saxatilis*	HS	No	Anadromous/ Estuarine, freshwater resident	Broadcast spawn; Sacramento and San Joaquin Rivers	Inshore, Coastal, Offshore, Midwater/ SW	Carnivore (threadfin shad, bass, pelagic fish, bay shrimp)
FAMILY SCIAENIDAE						
Queenfish*[1] *Seriphus politus*	None	Yes	Marine; Depth surface to 180 feet; Rare north of Monterey	Broadcast spawn; Pelagic 25-125 feet	Inshore, Bay, Estuary and Slough, over sand bottom/ Sed, SW	Carnivore (small fish, shrimps, crabs, clams, worms)
White Croaker*[C,1,2] *Genyonemus lineatus*	HS	Yes	Coastal migrant/ Estuarine, marine resident; Surface to 330 feet	Broadcast spawn, ocean	Inshore, Bay, Coastal, Offshore, Benthic/ Sed, SW	Carnivore (planktonic crustaceans)
White Seabass[2] *Atractoscion nobilis*	HS	Yes	Coastal migrant/ Marine, estuarine resident; Surface to 400 feet	Broadcast spawn in shallow nearshore areas	Bay, Kelp bed, Coastal, Offshore/SW	Carnivore (herring, smelt, squid)
FAMILY EMBIOTOCIDAE						
Walleye Surfperch*[1] *Hyperprosopon argenteum*	HS	Yes	Marine; Depth surface to 60 feet	Viviparous (Nov. to Dec. mating, mid-April birthing)	Inshore, Midwater/ SW	Carnivore (sand crabs, invertebrates)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
Shiner Surfperch*,C,1,2 *Cymastogaster aggregata*	HS	Yes	Marine, estuarine resident; Depth surface to 480 feet	Viviparous; Oceans, estuaries	Inshore, Bay, Coastal, Offshore Benthic/ Sed, SW	Omnivore (crustaceans, algae, worms, mollusks)
Barred Surfperch*,1 *Amphistichus argenteus*	HS	Yes	Marine; Depth surface to 240 feet	Viviparous	Inshore, Bay, Benthic/ Sed, SW	Carnivore (sand crabs, bead clams, small crustaceans)
Calico Surfperch*,1 *Amphistichus koelzi*	HS	Yes	Marine; Depth surface to 60 feet	Viviparous	Inshore, Bay	Carnivore (small invertebrates)
Redtail Surfperch*,1 *Amphistichus rhodoterus*	HS	Yes	Marine; Depth surface to 140 feet	Viviparous	Inshore, Benthic/ Sed, SW	Carnivore (benthic, crustaceans, and small fish)
Dwarf Surfperch *,C,1 *Micromitnus minimus*	None	Yes	Tidepools to 30 feet. Associated with rocky substrate and kelp beds	Viviparous	Midwater, Benthic/ Sed, SW	Carnivore (isopods, gastropod mollusks, amphipods, worms, small crabs)
Black Surfperch*,C,1 *Embiotoca jacksoni*	HS	Yes	Depth surface to 130 feet; Associated with rocky substrate and kelp beds	Viviparous	Midwater, Benthic/ Sed, SW	Carnivore (isopods, gastropod mollusks, amphipods, worms, small crabs)
Spotfin Surfperch*,1 *Hyperprosospon anale*	None	Yes	Marine; Depth surface to 210 feet	Viviparous	Inshore, Midwater/ Sed, SW	Carnivore (isopods, gastropod mollusks, amphipods, worms, small crabs)
Silver Surfperch*,1 *Hyperprosopon ellipticum*	None	Yes	Marine; Depth surface to 60 feet	Viviparous	Inshore	Carnivore (small invertebrates)
Pile Surfperch*,1 *Rhacochilus vacca*	HS	Yes	Marine; Depth Surface to 150 feet	Viviparous	Inshore, Midwater, Benthic/ Sed, SW	Carnivore (isopods, gastropod mollusks, amphipods, worms, small crabs)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
Rubberlip Surfperch*[,1] *Rhacochilus toxotes*	HS	Yes	Estuarine; Abundant near kelp beds and jetties	Viviparous	Inshore, Bay/ Sed, SW	Carnivore (benthic crustaceans, small shrimp, amphipods)
White Surfperch*[,1] *Phanerodon furcatus*	HS	Yes	Surface to 140 feet	Viviparous	Inshore, Benthic/ Sed, SW	Carnivore (benthic crustaceans, and small fish)
FAMILY AMMODYTIDAE						
Pacific Sand Lance[2] *Ammodytes hexapterus*	None	Yes	Marine, estuarine		Inshore, Benthic/ Sed, SW	Carnivore (harpacticoid copepods)
FAMILY GOBIIDAE						
Yellowfin Goby*[,1] *Acanthogobius flavimanus*	None	No	Resident of shallow bays	Nest builder, constructed of mud and sand; Estuaries	Inshore, Bay, Benthic/ Sed, SW	Carnivore (bottom invertebrates and small fish)
Bay Goby*[,1] *Lepidogobus lepidus*	None	Yes	Shallow bays to 200 feet	Nest builder, constructed of mud and sand; Estuaries	Bay, Benthic/ Sed, SW	Carnivore (bottom invertebrates and small fish)
Cheekspot Goby*[,1] *Ilypnus gilberti*	None	Yes	Bay mud flats	Nest builder, constructed of mud and sand; Estuaries	Bay, Benthic/ Sed, SW	Carnivore (bottom invertebrates and small fish)
Chameleon Goby*[,1] *Tridentiger trigonocephalus*	None	No	Shallow bay areas	Nest builder, constructed of mud and sand; Estuaries	Bay, Benthic/ Sed, SW	Carnivore (bottom invertebrates and small fish)
Arrow Goby*[,C,1,2] *Clevelandia ios*	None	No	Estuarine, resident of bays	Batch spawn; Eggs laid on mud and sand	Inshore, Bay, Benthic/ Sed, SW	Carnivore (amphipods, copepods, oligochaetes)
FAMILY STROMATEIDAE						
Pacific Butterfish*[,1] *Peprilus simillimus*	HS	Yes	Marine; Depth 30 to 300 feet	Spawn every month of year; Eggs are pelagic	Inshore, Midwater/ SW	Carnivore

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
FAMILY SCORPAENIDAE						
Brown Rockfish*[,1] *Sebastes auriculatus*	HS	Yes	Marine; Depth shallow to 180 feet	Ovoviviparous; Larvae released open ocean (December and January)	Inshore, Midwater/ SW	Carnivore (size-dependent feeding, small-large fish, crustaceans, amphipods)
Black Rockfish*[,1] *Sebastes melanops*	HS	Yes	Marine; Depth shallow to 2000 feet	Ovoviviparous	Nearshore, Midwater, Benthic/ Sed, SW	Carnivore (size-dependent feeding, small-large fish, crustaceans, amphipods)
Blue Rockfish*[,1] *Sebastes mystinus*	HS	Yes	Marine; Depth surface to 300 feet	Ovoviviparous; Larvae planktonic 1 month to 1 year depending on sp.	Inshore, Midwater/ SW	Carnivore (mainly krill))
FAMILY HEXAGRAMMIDAE						
Lingcod*[,1,2] *Ophiodon elongatus*	HS	Yes	Depth varies: Juveniles in shallow bays and on sand and mud bottoms; Adults surface to 1,400 feet	Nest builder, oceans	Inshore, Bay, Coastal, Offshore, Benthic, Midwater/ Sed, SW	Carnivore (juvenile, shrimp and other crustaceans; adult, fish, octopus, squid)
FAMILY COTTIDAE						
Pacific Staghorn Sculpin*[,C,1,2] *Leptocottus armatus*	HS	Yes	Marine, estuarine, resident; Depth intertidal to 300 feet	Broadcast spawn; Oceans, estuaries	Inshore, Bay, Coastal, Offshore, Benthic/ Sed, SW	Carnivore (benthic amphipods, worms, aquatic insect larvae)
Bonehead Sculpin*[,1] *Artedius notospilotus*	None	Yes	Marine, estuarine	Spawn March to April; Pelagic larvae	Inshore, Bay/ SW	Carnivore (crustaceans)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR
IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
FAMILY AGONIDAE						
Pygmy Poacher*,[1] *Odontopyxis trispinosa*	None	Yes	Marine, estuarine; Depth 60 to 1,200 feet	Broadcast spawn	Bay, Offshore, Benthic/Sed, SW	Carnivore (copepods, euphausids, worms, small decapods)
FAMILY LIPARIDIDAE						
Showy Snailfish*,[1] *Liparis pulchellus*	None	Yes	Intertidal to 600 feet	Nest builders	Bay, Benthic/ Sed, SW	Carnivore (small crustaceans, polychaetes)
FAMILY BOTHIDAE						
California Halibut*,[1,2] *Paralicthys californicus*	HS	Yes	Marine, resident; Surface to 300 feet	Broadcast spawn, ocean	Bay, Coastal, Offshore, Benthic/ Sed, SW	Carnivore (anchovies, queenfish, other small fish)
Pacific Sanddab*,[1] *Citharichthys sordidus*	HS	Yes	Marine, estuarine; Depth 60 to 600 feet	Planktonic larvae	Inshore, Bay, Benthic/ Sed, SW	Carnivore (small crustaceans, polychaete worms, small fish)
Speckled Sanddab*,[1] *Citharichthys stigmaeus*	None	Yes	Marine, estuarine; Depth 30 to 1,800 feet	Planktonic larvae	Inshore, Bay, Benthic/ Sed, SW	Carnivore (small crustaceans, polychaete worms, small fish)
FAMILY PLEURONECTIDAE						
Sand Sole*,[1] *Psettichthys melanostictus*	HS	Yes	Marine, estuarine; Depth 5 to 27 feet	Broadcast spawn; Pelagic larvae	Inshore, Bay, Benthic/ Sed, SW	Carnivore (small crustaceans, polychaete worms, mollusks, fish)
Curlfin Sole*,[1] *Pleuronectes decurrens*	HS	Yes	Marine; Depth 120 to 1,600 feet	Broadcast spawn	Coastal, Offshore, Benthic/Sed, SW	Carnivore (mollusks, polychaetes)
English Sole*,[1,2] *Parophyrys vetulus*	HS	Yes	Marine, resident; Depth 60 to 1,000 feet	Broadcast spawn, ocean	Coastal, Offshore, Benthic/ Sed, SW	Carnivore (worms, small crustaceans, clams, small fish, crabs, and shrimp)

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Species (and reference)	Status	CA Native	Mobility/ Occurrence	Spawn	Habitat/ Primary Exposure	Feeding Guild
Diamond Turbot*[,1,2] *Hypsopsetta guttulata*	HS	Yes	Marine, estuarine, Resident; Depth 5 to 150 feet	Broadcast spawn, ocean; Pelagic larvae	Inshore, Bay, Coastal, Benthic/ Sed, SW	Carnivore (clam parts polychaete worms, ghost shrimp)
Starry Flounder*[,C,1,2] *Platichthys stellatus*	HS	Yes	Coastal migrant/ Marine, estuarine resident; Depth 2 to 900 feet.	Broadcast spawn; ocean, estuaries	Inshore, Bay, Coastal Offshore, Benthic/Sed, SW	Carnivore (worms, crustaceans, clams, brittle stars, small fish)
FAMILY CYNOGLOSSIDAE						
California Tonguefish*[,1] *Symphurus atricauda*	None	Yes	Depth 5 to 276 feet. Rare in California	Broadcast spawn	Inshore, Bay, Benthic/ Sed, SW	Carnivore (crustaceans, polychaete worms, other invertebrates)
FAMILY GASTEROSTERIDAE						
Threespine Stickleback*[,C,1,2] *Gasterosteus aculeatus*	None	Yes	Anadromous/ Estuarine, FW Resident; Surface to 90 feet	Nest builder, constructed of sand and algae	Inshore, Bay, Benthic/ Sed, SW	Carnivore (free swimming crustaceans, bottom invertebrates)

Notes

All species listed are typical of San Francisco Bay open waters

References for Occurrence

* Identified in catch data collected 0.5 miles north and south of YBI by the Interagency Ecological Study Program from 1980-1997.

C Indicates confirmed presence in Clipper Cove

1 Hieb, K. 1998. "Fish, Shrimp, and Crab Catch Data Collected in the Delta Outflow/San Francisco Bay Study." Prepared by the Bay-Delta and Special Water Projects Division of the California Department of Fish and Game. Interagency Ecological Study Program.

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

References for Occurrence (continued)

2 Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. "Distribution and Abundance of Fishes and Invertebrates in West Coast Estuaries, Volume II: Species Life History Summaries." ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Status

Species of special conservation status, as registered in the California Department of Fish and Game's Natural Diversity Data Base and 50 CFR Part 17 Endangered and Threatened Species, Plant and Animal Taxa; Proposed Rule (May 18, 1998), are indicated by the following codes.

Blank	Species has no special status
CCE	State of California Candidate for Endangered Species
CE	State of California-listed Endangered Species
CSC	California Department of Fish and Game (CDFG) Species of Special Concern/U.S. Fish and Wildlife Service Species of Special Concern, April 7, 1998
CT	State of California-listed Threatened Species
FE	Federal Endangered Species
FPE	Federal Proposed Endangered
FSC	Federal Northern California Species of Special Concern
FSS	Forest Service Sensitive Species
FT	Federal Threatened Species
FPT	Federal Proposed Threatened Species
HS	Species designated for harvest under California State Fish and Game Code and USFWS regulations

Native

Yes	Species is native to California.
No	Species is not native to California.
Blank	Not confirmed during this preliminary search.

Mobility/Occurrence

This column provides a general description of the typical migration and residency patterns of the species. A blank cell indicates that no data were found during this preliminary search.

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR IN NAVSTA TI (Continued)

Spawn

This column provides a general description of the spawning behavior of the species. A blank cell indicates that no data were found during this preliminary search.

Primary Exposure

The primary exposure description reflects the primary routes of exposure to contaminants for the species, excluding exposure through ingestion of contaminated prey.

Sed	Sediments
SW	Surface Water (including San Francisco Bay water)
Blank	No data were found regarding exposure routes for this species during this preliminary search.

Feeding Guild

Carnivore	Eats primarily animals
Herbivore	Eats primarily plants
Omnivore	Eats a combination of animals and plants
Planktivore	Eats plankton

References

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Leet, W.S.; Dewees, C.M.; Haugen, C.W. 1992. "California Living Marine Resource and Their Utilization." Department of Wildlife and Fisheries Biology. California Sea Grant Extension Publication UCSGEP-92-12

TABLE 3-3
NATURAL HISTORY OF FISH OBSERVED OR PREDICTED TO OCCUR
IN NAVSTA TI (Continued)

References (continued)

Nelson, J.S. 1984. "Fishes of the World, Second Edition." John Wiley & Sons.

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U.S. Fish and Wildlife Service (FWS). 1992a. "Status and Trends Report on Wildlife of the San Francisco Estuary, San Francisco Estuary Project." January.

FWS. 1996. Northern California Animal Species of Concern, as of February 28, 1996

FWS. 1998. 50 CFR Part 17; Endangered and Threatened Species, Plant and Animal Taxa; Proposed Rule. May 18.

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI

Species	Status	Residency	Behavior	Feeding Guild
Red-throated Loon* *Gavia stellata*	None	Winter	Dives for food in shallow or deep water, often close to surf	Carnivore/Omnivore Fish, crustaceans, leeches, snails, aquatic insects, other invertebrates
Common Loon* *Gavia immer*	CSC, MNBMC	Migrant - winter visitor	Dives for food from water surface, may take prey off bottom	Omnivore Mainly fish, crustaceans, aquatic plants; some snails, leeches, frogs, salamanders, aquatic insects, aquatic birds
Horned Grebe* *Podiceps auritus*	None	Migrant - winter visitor	Dives for food, also feeds from surface	Carnivore Small fishes, crustaceans, insects
Eared Grebe* *Podiceps nigricollis*	None	Migrant - winter resident	Dives and captures food underwater and on bottom, rests on water, builds floating nests	Carnivore Mainly aquatic and land insects and larvae; some crustaceans, mollusks, invertebrates, small fishes, amphibians
Pied-billed Grebe* *Podilymbus podiceps*	None	All Year	Dives for food, pursuing prey underwater, or searching the bottom	Carnivore Mainly insects, crustaceans, and fish; some amphibians, mollusks, leeches, and aquatic plants.
Red-necked Grebe* *Podiceps grisegena*	None	Migrant - winter resident	Dives for food; often forages at, or near, the bottom	Carnivore Mainly fish, crustaceans, insects; some amphibians, worms, and mollusks
Western Grebe* *Aechmophorus occidentalis*	None	Migrant -winter resident	Dives for and pursues food underwater, rests on water, builds floating nests that may be anchored to bottom	Carnivore Mainly fish; some insects, invertebrates, rarely amphibians, plants
Clark's Grebe* *Aechmophorus clarkii*	None	Migrant -winter resident	Dives for and pursues food underwater, rests on water, builds floating nests that may be anchored to bottom	Carnivore Mainly fish; some insects, invertebrates; rarely amphibians, plants
American White Pelican *Pelecanus erythrorhynchos*	CSC	Transient	Dives and scoops up prey items from surface of water, roosts primarily at edge of water on sandbars or beaches	Carnivore Mainly fish; some amphibians, crustaceans
California Brown Pelican* *Pelecanus occidentalis californicus*	CE, CFP, FE, MNBMC	Transient	Dives for prey from air at rising tide, rests primarily on water or inaccessible rocks	Carnivore Mainly fish; some crustaceans, carrion, young of its own species

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
Double-crested Cormorant* *Phalacrocorax auritis*	CSC	All year	Dives underwater to catch prey, roosts overnight on shore	Carnivore Mainly fish; some crustaceans, amphibians
Brandt's Cormorant* *Phalacrocorax penicillatus*	None	All year	Dives for food in shallow or deep water: spends little time on water except when fishing	Carnivore Fish, crustaceans
Pelagic Cormorant* *Phalacrocorax pelagicus*	None	All year	Dives; roosts on rocky cliffs	Carnivore Fish, crustaceans
Great Blue Heron* *Ardea herodias*	None	All year	Feeds in shallow or open water, perches, roosts and nests in tops of trees	Carnivore Mainly fish; some small rodents, amphibians, snakes, lizards, insects, crustaceans, small birds
Great Egret *Casmerodius albus*	None	All year	Feeds in shallow water along shores, roosts in trees	Carnivore Mainly fish, amphibians, snakes, snails, crustaceans, insects, small mammals
Snowy Egret *Egretta thula*	None	All year	Feeds in shallow water, nests in trees	Carnivore Mainly small fish, crustaceans, large insects; some amphibians, reptiles, worms, snails, small mammals
Black-crowned Night-Heron* *Nycticorax nycticorax*	None	All year	Hunts primarily in shallow water, roosts in dense foliage of trees	Carnivore Fishes, crustaceans, aquatic insects, invertebrates, amphibians, reptiles, small mammals; rarely young birds
Northern Pintail *Anas acuta*	HS	Migrant - winter resident	Forages in very shallow water, taking food from surface, subsurface, and bottom	Omnivore Aquatic plant seeds, wild grasses, forbs, grains, stems, leaves, insects, crustaceans, mollusks, worms
American Wigeon *Anas americana*	HS	Migrant - winter resident	Forages in shallow waters by gleaning surface or subsurface or dabbling	Omnivore Adults: mainly leaves, stems and seeds of aquatic plants, terrestrial grasses and forbs; some crops (lettuce, alfalfa, clover, barley), waste grain, aquatic insects Young: insects, invertebrates

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
Mallard* *Anas platyrhynchos*	HS	All year, more abundant in winter	Tips up for food in shallow water, skims and filters food from water and bottom, gleans insects and seeds along shores, probes in mud and shallow water, grazes, rarely dives	Omnivore Mostly grains, seeds and leaves of aquatic plants, grasses, and other green vegetation. Aquatic insects, snails, small crustaceans, earthworms, tadpoles, and small fish
Redhead *Aythya americana*	HS	Migrant - winter resident	Dives for food and grubs in bottom mud, dabbles in shallow water and takes food from surface	Omnivore Mainly aquatic plant leaves, stems, seeds, and tubers; some aquatic insects
Ring-necked Duck *Aythya collaris*	HS	Migrant - winter resident	Feeds in shallow water, dives for food, takes food from muddy bottom or subsurface water	Omnivore Mainly aquatic plant seeds, tubers, rootstocks, and foliage; some aquatic insects, mollusks, invertebrates
Canvasback *Aythya valisineria*	HS	Migrant - winter resident	Dives for food, grubs in bottom sediments, or pursues fish	Omnivore Eats seeds, tubers, leaves, and stems of aquatic plants, aquatic mollusks, crustaceans, worms, insects, and fish
Greater Scaup* *Aythya marila*	HS	Migrant - winter resident	Feeds by diving to bottom	Omnivore Mainly mollusks, crustaceans, insects; some vegetation
Lesser Scaup *Aythya affinis*	HS	Migrant - winter resident	Feeds most frequently by gleaning or grubbing from bottom sediments, dabbles	Omnivore Mainly aquatic invertebrates; some leaves, stems, seeds, and tubers of aquatic plants
Oldsquaw* *Clangula hyemalis*	HS	Not available	Feeds by diving deep, favors rough water or coves	Omnivore Small crustaceans, mollusks, aquatic insects, small fishes, plant matter
Black Scoter *Melanitta nigra*	HS	Migrant-winter resident	Feeds by diving	Omnivore Marine invertebrates, bivalves, gastropods, barnacles, shrimp, herring roe, aquatic plant material
Surf Scoter* *Melanitta perspicillata*	HS	Migrant - winter resident	Dives and takes food from the bottom	Omnivore Mainly mollusks; some crustaceans, invertebrates, aquatic insects, fish; small amounts of aquatic plants

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
White-winged Scoter* *Melanitta fusca*	HS	Migrant - winter resident	Dives and takes food from bottom, preferring shallow water	Carnivore Mainly mollusks; some crustaceans, invertebrates, aquatic insects, fishes; small amounts of aquatic plants
Barrow's Goldeneye* *Bucephala islandica*	CSC, HS	Migrant - winter resident	Feeds on rocky bottoms, gleans food from submerged plants	Omnivore Adults: mainly mollusks, crustaceans, aquatic insects; some fish eggs and young, algae, aquatic plants Young: aquatic insects
Common Goldeneye* *Bucephala clangula*	None	Migrant - winter resident	Dives and takes food from bottom by gleaning, scrubbing in mud, or turning over stones	Omnivore Mainly crustaceans, mollusks, small fish, and insects; some tubers, leaves and stems of aquatic plants.
Bufflehead* *Bucephala albeola*	HS	Migrant - winter resident	Dives for food, pursuing prey underwater, gleans from bottom	Omnivore Adults: mainly small invertebrates, crustaceans, mollusks, aquatic insect, gastropods; some fish, parts of aquatic plants Young: aquatic insects
Red-breasted Merganser* *Mergus serrator*	HS	Migrant- winter resident	Dives for food, pursuing prey in open water and near underwater stumps, rocks, and logs. Probes underwater crevices	Omnivore Fish, crustaceans, amphibians, insects worms
Ruddy Duck* *Oxyura jamaicensis*	HS	All year	Dives to bottom and gleans food, filters bottom sediments, surface and subsurface waters	Omnivore Submerged aquatic plant seeds, tubers, foliage, stems, algae, bulrush seeds, aquatic insects, mollusks, crustaceans, worms
Osprey *Pandion haliaetus*	CSC	Migrant - summer resident	Feeds and forages on open clear water; catches prey on surface	Carnivore Mainly fish; some mammals, birds, amphibians, invertebrates
American Coot* *Fulica americana*	HS	All year	Forages underwater on the foliage and roots of submerged aquatic plants	Omnivore Submerged aquatic plants, seeds, insects, small fish

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
Black Oystercatcher* *Haematopus bachmani*	None	All year	Forages on undisturbed rocky coastlines; pries off invertebrates from substrate with bill	Carnivore Crustaceans, marine worms, fish
Black-bellied Plover* *Pluvialis squatarola*	None	Migrant - winter visitor	Feeds by pecking at water surface or substrate	Carnivore Polychaete worms, small mollusks, crustaceans, insects, mud snails
Western Snowy Plover *Charadrius alexandrinus nivosus*	CSC, FT, MNBMC	All year	Gleans prey from sand of upper beaches; requires a sand, gravelly or friable soil substrate for nesting	Carnivore Mainly insects, amphipods; some sand crabs, brine flies
Semipalmated Plover *Charadrius semipalmatus*	None	Migrant - winter resident	Feeds by pecking at water surface or substrate	Carnivore Worms, small mollusks, amphipods, fly larvae, locusts, aquatic and terrestrial insects
Killdeer* *Charadrius vociferus*	None	All year	Quickly runs forward, stops, and suddenly seizes prey from the surface; gleans, and probes shallowly in open fields, muddy shores, and lawns	Carnivore Invertebrates, especially insects
American Avocet *Recurvirostra americana*	None	All year	Feeds by probing in mud, sweeping bill through water or soupy mud or dabbling	Omnivore Aquatic insects, crustaceans, snails, worms; some aquatic plant seeds
Greater Yellowlegs* *Tringa melanoleuca*	None	Migrant - winter resident	Takes prey by snatching at surface; occasionally probes into substrate	Carnivore Aquatic insects, small fish, crustaceans, worms, terrestrial insects, gobies
Lesser Yellowlegs *Tringa flavipes*	None	Migrant - winter resident	Forages in shallow water by pecking at water surface or mud	Carnivore Adult and larval aquatic insects, grasshoppers, small fish, crustaceans, worms
Willet* *Catoptrophorus semipalmatus*	None	All Year	Feeds by a peck-probe method	Carnivore Invertebrates, small crustaceans, mollusks; some fish, polychaete worms, larval and pupal dipteran insects, fish eggs

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
Wandering Tattler* *Heteroscelus incanus*	None	Migrant - spring and fall	Probes among the kelp and rocks of outer coast marine habitats; occasionally wades in deep water	Carnivore Decapod crustaceans, marine worms, and small mollusks
Spotted Sandpiper* *Actitis macularia*	None	Migrant - winter resident	Probes, gleans, and stalks; wades into water to forage on the bottom	Carnivore Flying and benthic insects, beetles, crickets, flies, grasshoppers, worms, ants, aquatic invertebrates, small fish
Sanderling* *Calidris alba*	None	Migrant - winter visitor	Probes in wet sand, follows retreating waves	Carnivore Sandy beach crustaceans, sand crabs, amphipods, small mollusks, marine worms, and adult and larval flies
Whimbrel *Numenius phaeopus*	None	Migrant - winter resident	Feeds by probing in to substrate or picking prey from surface	Omnivore Berries, insects, crabs, crayfish, marine worms, grasshoppers, spiders, beetles
Long-Billed Curlew *Numenius americanus*	CSC, MNBMC	Migrant - winter resident	Uses long bill for probing deep into substrate	Carnivore Invertebrates, small crustaceans, mollusks, insects, insect pupae
Marbled Godwit *Limosa fedoa*	None	Migrant - winter visitor	Obtains prey by probing into substrate	Carnivore Snails, clams, sand crabs, amphipods, worms, aquatic insects, grasshoppers, mollusks
Ruddy Turnstone* *Arenaria interpres*	None	Migrant - winter resident	Feeds by probing, jabbing, and overturning objects such as mud crust	Carnivore Mainly dipterans (midges), lepidopterans, hymenopterans, spiders, crustaceans, worms, mollusks, insects; some plant material, small fish, carrion
Black Turnstone *Arenaria melanocephala*	None	Not available	Feeds by probing substrate, and using bill to tip over small rocks, kelp, and other material to get prey underneath	Carnivore Small crustaceans and mollusks
Surfbird *Aphriza virgata*	None	Migrant - winter resident	Feeds close to the water's edge on rocks, or stony beaches, by probing into small crevices, or by pecking for prey on the surface of rocks	Carnivore Mussels, periwinkles, barnacles, small crustaceans, and other marine invertebrates

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
Western Sandpiper* *Calidris mauri*	None	Migrant - winter resident	Probes and gleans in soft mud of tidal marine mudflats	Carnivore Adults: insects, mollusks, crustaceans, worms Young: flies, larval flies, beetles
Least Sandpiper* *Calidris minutilla*	None	Migrant - winter visitor	Feeds by pecking and probing in mud or soft earth; bathes in tidepools and may drink	Carnivore Crustaceans, worms, insects, insect larvae; some seeds and plant material
Dunlin *Calidris alpina*	None	Migrant - winter visitor	Feeds by deep or shallow probing and surface pecking	Carnivore Flies, fly larvae (crane, midge), polychaete worms, small crustaceans, small mollusks
Short-billed Dowitcher *Limnodromus griseus*	None	Migrant - winter resident	Forages on soft mud substrate by probing deeply, in shallow water entire head may be immersed	Carnivore Mainly small mollusks, crustaceans, marine worms, insects, fly larvae, polychaete worms, small gastropods, mud-burrowing gobies; some vegetation
Long-billed Dowitcher *Limnodromus scolopaceus*	None	Migrant - winter resident	Forages on soft mud substrate by probing deeply	Omnivore Fly larvae (crane, midge), small burrowing crustaceans, insect larvae, small snails; some seeds, plant fiber
Red-necked Phalarope *Phalaropus lobatus*	None	Not available	Not available	Carnivore/Omnivore Crustaceans, aquatic insects, mollusks, zooplankton, seeds
Bonaparte's Gull* *Larus philadelphia*	None	Transient/ winter visitor	Catches food in flight or picks it from the water surface	Carnivore Insects, fish, crustaceans, marine worms, refuse
Mew Gull* *Larus canus*	None	Migrant - winter visitor	Dives from above or forages on water's surface	Carnivore Mollusks, crustaceans, echinoderms, worms, insect larvae
Ring-billed Gull* *Larus delawarensis*	None	Migrant - winter resident	Gleans, searches, and dives for fish; drinks and bathes in freshwater	Omnivore Fish, insects, earthworms, crustaceans, garbage, grain, rodents, amphibians, reptiles, carrion, plant material

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
California Gull* *Larus californicus*	CSC	All year	Nests in a scrape lined with grass or rubble	Omnivore Adults: refuse, carrion, insects, insect larvae Young: larval insects, brine shrimp, young birds, garbage, earthworms, insects
Herring Gull* *Larus argentatus*	None	Migrant - winter resident	Forages near water surface or dives like a tern	Omnivore Refuse, small fish, marine invertebrates, worms, insect larvae, rats, mice, moles, small rabbits
Thayer's Gull *Larus thayeri*	None	Migrant - winter visitor	Forages near water surface for fish	Omnivore Refuse, fish, marine invertebrates, carrion
Western Gull* *Larus occidentalis*	None	All year	Forages over open water using aerial dives; on the water's surface, feeds by dipping	Omnivore Fish, intertidal inverts, small birds, eggs, refuse
Heermann's Gull* *Larus heermanni*	None	Migrant - post-breeding visitor	Feeds offshore kelp beds, on rocky shoreline, and sandy beaches	Omnivore Fish, mollusks, shrimp, other crustaceans; scavenges
Glaucous-winged Gull* *Larus glaucescens*	None	Migrant - winter resident	Roosts and preens on sandy beaches or mudflats; drinks and bathes in fresh water	Omnivore Refuse, barnacles, mollusks, sea urchins, carrion, fish
Caspian Tern* *Sterna caspia*	None	Migrant - summer resident	Dives for prey just below water's surface	Carnivore Small fish (up to 15 centimeters)
Forster's Tern* *Sterna forsteri*	None	All year	Dives for prey; may scoop small prey from shallow water	Carnivore Small fish, aquatic insects, crustaceans, small amphibians
Least Tern *Sterna antillarum browni*	CE (nest colony), CFP, FE (nest colony), MNMBC	All year	Hovers over prey and dives	Piscivore Small fish, anchovy, silversides, shiner surfperch
Belted Kingfisher* *Ceryle alcyon*	None	All year	Dives into water from a perch or hovers	Carnivore Fish, also amphibians, crayfish, insects

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

Species	Status	Residency	Behavior	Feeding Guild
American Pipit *Anthus rubescens*	None	Winter	Forages in open moist habitats with little or no vegetation: gleans food from ground and low plants, hawks insects in air, wades into shallow water to forage	Omnivore Insects, also mollusks, crustaceans, arthropods, seeds
Red-tailed Hawk* *Buteo jamaicensis*	None	All year	Searches by soaring; also perches or pounces	Carnivore Small mammals, small birds, reptiles, amphibians, and some carrion
Peregrine Falcon* *Falco peregrinus*	CE, CFP, FE, MNBMC	All year	Swoops from flight onto flying prey, chases in flight, rarely hunts from a perch	Carnivore Birds up to ducks in size, occasionally mammals, insects, and fish

Notes:

* : Presence confirmed at NAVSTA TI
All species are native to California

Status: Species of special conservation status, as registered in the California Department of Fish and Game's Natural Diversity Data Base, are indicated by the following codes:

CCE State of California Candidate for Endangered Species
CCT State of California Candidate for Threatened Species
CE State of California Endangered Species
CFP State of California Fully Protected
CSC California Department of Fish and Game (CDFG) Species of Special Concern
CT State of California Threatened Species
FC Federal Candidate
FE Federal Endangered Species
FNC Federal Northern California Species of Special Concern
FPE Federal Proposed Endangered
FPT Federal Proposed Threatened
FT Federal Threatened Species

TABLE 3-4
NATURAL HISTORY OF BIRDS OBSERVED OR PREDICTED TO OCCUR OFFSHORE NAVSTA TI (Continued)

HS	Species designated for harvest under California State Fish and Game Code and USFWS regulations
MNBMC	Fish and Wildlife Service Migratory Nongame Birds of Management Concern
None	Species has no special status

Residency:

All year	Species resides at NAVSTA TI year round
Migrant - summer resident	Species may breed at NAVSTA TI for the summer
Migrant - summer visitor	Migrating species making a summer stopover at NAVSTA TI
Migrant - winter resident	Species resides at NAVSTA TI for the winter season
Migrant - winter visitor	Migrating species making a winter stopover at NAVSTA TI
Transient	Species that strays off of its usual migration route, making its presence a casual occurrence at NAVSTA TI

Behavior: The behavior noted may influence the exposure of individuals to contaminants.

Feeding Guild:

Carnivore	Eats primarily animal matter
Herbivore	Eats primarily plant matter
Omnivore	Eats a combination of animal and plant matter

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TABLE 3-4
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FWS. 1998. 50 CFR Part 17; Endangered and Threatened Species, Plant and Animal Taxa; Proposed Rule. May 18.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White. 1990. "California's Wildlife-Volume II, Birds." California Statewide Wildlife Habitat Relationships System, Department of Fish and Game, Sacramento, California.

TABLE 3-5
LIST OF POTENTIAL MAMMALIAN SPECIES OFFSHORE NAVSTA TI

COMMON NAME	SCIENTIFIC NAME
California Sea Lion	*Zalophus californianus*[1]
Harbor Seal	*Phoca vitulina**[2]

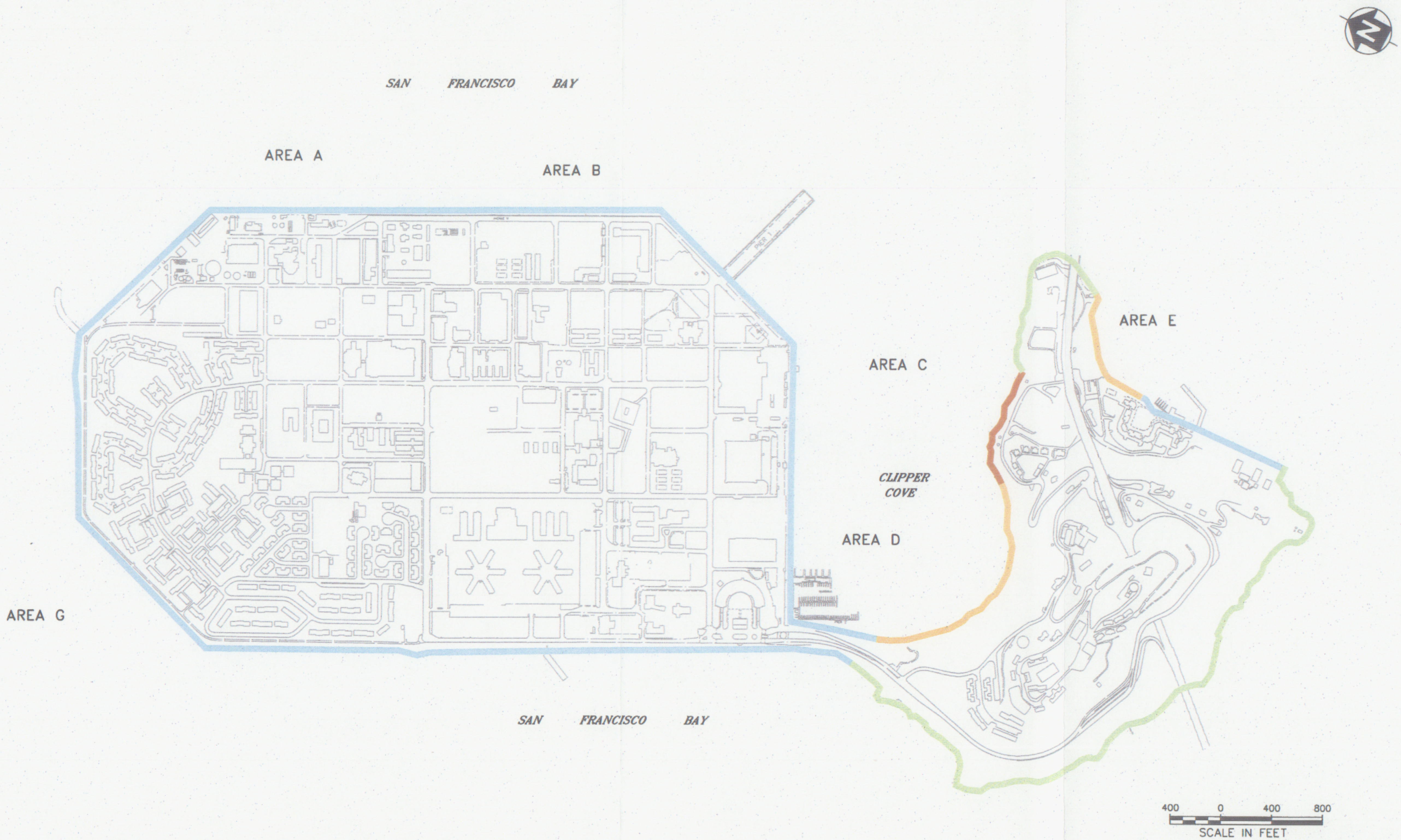
Notes:

* Indicates confirmed presence at NAVSTA TI.

References:

1. Ingles, Lloyd G., 1965. "Mammals of the Pacific States: California, Oregon, and Washington." Stanford University Press, Stanford, CA. Pages 404 - 405.

2. Harvey, J.T. and M.L. Torok. 1994. "Movements, Dive Behaviors, and Food Habits of Harbor Seals (*Phoca vitulina richardsi*) in San Francisco Bay, California." Moss Landing Marine Laboratories. March.



LEGEND:

- RIPRAP AND PIER AREA
- INTERTIDAL SAND/MUDFLAT
- INTERTIDAL ROCKY SHORELINE
- MIXED INTERTIDAL ROCKY SHORELINE AND INTERTIDAL SAND/MUDFLAT

NOTE:

1. ONE FISH, TWO CLAM, AND ONE CRAB TISSUE SAMPLES WERE COLLECTED FROM THE CLIPPER COVE BEACH AREA.
2. TWO CRAB AND ONE POLYCHAETE TISSUE SAMPLES WERE COLLECTED FROM THE INTERTIDAL SAND/MUDFLAT IN AREA E.

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST DIVISION
SAN DIEGO, CALIFORNIA
NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA

Figure 3-1

SHORELINE HABITATS OF NAVSTA TI
Naval Station Treasure Island

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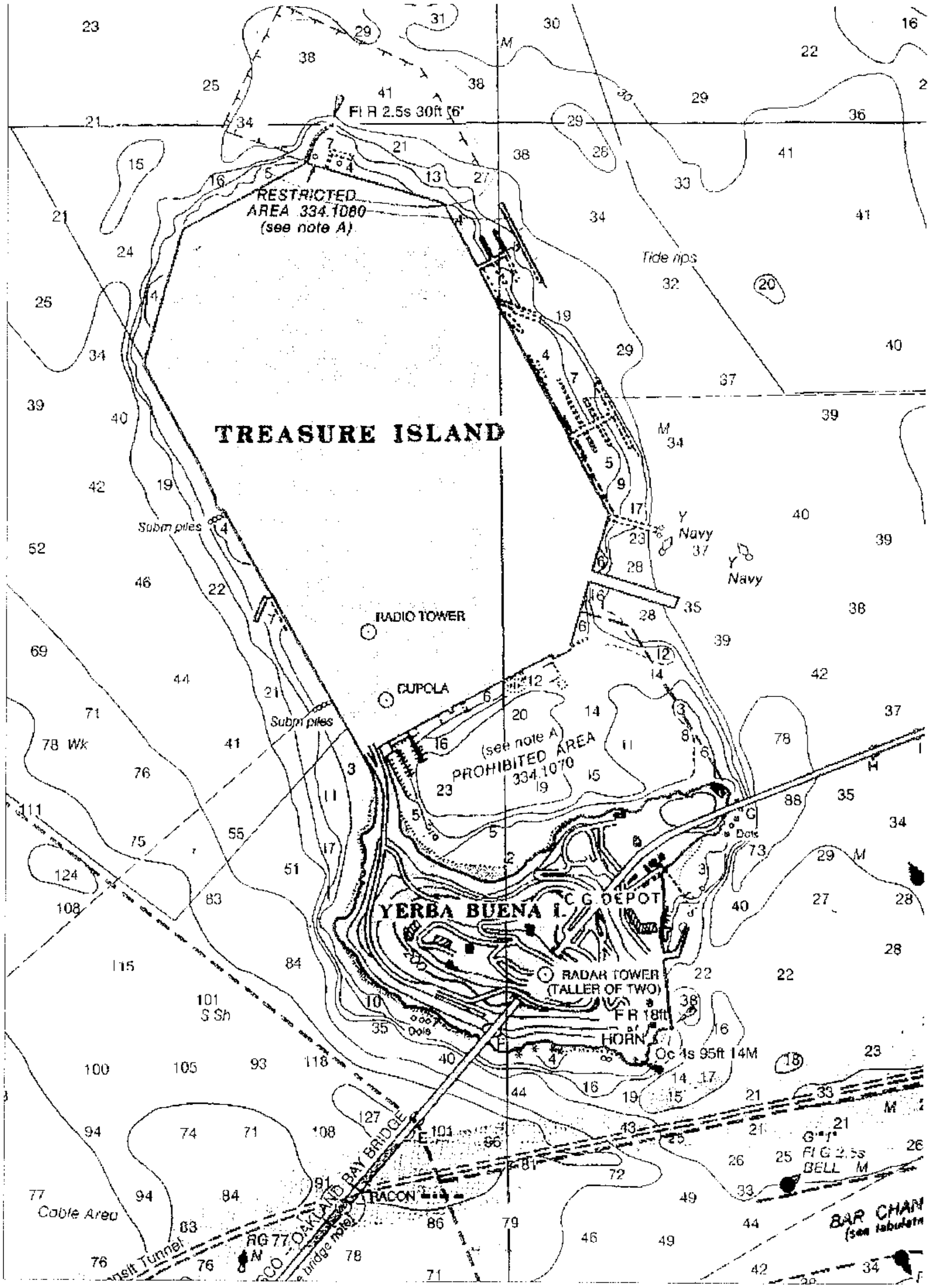


• MAP ADAPTED FROM NOAA CHART 18650

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

SOUTHWEST DIVISION

SAN DIEGO, CALIFORNIA

NAVAL STATION TREASURY ISLAND — SAN FRANCISCO, CALIFORNIA

Figure 3-2

NAVSTA TI Water Depths

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[a]
10	Screening values	Section 2.3	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 1.3.1.1. Tetra Tech. August 13, 2010.

1.3 PREVIOUS INVESTIGATIONS AND RISK CHARACTERIZATION

In 1993, the Water Board issued Order No. 93-130, requiring the Navy to investigate and manage contamination attributable to the skeet range in the Clipper Cove area of NAVSTA TI (Water Board 1993). The order set forth specific compliance requirements and tasks. The Navy has complied with the substantive requirements of the order through the CERCLA process, which included sediment and biological characterization as part of the RI and additional characterization of lead shot in nearshore sediments as part of this FS. Attachment 1 presents the requirements of Water Board Order 93-130 and the CERCLA documents that fulfill them. Once a remedial action plan is implemented, the Navy will have met all provisions of the order.

The following sections summarize the sampling investigations conducted at Site 27. Complete investigation results for sediments at Site 27 are provided in the RI for the Offshore Sediments OU (Tetra Tech 2001) and in Appendix A of this FS. The Phase I and Phase II RIs were not specific to Site 27; however, samples collected in Clipper Cove were used to help further delineate the nature and extent of lead and polycyclic aromatic hydrocarbons (PAH) at Site 27 (Tetra Tech 2001). Chemicals associated with the skeet range (lead shot, lead in sediment, and PAHs) were targeted as potential chemicals of concern at Site 27. A separate offshore sediment investigation was conducted within the boundary of Site 27 in 1996. Data for onshore soil were collected under the Phase IIB RI (Tetra Tech 1997), the Causeway Pipeline investigation (IT Corp. 2003), and the Building 454 EBS data gaps investigation (Shaw 2004). Previous investigations conducted at Site 27 and the results are summarized in Attachment 5.

1.3.1 Site 27 Offshore Investigations

The offshore portion of Site 27 was evaluated in past investigations of the offshore area of Treasure Island as well as under investigations specific to IR Site 27. The results of those investigations are summarized in the following sections. Phase I and Phase II investigations were not limited to Site 27; however, samples were evaluated to help characterize lead and PAHs related to the area associated with the former skeet range activities at Site 27 because the samples were collected in Clipper Cove. The results of the Phase I and Phase II RIs are summarized below and are detailed in the RI for the Offshore Sediments OU (Tetra Tech 2001). The 2008 field investigation of lead shot in the nearshore area is also summarized below and is presented in greater detail in Appendix A. Sample locations from 2008 and previous investigations in Clipper Cove are shown on Figure 7.

1.3.1.1 Sediment Screening Values

Analytical results for sediment samples collected at Site 27 were compared with ambient chemical concentrations in San Francisco Bay sediments. Ambient values developed by the Water Board were used for these comparisons (Water Board 1998). In addition, the sediment data were compared with effects range-low (ER-L) and effects range-median (ER-M) concentrations (Long and others 1995). ER-M and ER-L values were used as guidelines in interpreting and assessing potential effect of sediment chemical concentrations on benthic receptors at NAVSTA TI.

The ER-Ls and ER-Ms are intended to be used as screening tools and have no regulatory status. The ER-L is the chemical concentration measured at the 10th percentile of the effects data for each substance. The ER-M is the chemical concentration measured at the 50th percentile, or median, of the effects data for each substance. Sediment concentrations below the ER-L are interpreted as "rarely" associated with adverse effects. Concentrations between the ER-L and ER-M are "occasionally" associated with adverse effects, and concentrations above the ER-M are "frequently" associated with adverse effects (Long and others 1995).

Three chemical concentration ranges have been defined based on ER-L and ER-M values for several chemical classes, and the reliability of ER-Ls and ER-Ms have been evaluated using percent incidence of adverse effects (Long and others 1995). The percent incidence was 8 percent for adverse effects for lead concentrations below the ER-L, 35.8 percent between the ER-L and ER-M, and 90.2 percent above the ER-M (Long and others 1995).

1.3.1.2 Phase I Remedial Investigation Offshore Sampling

Data were collected under the storm water pollution prevention project during the 1993 Phase I RI sampling at NAVSTA TI (PRC 1993). Fourteen sediment samples were collected directly in front of or near storm water outfalls, and nine storm water samples were collected from storm water drainage outfalls. Samples were analyzed for metals, pesticides, polychlorinated biphenyls (PCB), and PAHs. Eight sediment locations (SS06 to SS08 and SS11 to SS15) and two storm water outfalls (G and F) were sampled in Clipper Cove (see Figure 7).

Lead in sediment was detected in four of the eight samples collected within Clipper Cove during the Phase I RI; however, none of the samples contained lead at concentrations above the ER-L (46.7 milligrams per kilogram [mg/kg]). PAHs were detected in seven of the eight sediment samples collected within Clipper Cove. Three of the sediment samples (SS11, SS12, and SS13), that were collected at depths of 0 to 2 feet below the sediment surface contained concentrations of PAHs above the ER-L (4.2 mg/kg); however, these samples were located outside the Site 27 boundary, as shown on Figure 7. The maximum concentration of PAHs detected (13.96 mg/kg at location SS11) was well below the ER-M (44 mg/kg). Lead and PAH concentrations detected in sediment samples during the Phase I RI, are shown on Figures 8 and 9.

1.3.1.3 1996 Site 27 Clipper Cove Skeet Range Offshore Investigation

As a direct result of Water Board Order No. 93-130 (Water Board 1993), samples were collected in 1996 to define the vertical and horizontal extent of lead, lead shot, and PAHs in offshore sediments and overlying surface water that may have resulted from the skeet range. During this investigation, sediment samples were collected at depths of up to 5 feet below the sediment surface. However, during subsequent investigations, only lead shot in offshore sediment up to 2 feet below the sediment surface was identified as being a potential future risk to diving ducks at

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xi]
11	lead, lead shot	Table 1	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Sections 6.4 through 6.4.4. Tetra Tech. December 28, 2001.

Chromium	H
Copper	A, B, E, G, H, and J
Lead	B, E, and H
Manganese	A, B, D, E, G, H, and J
Mercury	B
Nickel	D and H
Vanadium	A, B, D, G, and H
Zinc	A, B, G, and H

6.4 CLIPPER COVE SKEET RANGE

The following subsections provide the analytical results of the Clipper Cove Skeet Range investigation.

6.4.1 Lead Concentrations in Sediment

Lead was detected in 50 of 72 subsurface sediment samples from the skeet range in Clipper Cove, at concentrations ranging from 6.3 mg/kg to 54.4 mg/kg. All detected concentrations were below the ER-M level. Seven samples contained higher lead concentrations than the ambient level, and five samples contained higher lead concentrations than the ER-L. The highest lead concentrations were generally in the deeper core samples, at depths of 4 to 5 feet. The highest concentrations were detected from locations S4 (54.4 mg/kg and 50.4 mg/kg, at depths of 5 and 4 feet bgs, respectively), S2 (51.4 mg/kg and 50.0 mg/kg, at depths of 5 and 4 feet bgs, respectively), and S8 (49.5 mg/kg at 5 feet bgs). Detected lead concentrations in skeet range sediments are within the range of concentrations detected in Area C and D subsurface sediment samples.

6.4.2 Lead Shot in Sediment

In addition to the chemical analyses, a portion of each 1-foot section of 10 skeet range cores was sieved for lead pellets and a percent lead fraction calculated. The lead pellet fraction determination was a ratio of the weight of solid lead visible as pellets compared to the total weight of the sample. The lead fraction percent ranged from 0.0 to 0.081 percent. The highest lead fraction was found in the 3- to 4-foot depth at sampling location S6. In addition to the lead fraction, the number of lead shot recovered per kilogram of sediment was estimated baed on individual shot weight (0.065 grams per shot) and the total weight of lead shot recovered. The maximum number of lead shot recovered (estimated) per kilogram sediment was 11.91 in the 3- to 4-foot depth interval at sampling location S6; the lead fraction was 0.081. Percent lead fraction decreased to 0.063 percent in the 4 - to 5- foot depth interval at location S6; with 9.25 estimated lead shot recovered per kilogram sediment (Table 6-9). Surface samples produced very low levels of lead shot.

6.4.3 Lead Concentration in Porewater

Four porewater samples were collected from Clipper Cove in February 1996 as part of the Clipper Cove skeet range investigation (PRC 1996b). Samples were collected at locations where bioassays would also be conducted. Lead was not detected in any of the four porewater samples (Table 6-12).

6.4.4 Lead Concentrations Bay Water

Four bay water samples were collected from Clipper Cove in February 1996 as part of the Clipper Cove skeet range investigation (PRC 1996b). Samples were collected 1 to 2 feet above the sediment-water interface (approximately 22 feet below the water surface) and analyzed for lead to assess the effect of the skeet range on the bay water. Figure 4-2 shows sample locations of the water samples collected from Clipper Cove. Lead was not detected in any of the four water samples collected (Table 6-19).

6.5 SUMMARY OF INORGANIC COPECS

Inorganic COPECs for the offshore habitat of NAVSTA TI were identified based on a screening approach that included (1) comparison to local ambient conditions, (2) comparison to effects levels, and (3) consideration of chemicals without screening criteria (as described in Section 5.0). Chemicals in sediment, porewater, stormwater, and bay water were evaluated separately; all of these media are represented in the final list of COPECs.

A complete list of inorganic COPECs is presented in Tables 6-10, 6-11, 6-20, and 6-22 for sediment, porewater, and stormwater samples. The following inorganic chemicals are considered COPECs for the offshore habitat of NAVSTA TI:

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xii]
12	PAHs	Table 1	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 7.4. Tetra Tech. December 28, 2001.

Three pesticides were detected in samples collected offshore of stormwater outfall J, including alpha-chlordane (0.02 μg/L), DDT (0.03 μg/L), and dieldrin (0.01 μg/L). The detected concentrations of all three pesticides were below the acute AWQC and above the chronic AWQC level.

7.3.3 Polychlorinated Biphenyls

No PCBs were detected in stormwater samples; however, the detection limit for these samples was greater than the chronic AWQC, which is a source of uncertainty in the risk characterization (Appendix I).

7.3.4 Summary of Organic COPECs in Stormwater

No additional PCBs or PAH COPECs were identified from stormwater samples; however, several pesticides are considered COPECs due to their concentrations in stormwater. Pesticides were considered COPECs for a stormwater outfall location if the detected concentration exceeded screening criteria described in Section 5. The COPECs in stormwater are summarized in Table 6-22.

Pesticide	Stormwater Outfall Location
DDT	B, E, G, H, and J
Alpha-BHC	A, B, D, and G
Delta-BHC	A, G, and H
Alpha-chlordane	J
Gamma-chlordane	G
Dieldrin	A, E, and J
Endosulfan I	A, B, E, and G
Endrin	A and G
Endrin aldehyde	A and G
Heptachlor	A and G
Heptachlor epoxide	G

7.4 ORGANIC CHEMICALS IN SKEET RANGE SAMPLES

PAHs were the only organic chemicals evaluated in Clipper Cove Skeet Range samples. PAHs were evaluated in sediment, porewater, and bay water.

Sediment: Twenty-five individual PAHs were detected in skeet range subsurface sediment samples. Detected concentrations from each sample in reference to screening values are shown in Figures 7-17 through 7-40 and Table 6-9. Detected concentrations for these compounds were below both the ER-M and ER-L values (Table 6-9). Total PAH concentrations ranged from 297 μg/kg to 2,036 μg/kg, substantially lower than the ER-L level of 4,022 μg/kg. No individual PAHs exceeded screening values. However, no screening values were available for dibenzothiophene; therefore, it was considered a COPEC where detected (S3 and S4).

Porewater: Porewater was analyzed at four locations in the Clipper Cove Skeet Range. No PAHs were detected in any of the four porewater samples.

Bay Water: Four water samples were collected 1 to 2 feet above the water-sediment interface during winter 1996 to analyze the effect of the skeet range on the bay water. No PAHs were detected in any of the four samples collected (PRC 1996b, Appendix I).

7.5 SUMMARY OF ORGANIC COPECS

Organic COPECs detected at the site include PAHs, pesticides, PCBs, and organotins. The high detection limits using CLP methods confound the evaluation of nondetect data (Appendix I). Tables 6-10 and 6-11 list the COPECs in sediment, Table 6-20 lists the COPECs in porewater, and Table 6-22 lists the COPECs in stormwater.

PAHs were detected in all media sampled; total PAH is a COPEC in sediment only in areas A, B, C, D, and E. Benzo(a)pyrene is the only PAH that was detected at a concentration above the ER-M (in one Phase I surface sediment sample only) and is the PAH of highest concern.

A number of pesticides were detected in all media sampled. Most pesticides were detected in Phase I samples only, including the following: alpha-BHC, beta-BHC, gamma-BHC, alpha-chlordane, endosulfan I, endosulfan II, heptachlor, heptachlor expoxide, methoxychlor, and endrin aldehyde. DDT was the only pesticide detected at a concentration above the ER-M; it is considered a COPEC due to the relatively high levels and its potential to biomagnify. All other pesticide COPECs are listed in Tables 6-10, 6-11, 6-20, and 6-22.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xiii]
13	ERA	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections 1.3.2 through 1.3.2.2. Tetra Tech. August 13, 2010.

1.3.2 Site 27 Offshore Ecological Risk Characterization

The following sections summarize the results of the ecological risk assessment (ERA) for Site 27 conducted as part of the RI for the Offshore Sediments OU (Tetra Tech 2001) and the results of the 2008 lead shot investigation in the nearshore area. No human health risk assessment was conducted because there is no pathway for exposure to lead shot in sediment.

1.3.2.1 Exposure Routes and Receptors of Concern

Ingestion of and dermal contact with offshore sediments at Site 27, or direct ingestion of organic material by offshore receptors, constituted the primary routes of exposure to chemicals evaluated in the Offshore RI. Chemicals associated with the skeet range (lead shot, lead in sediment, and PAHs) were targeted as potential chemicals of concern at Site 27.

Incidental ingestion of lead shot by diving ducks was evaluated as a potential receptor pathway. Diving ducks such as the surf scoter (*Melanitta perspicillata*) can penetrate the sediment surface from depths ranging from the length of their head (5 to 6.5 inches) to the length of their entire body (17 to 21 inches) while foraging for food in water as deep as 40 feet (Tetra Tech 1999). Recent hydrographic surveys of IR Site 27 have shown that sediment is continuously being deposited in the Skeet Range area, except within 150 feet of the shoreline. Sediment deposition in the offshore area has effectively covered the lead shot, eliminating the ingestion exposure pathway to diving ducks over most of the site. The offshore risk assessment characterized the exposure pathway to receptors from lead shot as incomplete because the highest concentration of lead shot per kilogram sediment was detected in a sample collected within the 3- to 4-foot depth interval, where an estimated 15.4 lead shot per kilogram of sediment was detected. However, the 2008 nearshore investigation of lead shot found lead buried under 1 foot of sediment in some locations, which is within reach of diving ducks. Therefore, there is a current potential risk to diving ducks from lead shot in the nearshore area of IR Site 27 (see Appendix A). A conceptual site model for the nearshore area (within 75 feet of the shoreline) is presented in Attachment 2a. Future maintenance dredging could potentially result in the disturbance of lead shot so that appropriate land use controls (LUCs) to restrict such activity (or require that such activity be conducted in a manner that properly addresses concerns about sediment disturbance) will be incorporated into the remedial design. The conceptual site model for exposure in the remainder of the skeet range is presented in Attachment 2b.

The risk to aquatic receptors from PAHs was evaluated based on a separate study. In 1990, Battelle conducted a study to assess the composition and concentrations of PAHs in clay targets, sediments, and organisms at a shooting range in the northeast United States to evaluate the potential release of PAHs from site sediments during the remediation process (Baer and others 1995). Trap and skeet targets are composed predominantly of dolomitic limestone and petroleum pitch, bound together under heat and pressure. Petroleum pitch is composed mainly of petrogenic hydrocarbons that are relatively insoluble in water and have low acute aquatic toxicity. Since the hydrocarbons in the pitch are bound under heat and pressure with dolomitic limestone, which is relatively inert biologically, it is unlikely that PAHs would leach from the target matrix. PAH concentrations measured in sediment and marine animals around the site were no higher, and in many instances were lower, than expected, supporting the hypothesis that

PAHs in skeet were not bioavailable (Baer and others 1995). Additionally, acute toxicity studies using mysid shrimp and target leachates showed no toxicity from exposure to targets from the skeet range (Baer and others 1995).

1.3.2.2 Offshore Risk Evaluation Conclusions

Risk to benthic invertebrate and vertebrate receptors from exposure to lead and total PAH at Site 27 was considered minimal in the 1996 Offshore RI based on sediment chemistry and toxicity data. Table 2 presents the values for lead in sediment and PAHs from the Offshore RI (Tetra Tech 2001) and the screening values used in these comparisons, including ambient concentrations, ER-Ls, and ER-Ms. Appendix A presents the lead results for the 2008 lead shot investigation. Although concentrations of lead in sediment exceeded the ER-L at several locations, all concentrations were well below the ER-M. The Offshore Sediments OU RI concluded that chemicals in sediment at Site 27 posed no current risk to human health or the environment. This conclusion has since been revised because the 2008 lead shot investigation in the nearshore area showed that there is current potential risk to diving ducks near the shoreline. This FS addresses the potential for current risk to diving ducks in the nearshore area and future risk to diving ducks in the rest of the site from ingestion of lead shot in the sediment that would be resuspended by dredging.

1.3.3 Site 27 Onshore Investigations

The onshore portion of Site 27 was evaluated in past investigations. The results of these investigations are summarized in the following sections. The onshore area is less than an acre and consists mostly of paved surfaces. There is a narrow strip of dirt where the former Causeway pipeline transected the site. South of the onshore portion of the skeet range is the shoreline, which is covered by riprap. The following sections describe the results of the onshore investigations of IR Site 27.

The main contaminants associated with skeet ranges are lead from the lead shot fired at the skeet targets and PAHs used in manufacturing the skeet (ITRC 2003). Only analytical results for lead and PAHs from previous investigations were evaluated.

1.3.3.1 Phase I Remedial Investigation

One soil boring (25-SB02) was located within the Site 27 boundary during the August 1992 Phase I RI conducted at Site 25, Seaplane Maintenance Area (Figure 11) (PRC 1993). Most of the onshore portion of Site 27 overlaps the western portion of Site 25. Three soil samples were collected and analyzed for lead and PAHs from 1.5 to 2.0 feet below ground surface (bgs), 2.5 to 3.0 feet bgs, and 4.5 to 5.0 feet bgs. No PAHs were detected in the three soil samples (PRC 1993). Although lead was detected in all three samples, none of the sample results were above the TI ambient soil level of 21 mg/kg.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xiv]
14	secondary evaluation	Section 2.5.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 10.0. Tetra Tech. December 28, 2001.

10.0 SELECTION OF CHEMICALS OF ECOLOGICAL CONCERN

This section identifies the inorganic and organic COECs in environmental media (sediment, porewater, and stormwater) at NAVSTA TI offshore sites based on an evaluation of COPECs in each area. Offshore sediment and porewater COECs are based on COPECs identified in the Phase II investigation, which focused on tracking chemicals from onshore sources to offshore sediments.

COPECs identified as a result of the Phase I 1992 stormwater investigation (PRC 1993b) are evaluated separately for selection of storm drain sediment and stormwater COECs. The analytical results for the Phase I samples were used to evaluate which chemicals were discharged to the bay via storm drain discharge and whether those chemicals were detected in nearby offshore sediments during Phase II sampling. Although Phase I COPECs were considered COECs for the storm drain areas if they met the conditions outlined below, data collected during Phase II are considered to be more representative of the current conditions of the offshore sediments, and thus were given more weight in the risk characterization. The Phase II investigation was conducted after the NAVSTA TI storm drain system (storm drain manholes and catch basins) was cleaned in 1996. Approximate locations sampled in Phase I were resampled in Phase II.

With the exception of aluminum, which was evaluated using pH, a COPEC was identified as a COEC if any one of the following conditions were met:

(1) Results for more than 10 percent of the surface samples from a given area exceeded criteria for the primary screening value. For sediment, primary screening included a comparison of ER-Ls, ambient, and reference site maxima. Porewater was compared to AWQC and the reference site maxima (Section 5).

(2) The concentration of the COPEC in any one surface sample is 10 percent greater than the primary screening value from which the COPEC was identified. In Areas C and D, subsurface samples were also evaluated in this way due to the potential for future dredging in the marina area.

(3) A COPEC in surface sediment is a demonstrated bioaccumlator in San Francisco Bay such as mercury, PCBs, dieldrin, chlordanes, and total DDTs (RWQCB 1994a).

Chemicals that did not meet any one of the criteria listed above were further evaluated for toxicity before being removed from the list. A COPEC was retained as a COEC if a review of the toxicological literature identified the chemical as likely to bioaccumulate and bioconcentrate in ecological receptors.

10.1 SELECTION OF INORGANIC COECS

In this section, COPECs identified in Section 6 are evaluated to select inorganic COECs for sediment and porewater. COPECs were summarized in Tables 6-10 and 6-11 (sediment) and 6-20 (porewater). Sediment and porewater COECs identified in Section 10 for all areas of NAVSTA TI are summarized in Table 10-1. COPECs from the Phase I investigation were evaluated separately for se lection of storm drain sediment and stormwater COECs as described above.

Aluminum

Aluminum was identified as a sediment COPEC in areas B, C, D, E, and G, because concentrations at these locations exceeded the maximum reference site concentration (Figure 6 -2). It was identified as a porewater COPEC in areas B, C, D, E, and G because no screening values were available for aluminum (Figure 6-19).

Aluminum was also identified as a sediment COPEC for storm drain areas C and D because Phase I sediment samples were found to exceed the maximum reference site concentration (Figure 6 -2). It was also detected in stormwater outfalls A, B, D, E, G, H, and J in areas A, B, C, D, E, and G (Figure 6-31). No AWQC were available for aluminum.

Although aluminum bioaccumulates in aquatic invertebrates, toxicity depends on pH and is most significant to wildlife in acidic habitats. At low pHs (less than 6.0 to 6.5), aluminum is likely to be more toxic and accumulate more, with asphyxiation, gill tissue damage, and impaired ion regulation occurring in fish at pH 4.5 to 6.5 (Sparling and Lowe 1996 and Spry and Wiener 1991, as cited in Hamelink and others 1994). Toxicity is also likely to be expressed through the food chain at pHs below 5.5 (Sparling and Lowe 1996). The pHs of sediment samples collected from areas B, C, D, E, and G are relatively neutral, ranging from 6.94 to 8.3. The pHs for porewater at these locations range from 6.8 to 7.48. Because aluminum is known to be innocuous at neutral pHs (5.5 to 7.5) (Sparling and Lowe 1996), it is not considered a COEC in sediment or porewater at any location.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xv]
15	lead as a COEC	Section 2.5.2	Final Remedial Investigation, Offshore Sediments Operable Unit, Naval Station Treasure Island, San Francisco, California. Section 10.1. Tetra Tech. December 28, 2001.

C exceeded the screening value by more than 10 percent, while copper concentrations in more than 10 percent of the surface samples from the area D storm drains exceeded the screening value. In addition, copper was identified as a stormwater COPEC at outfalls A, B, E, G, H, and J in areas A, B, C, D, and G (Figure 6-36). Copper in these Phase I stormwater samples exceeded the acute AWQC by more than 10 percent. As a result, copper is considered a storm drain COEC for areas A, B, C, D, and G.

Summary: Copper is a sediment COEC for area D, a storm drain sediment COEC in area D, and a stormwater COEC in areas A, B, C, D, and G (Table 10-1). It is also a porewater COEC for area C and D.

Lead

Lead was identified as a sediment COPEC for areas B, D, E, G and the skeet range because it was detected at levels that exceeded screening values (Figures 6-11 and 6-12). In areas B and D, subsurface samples collected from depths of 2- to 8-foot contained lead at levels that exceeded screening values by more than 10 percent. Although lead in subsurface sediments is not likely to be available to receptors in area B, it may become available to receptors in area D, if dredging occurs. Surface samples from areas E and G also contain levels of lead above screening values. For these reasons, lead is considered a sediment COEC for areas D, E, and G.

In the Clipper Cove Skeet Range, lead is a COEC for subsurface sediments. Lead concentrations in one subsurface sediment sample within the shot fall zone exceeded the ER-L. Also, while lead shot measured in sediment cores at the Clipper Cove Skeet Range was low in surface sediment, the maximum number of lead shot recovered (11.9 per kilogram sediment) was found in the 3- to 4-foot depth interval. Estimated lead shot recovered per kilogram sediment decreased to 9.25 in the 4- to 5-foot depth interval. If sediments in this area are dredged in the future, lead in the subsurface may become available to ecological receptors.

Lead was identified as a stormwater COPEC in areas A, B, and C because it was detected at elevated levels in Phase I stormwater samples from outfalls B, E, and H. Because lead levels exceeded the screening values by more than 10 percent, lead is a stormwater COEC for areas A, B, and C (Figure 6-37).

Summary: Lead is a sediment COEC for areas D, E, G, and the skeet range. It is also a stormwater COEC for areas A, B, and C (Table 10-1).

Manganese

Manganese was identified as is a sediment COPEC for areas B and E and a porewater COPEC for areas B, C, and E (Figure 6-13). Manganese levels at these locations exceeded screening levels by more than 10 percent. Therefore, manganese is considered a COEC in sediment for areas B and E and in porewater for areas B, C, and E.

Manganese was also identified as a COPEC in stormwater for areas A, B, C, D, and G (Figure 6 -38). It was detected in Phase I stormwater samples collected from eve ry outfall located in these areas. Because no screening values were available for manganese, manganese is a stormwater COEC for areas A, B, C, D, and G.

Summary: Manganese is a sediment COEC for areas B and E, and a porewater COEC for areas B, C, and E. It is also a stormwater COEC for areas A, B, C, D, and G (Table 10-1).

Mercury

Mercury is a sediment COPEC for areas A, B, C, D, and E. Mercury concentrations detected at these locations exceeded screening values (Figure 6-14). Because mercury is readily bioconcentrated and has high potential for bioaccumulation and biomagnification, it is considered a sediment COEC for areas A, B, C, D, and E (Eisler 1987a, Kramer and Neidhart 1975).

Mercury is a porewater COPEC for areas B, E, and G because mercury concentrations at locations B8, B9, B10, E8, and G4 exceeded the maximum reference site concentration (Figure 6 -27). Mercury is a porewater COEC for areas B and E because the reference concentration was exceeded by more than 10 percent. Mercury at sample location G4 exceeded the reference maximum by only 7.7 percent; however, because of mercury's bioaccumulation potential, it is considered a porewater COEC for area G as well.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xvi]
16	toxic effects	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section A1.0, fourth paragraph. Tetra Tech. August 13, 2010.

A1.0 INTRODUCTION

This appendix describes the results of the March 2008 lead shot investigation conducted by the Department of the Navy (Navy) at Installation Restoration (IR) Site 27 at Naval Station Treasure Island. A previous Revised Draft Feasibility Study (FS) Report for Site 27 was prepared in 2004 (SulTech 2004). After the Revised Draft FS (SulTech 2004) was submitted, uncertainty about the sediment accumulation and deposition rates in Clipper Cove was identified as a data gap.

Recent hydrographic surveys of IR Site 27 have shown that sediment is naturally being deposited in the Skeet Range area, except within 150 feet of the shoreline. A layer of sediment more than 2 feet thick has been deposited in Clipper Cove since skeet range operations ceased in 1989 (Tetra Tech EM Inc. [Tetra Tech] 2005). This sediment deposition has effectively covered the lead shot, eliminating the ingestion exposure pathway to diving ducks over most of the site. However, it was not known whether an ingestion pathway was complete within 150 feet of the shoreline.

The Navy conducted this additional field investigation of lead shot within 150 feet of the shoreline in 2008 to further characterize the distribution of lead shot in the sediment and support development of the remedial alternatives presented in the Revised Draft FS (SulTech 2004) and determine whether there was potential risk to diving ducks from lead shot in sediment in the nearshore area (SulTech 2008).

Diving ducks may ingest lead shot while they forage in the sediment for prey or grit to aid in digestion. Diving ducks generally dive below the water and forage for grit or for organisms that live in the top 3 inches of sediment (Richman and Lovvorn 2003). Diving ducks such as the surf scoter (*Melanitta perspicillata*) can penetrate the sediment surface from depths from the length of their head (5 to 6.5 inches) to the length of their entire body (17 to 21 inches) while foraging for food in water as deep as 40 feet (Tetra Tech 1999). Ducks may inadvertently ingest lead shot; once it has been ingested, the lead shot may be retained in the gizzard because it is similar in size to other grit used for grinding hard-bodied prey such as shellfish. In the gizzard, the lead shot can be broken down by acids and other grit into toxic lead salts that are absorbed into the bloodstream. Death may occur from chronic poisoning from ingestion of a few pellets or, less often, from acute poisoning after ingestion of a large number of shot (Sanderson and Bellrose 1986). Symptoms of lead poisoning caused by chronic exposure include weight loss, severe wasting of the breast muscles, green-stained vents, and loss of muscle coordination that may lead to an inability to swim or fly, and drooping wings. However, birds that die from acute lead poisoning may not exhibit these signs (Friend 1989). Based on the documented toxic effects of lead shot, ingestion of lead shot poses potential unacceptable risk to diving ducks at Site 27.

Section A2.0 summarizes the sampling methods used in the investigation, Section A3.0 of this appendix presents the results of the analyses. Section A4.0 provides the conclusions, and Section A5.0 lists the references used in preparing this appendix.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xvii]
17	investigation of the nearshore area	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section A2.0. Tetra Tech. August 13, 2010.

A2.0 FIELD SAMPLING

The primary objective of the sediment investigation at Site 27 was to obtain data to characterize the extent of lead shot in the upper 2 feet of nearshore sediments (within 150 feet of the shoreline). The areas of lowest shot fall density at the corners of the site, underneath the existing marina on the west end of the site and to the northeast corner of the site, were not sampled; these are the areas of lowest shot fall density based on the predicted shot fall densities (Attachment 3 of the FS). The areas of lowest shot fall density at the corners of the site are not expected to be affected based on the much lower shot fall density than the surrounding area and the lack of detections in adjacent samples.

As a secondary characterization, residual lead was analyzed in the upper 2 feet of nearshore sediments, as well as grain size, total organic carbon (TOC), and benthic biomass in the upper 3 inches. Benthic biomass refers to organisms that live within the sediment surface that could be available as food forage for diving ducks. The field methods are summarized below and are described in detail in the Sampling and Analysis Plan (SulTech 2008). Photographic documentation of the field effort is presented in Attachment A1.

The field investigation was conducted from March 17 to 21, 2008. Four-inch-diameter core samples were collected from 30 locations using a Vibracore and analyzed for lead shot and total lead (see Figure A-1). Each 2-foot core was divided into 6-inch-long intervals (0 to 6, 6 to 12, 12 to 18, and 18 to 24 inches below ground surface [bgs]), with the initial 0- to 6-inch-bgs interval further subdivided into two 3-inch-long sections (0 to 3 and 3 to 6 inches bgs) for analysis of lead shot. Before the sample was sieved for lead shot, each core was logged in bore log format (Attachment A2). Samples were passed through a sieve and visually inspected for lead shot. Sediment to be analyzed for total lead was collected after the sediment had passed though a screen to ensure that no lead shot was contained in the sample. Total lead was analyzed for four 6-inch intervals per core by U.S. Environmental Protection Agency (EPA) Method 6010B (EPA 1996).

Grab samples were collected in 10 locations using a clamshell grab sampling device for biomass, TOC, and grain size (see Figure A-1). These secondary data were collected in the event they might be needed to assess the availability of food and grit at the site and the potential for diving ducks to use the area. The top 3 inches of sediment was sieved for biomass. A biologist sorted the benthos by taxa in the field and weighed the biomass on an analytical balance. A sample was collected for laboratory analysis of TOC via Standard Method 5310B (American Public Health Association, American Water Works Foundation and Water Environmental Federation 1998) and grain size via ASTM International D4464-00(2005) (ASTM International 2005).

A3.0 RESULTS

Lead shot was detected in samples from eight locations. All shot was found in the 12- to 18- and 18- to 24-inch intervals. The minimum number of shot per 6-inch core was 1 (and the maximum was 46). The shot were completely intact, indicating that they have not been degraded or broken

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xviii]
18	**Lead shot was detected**	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections A3.0 and A4.0. Tetra Tech. August 13, 2010.

The primary objective of the sediment investigation at Site 27 was to obtain data to characterize the extent of lead shot in the upper 2 feet of nearshore sediments (within 150 feet of the shoreline). The areas of lowest shot fall density at the corners of the site, underneath the existing marina on the west end of the site and to the northeast corner of the site, were not sampled; these are the areas of lowest shot fall density based on the predicted shot fall densities (Attachment 3 of the FS). The areas of lowest shot fall density at the corners of the site are not expected to be affected based on the much lower shot fall density than the surrounding area and the lack of detections in adjacent samples.

As a secondary characterization, residual lead was analyzed in the upper 2 feet of nearshore sediments, as well as grain size, total organic carbon (TOC), and benthic biomass in the upper 3 inches. Benthic biomass refers to organisms that live within the sediment surface that could be available as food forage for diving ducks. The field methods are summarized below and are described in detail in the Sampling and Analysis Plan (SulTech 2008). Photographic documentation of the field effort is presented in Attachment A1.

The field investigation was conducted from March 17 to 21, 2008. Four-inch-diameter core samples were collected from 30 locations using a Vibracore and analyzed for lead shot and total lead (see Figure A-1). Each 2-foot core was divided into 6-inch-long intervals (0 to 6, 6 to 12, 12 to 18, and 18 to 24 inches below ground surface [bgs]), with the initial 0- to 6-inch-bgs interval further subdivided into two 3-inch-long sections (0 to 3 and 3 to 6 inches bgs) for analysis of lead shot. Before the sample was sieved for lead shot, each core was logged in bore log format (Attachment A2). Samples were passed through a sieve and visually inspected for lead shot. Sediment to be analyzed for total lead was collected after the sediment had passed though a screen to ensure that no lead shot was contained in the sample. Total lead was analyzed for four 6-inch intervals per core by U.S. Environmental Protection Agency (EPA) Method 6010B (EPA 1996).

Grab samples were collected in 10 locations using a clamshell grab sampling device for biomass, TOC, and grain size (see Figure A-1). These secondary data were collected in the event they might be needed to assess the availability of food and grit at the site and the potential for diving ducks to use the area. The top 3 inches of sediment was sieved for biomass. A biologist sorted the benthos by taxa in the field and weighed the biomass on an analytical balance. A sample was collected for laboratory analysis of TOC via Standard Method 5310B (American Public Health Association, American Water Works Foundation and Water Environmental Federation 1998) and grain size via ASTM International D4464-00(2005) (ASTM International 2005).

A3.0 RESULTS

Lead shot was detected in samples from eight locations. All shot was found in the 12- to 18- and 18- to 24-inch intervals. The minimum number of shot per 6-inch core was 1 (and the maximum was 46). The shot were completely intact, indicating that they have not been degraded or broken over time by wave action or oxidation. The lead shot results are presented in Table A-1 and Figure A-1.

Detected concentrations of total lead in sediment ranged from 24 milligrams per kilogram (mg/kg) to 120 mg/kg. These results were consistent with those previously reported in the offshore area and with San Francisco Bay ambient values. During the 1996 investigation of the offshore sediments of Site 27, 72 sediment samples were collected for analysis of lead, and concentrations ranged from 6.3 to 54.4 mg/kg. The maximum concentration detected in Site 13, the offshore area of Treasure Island including Site 27, was 135 mg/kg (Tetra Tech EM Inc. 2001). The maximum concentration detected during the 2008 lead shot investigation, 120 mg/kg, is lower than the maximum concentration of 135 mg/kg detected within Site 13 (Tetra Tech EM Inc. 2001). The average concentration detected in 2008 was 34 mg/kg, which is below the ambient concentration and within the range of concentrations detected during the 1996 investigation. The record of decision for Site 13 indicated that the Navy, with concurrence from the California Department of Toxic Substances Control (DTSC), the San Francisco Regional Water Quality Control Board (Water Board), and other regulatory agencies and stakeholders, concluded that no further action was necessary because sediments in Site 13 do not pose unacceptable risk to human health or the environment. The ambient value for lead in San Francisco Bay sediment that is less than 100 percent fines is 43.2 mg/kg and the effects range-low (ER-L) is 46.7 mg/kg; only 8 of 120 samples collected in 2008 exceeded the ER-L (Water Board 1998, Long and others 1995). None of the 2008 results exceeded the effects range-median (ER-M) of 218 mg/kg. Based on the concentrations detected at Site 27 in 2008 and throughout Site 13 in previous investigations, lead in sediment is not considered a chemical of ecological concern at Site 27. Results are presented in Tables A-1 and A-2, and Figure A-2.

The biomass samples from the top 3 inches of sediment contained benthic organisms from three phyla: Annelida (segmented worms), Arthropoda (arthropods), and Mollusca (molluscs). The most abundant group identified was Annelida, with up to 73 individual specimens per sample. These worms could serve as food source for diving ducks. The biomass data are presented in Attachment A3.

TOC results ranged from 15,959 to 22,312 mg/kg, or about 2 percent weight by weight in sediment. The TOC data are presented in Table A-2.

Grain size analysis of the surface grab samples indicated that the top 6 inches of sediment were composed of silt and clay. Clay particles made up a majority of each sample, ranging from 52 percent to 69 percent. Grain size data are presented in Table A-2.

The chains of custody for all analytical samples are provided in Attachment A4. The field log notes are presented in Attachment A5. The laboratory data reports are provided in Attachment A6.

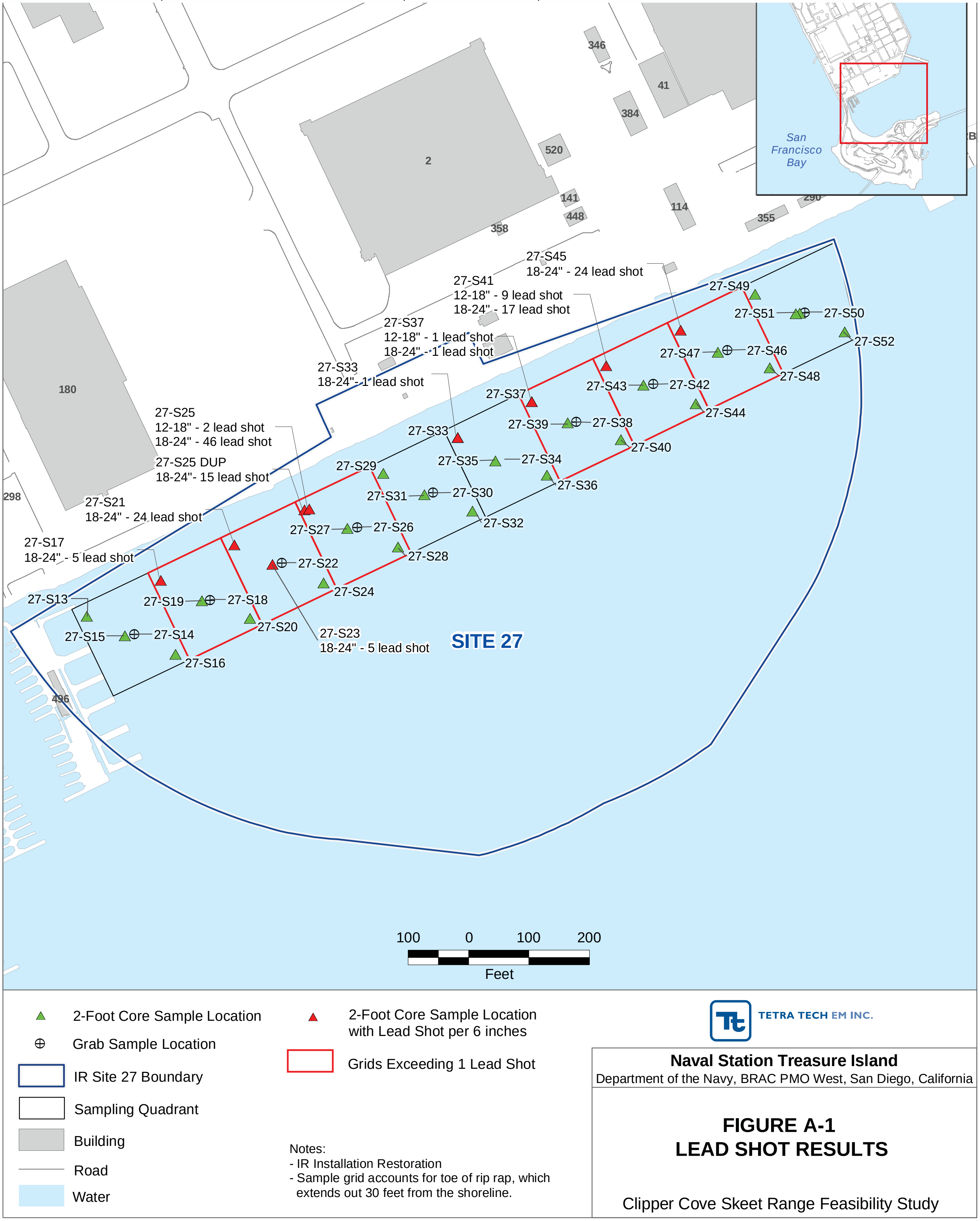
A4.0 CONCLUSIONS

Lead shot in the nearshore area is buried by as little as 1 foot of sediment. Therefore, there is a potentially complete exposure pathway for diving ducks. The concentrations of total lead are consistent with other offshore samples collected at Treasure Island and in San Francisco Bay. Therefore, the only contaminant of concern at IR Site 27 is lead shot.

The secondary characterization data (biomass, TOC, and grain size) confirm that there is suitable foraging material for diving ducks in the nearshore area. During the field investigation, diving ducks were observed at IR Site 27.

The results and conclusions of this investigation were used to support development of remedial alternatives in the FS.

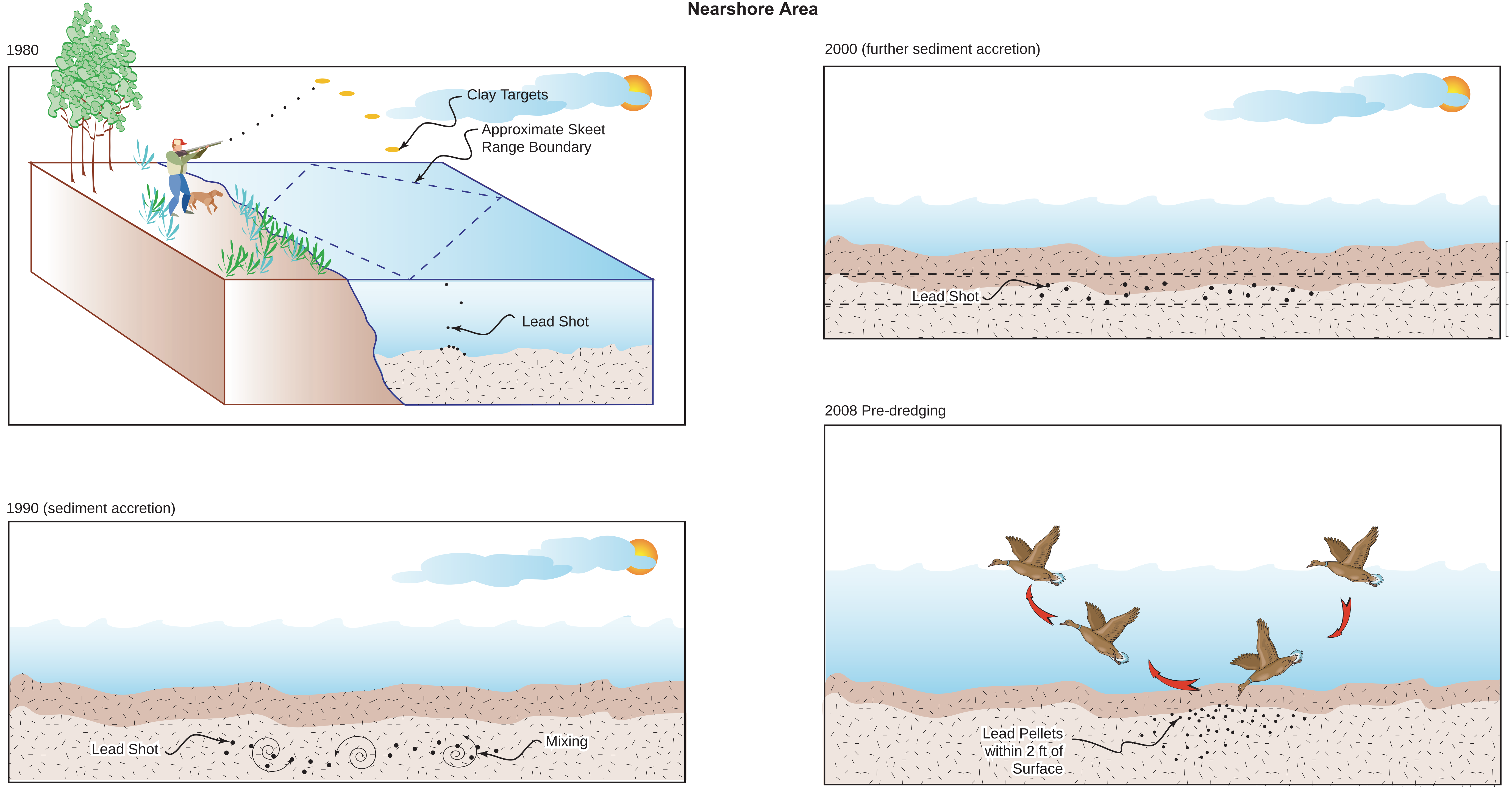
Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xix]
19	eight of 30 locations	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Figure A-1. Tetra Tech. August 13, 2010.



5/28/2008 V:\Projects\B078 - TI Site 27\SAP\Figure 3_2.mxd SULLIVAN - SD AWren

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record**
20	conceptual site model	Section 2.5.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Attachment 2a. Tetra Tech. August 13, 2010.

Nearshore Area



TETRA TECH

Naval Station Treasure Island
Department of the Navy, BRAC PMO, San Diego, CA

ATTACHMENT 2a
SITE CONCEPTUAL MODEL AND POTENTIAL EXPOSURE FOR DIVING DUCKS

CLIPPER COVE SKEET RANGE FEASIBILITY STUDY

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxi]
21	general response actions (GRA)	Section 2.8	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections 2.3 and 3.3. Tetra Tech. August 13, 2010.

2.3 GENERAL RESPONSE ACTIONS

GRAs are broad classes of actions that will satisfy RAOs for the site. Based on EPA guidance (1988), GRA categories may include treatment, containment, excavation, extraction, disposal, institutional controls, no action, or a combination of these actions. At Site 27, the only immediate concern is that the lead shot contamination within 75 feet poses potential risk to ecological receptors (diving ducks). The available depth of sediments to diving ducks is 0 to 2 feet, and lead shot is found in the nearshore area below 1 foot of sediment in some areas. Therefore, there is no current risk in the remainder of the site, where lead shot is buried under more than 2 feet of sediment. Given the nature of contamination at Site 27, the GRAs in this FS Report are limited to no action, institutional controls (IC), and active remediation. Other commonly used GRAs, such as monitored natural recovery, are not discussed because they are not applicable at Site 27. The following sections discuss each of the following GRAs and its applicability to Site 27.

- **No Action –** Under the no action remedial alternative, no remedial measures would be taken at the site
- **Institutional Controls –** ICs are non-engineered instruments such as administrative or legal controls that minimize the potential for exposure to contaminants by limiting land or resource use
- **Treatment Technologies –** This category encompasses treatments for contaminated sediments to reduce or eliminate the exposure of contaminants to potential receptors
- **Sediment Removal –** Contaminated sediment would be dredged and removed from the site to eliminate the exposure pathway to potential receptors
- **Sediment Disposal** – Contaminated sediment will need to be disposed of off site

3.0 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

RAOs have been developed, potential ARARs have been identified and reviewed, and GRAs have been proposed in Section 2.0. The next step toward development of remedial alternatives is the preliminary screening of remedial technologies and process options. Only the remedial technologies that are potentially applicable to Site 27 will be evaluated and discussed in this section. During screening, the range of remedial technologies and process options is reduced in terms of technical practicability, site conditions, waste characteristics, and contaminant properties, as well as the ability to meet the requirements of the NCP and the RAOs.

Cost

The costs of a monitoring program would depend on the type of monitoring, the size of the area monitored, and the duration of monitoring. Generally, the cost would be low to medium compared with other elements of an active remedy.

Screening Results

All three types of monitoring are retained for evaluation as a component of the remedial alternatives in Section 4.0.

3.3 SUMMARY OF SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

The screening section (Section 3.2) presented the evaluation of the various technologies for effectiveness, implementability, and cost, and eliminated technologies that would not effectively address sediment contamination at Site 27. Table 4 summarizes the results of the initial screening of remedial technologies and process options and identifies the technologies that were eliminated from consideration in this FS Report. Based on the screening, the following GRAs were retained:

- No Action
- ICs
- Sediment Removal
- Sediment Disposal

The retained process options for the GRAs include:

- Restricted Land Uses and Restricted Activities
- Sediment Monitoring
- Mechanical (Closed-bucket) Dredging
- Sediment Landfill Disposal
- Sediment Upland Disposal/Beneficial Reuse

Aside from effectiveness, implementability, and cost considerations, professional judgment and information from vendors were also used to screen the site GRAs.

3.4 IDENTIFICATION OF ALTERNATIVES FOR DETAILED ANALYSIS

Based on the results from the technology and process option screening, three remedial alternatives have been identified that will be carried forward into the detailed and comparative analysis in this FS Report. Brief descriptions of these three alternatives are provided below, with more detailed descriptions in Section 4.0 of this FS.

TABLE C-1: ALTERNATIVE 2a -- COST OPINION FOR FOCUSED DREDGING AND BACKFILL WITH LANDFILL DISPOSAL OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
A	**Focused Dredging**									
1	**Direct Cost**									
i	**Mobilization**									
	Permitting	EA	1	$ 75,000	1	$ 75,000	$ 75,000	$ 75,000		Assumed
	Mobilize heavy equipment (Dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Both land- and water-based dredging will be required, so 2 mobilization will be needed.	Means 2010, #35 20 23 13 0100, Heavy Construction Cost Data - Unit Price
	Setup temporary office facilities (Trailer, decontamination area, toilets, fencing, and signs)	MO	12	$ 3,000	1.238	$ 3,714	$ 44,568	$ 49,025	Estimated time for dredging and dewatering	Means 2005, #99 04 0103, #99040301, #99 04 0401 Envir. Remed. Cost Data - Unit Price
	Truck scale rental	MO	12	$ 3,221	1.238	$ 3,988	$ 47,851	$ 52,636	Same as above	Means 2005, #33 01 0462, Envir. Remed. Cost Data - Unit Price
	Baseline monitoring/Hydrographic survey	EA	2	$ 10,000	1	$ 10,000	$ 20,000	$ 20,000		Assumed
	Health & safety program	EA	1	$ 20,000	1	$ 20,000	$ 20,000	$ 20,000		Assumed
	Subtotal							**$ 391,219**		
ii	**Sediment Removal, Backfill and Transport to Drying Facility**									
	Utility Clearance	EA	1	$ 3,000	1	$ 3,000	$ 3,000	$ 3,000		Assumed
	Dredging with Environmental Clamshell Bucket	BCY	11,180	$ 14	1.238	$ 17	$ 188,235	$ 188,235		Means 2010, #35 20 23 13 0510, Heavy Construction Cost Data - Unit Price
	Construction Monitoring	LS	1	$ 10,000	1	$ 10,000	$ 10,000	$ 10,000		Assumed
	Backfill, Sand, 18 inch, Haul and Placed	BCY	6,760	$ 10	1	$ 10	$ 67,600	$ 67,600		Assumed
	Backfill, Rock, 12 inch, Haul and Placed	BCY	4,420	$ 15	1	$ 15	$ 66,300	$ 66,300		Assumed
	Subtotal							**$ 335,135**		
iii	**Construction and Operation of Drying Facility**									
	Equipment Mobilization	EA	4	$ 565	1.238	$ 699.47	$ 2,798	$ 2,798	Assuming (2) Dozers, (2) loaders	Means 2010, #01 54 36 50 0400 Site Work & Landscape Cost Data - Unit Price (Earthwork)
	Site Preparation, Soil Scraping	CY	2,016	$ 2	1.238	$ 3	$ 5,867	$ 5,867	Assuming 2.5 acre sites, 6" topsoil scraping	Means 2010, #31 14 13 23 1420, Heavy Construction Cost Data - Unit Price
	Soil berm	BCY	1,760	$ 26	1.238	$ 32	$ 56,651	$ 56,651	Assume berm is 3.5 feet high, 3 feet wide at top, 19 feet wide at bottom, 1:1 slope inside and 2:1 slope outside; cost includes cost of materials, equipment and labor for soil berm construction	Means 2010 #31 23 23 15 7080, Heavy Construction Cost Data - Unit Price
	Soil berm compaction	ECY	1,760	$ 0.4	1.238	$ 1	$ 937	$ 937	12-inch lifts; 2 passes	Means 2010 #31 23 23 15 7080, Heavy Construction Cost Data - Unit Price

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxii]
22	**Present-Value Cost: $2.9 million**	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-1. Tetra Tech. August 13, 2010.

TABLE C-1: ALTERNATIVE 2a -- COST OPINION FOR FOCUSED DREDGING AND BACKFILL WITH LANDFILL DISPOSAL OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
	Gravel drainage base (spread and compacted)	SY	12,100	$ 10	1.238	$ 13	$ 156,539	$ 156,539	Assuming 2.5 acre sites, 1' deep	Means 2010, #32 11 23 23 0400, Site Work & Landscape Cost Data - Unit Price
	Geotextile filter fabric	SY	3,025	$ 2	1.238	$ 3	$ 7,601.49	$ 7,601.49	Assuming 2.5 acre sites	Means 2010, #33 46 26 10 0100, Site Work & Landscape Cost Data - Unit Price
	Piping to stormwater drainage system	LF	800	$ 13	1.238	$ 16	$ 12,578	$ 12,578	Assuming 2.5 acre sites	Means 2010, #33 31 13 25 2080, Site Work & Landscape Cost Data - Unit Price
	Grading and tilling of sediments	CY	11,180	$ 1	1.238	$ 1	$ 13,979	$ 13,979		Means 2010, #31 22 16 10 1020, Site Work & Landscape Cost Data - Unit Price
	Water content testing (on-site)	EA	704	$ 4	1	$ 4	$ 2,464	$ 2,464	Assuming weekly testing, 16 per week over an 11-month period.	Assumed
	Subtotal							**$ 259,414**		
iv	**Sampling and Analysis**									
	Confirmation sampling of sediment removal	EA	18	$ 1,000	1	$ 1,000	$ 18,000	$ 18,000	Assuming 1 per 100-foot interval	Assumed
	Sampling, analysis, and reporting of sediment chemistry	EA	6	$ 1,500	1	$ 1,500	$ 9,000	$ 9,000	Assuming 1 per 2,000 CY	Assumed
	Subtotal							**$ 27,000**		
v	**Transportation & Disposal of Excavated Material**									
	Volume of sediments, berm, and gravel	CY	16,969						Total summation of sediments and berm materials	
	Sediment Loading	TON	20,363	$3.50	1	$3.50	$71,271	$71,271	Assuming 1.2 tons/cy density after drying	Quote from Waste Management for Altamont Landfill Class II Disposal
	Landfill Disposal	TON	20,363	$ 16	1	$ 16	$325,811	$325,811	Same as above	Quote from Waste Management for Altamont Landfill Class II Disposal
	Transportation via end dumps	TON	20,363	$ 15	1	$ 15	$305,447	$305,447	Same as above	Same as above
	Mob/Demob of loading equipment	LS	1	$ 1,300	1	$ 1,300	$1,300	$1,300		WM email dated 3/16/2010
	Subtotal							**$703,829**		
vi	**Demobilize**									
	Demobilize heavy equipment (Dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Dredge and 2 On-site haul trucks	Means 2010, #35 20 23 13 0100, Heavy Construction Cost Data - Unit Price
	General area cleanup	ACR	2.5	$ 323.3	1.238	$ 400	$ 1,001	$ 1,101	Drying Areas	Means 2005, #17 04 0101, Envir. Remed. Cost Data - Unit Price
	Subtotal							**$ 175,659**		
	Subtotal Direct Cost							**$ 1,892,256**		
	Contingencies (15% of subtotal direct cost)							$ 283,838		
	Insurance (5% of direct cost)							$ 94,613		
	Total Direct Cost							**$ 2,270,707**		

TABLE C-1: ALTERNATIVE 2a -- COST OPINION FOR FOCUSED DREDGING AND BACKFILL WITH LANDFILL DISPOSAL OF SEDIMENT
Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
2	**Indirect Cost**									
i	**Construction Management**								Assuming 1 year dredging and drying, mob/demob, transportation and site cleanup	
	Construction Manager	WK	52	$ 1,647	1.238	$ 2,039	$ 106,027	$ 116,630	8 hour days	Means 2005, #99 01 0102, Envir. Remed. Cost Data - Unit Price
	Field Supervisor	WK	52	$ 1,575	1.238	$ 1,950	$ 101,392	$ 111,531	8 hour days	Means 2005, #99 01 0202, Envir. Remed. Cost Data - Unit Price
	Subtotal							**$ 228,161**		
	Office Overhead (5% of construction management staff cost)							$ 11,408		
	General & Administration (5% of construction management staff cost)							$ 11,408		
	Contingencies (15% of subtotal indirect cost)							$ 34,224		
	Total Indirect Cost							**$ 285,202**		
ii	**Other Cost**									
	Design (3% of direct cost)							$ 68,121		Assumed
	Subtotal							**$ 68,121**		
	Contingencies (15% of subtotal other cost)							$ 10,218		
	Total Other Cost							**$ 78,339**		
	Total Construction Direct Cost							**$ 2,634,249**		
B	**Post-Dredge Survey**									
	Sediment Profile Survey	EA	1	$ 10,000	1	$ 10,000	$ 10,000	$ 10,000	One event one year after implementing remedy	Assumed
	Subtotal							**$ 10,000**		
	Contingency (15% of subtotal IC cost)							$ 1,500		
	Total Post-Dredging Monitoring Cost							**$ 11,500**		
C	**Institutional Controls**									
1	**Capital Cost**									
	Planning (Documents, Meetings)	LS	1	$ 30,000	1	$ 30,000	$ 30,000	$ 30,000		Assumed
	IC Implementation	LS	1	$ 30,000	1	$ 30,000	$ 30,000	$ 30,000		Assumed
	Site Close-out Documentation (@ year 30)	LS	1	$ 50,000	1	$ 50,000	$ 50,000	$ 18,000		Assumed

TABLE C-1: ALTERNATIVE 2a -- COST OPINION FOR FOCUSED DREDGING AND BACKFILL WITH LANDFILL DISPOSAL OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
2	**Periodical Cost**									
	Monitoring and inspection (start from 5th year, up to 30 years)	EA	6	$ 10,000	1	$ 10,000	$ 60,000	$ 21,600	Assuming once every 5 years	Assumed
	IC Enforcement (Annually for 30 years)	EA	30	$ 5,000	1	$ 5,000	$ 150,000	$ 54,000		Assumed
	5-year Review	EA	6	$ 15,000	1	$ 15,000	$ 90,000	$ 32,400		Assumed
	Subtotal							**$ 186,000**		
	Contingency (15% of subtotal IC cost)							$ 27,900		
	Total ICs Cost							**$ 213,900**		
	Total Cost for Alternative 2 with Landfill Disposal							**$ 2,860,000**		

Notes:

Cost estimate was done using data from RS Means references (2010) and (2005), local contractor quote, and professional assumptions. Unit price obtained from Means Environmental Remediation, Heavy Construction Cost, and Site Work & Landscape were adjusted with a location multiplier of 1.238. Means Heavy Construction quotes were done in software, location adjustment was automatically included in the quoted prices

A bulking factor of 30 percent is assumed.

An escalation factor of 1.1 percent was used to escalate the value in 2005 to 2010 (Turner Building Cost Index 2010).

Final Cost was rounded to $1,000.

Discount factor = $\frac{1}{(1+i)^t}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and t = year (i.e., the present value of the dollar paid in year t)

Multi-year discount factor = $\frac{(1+i)^n - 1}{i(1+i)^n}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and n = total number of years

t	i (%)
3	2.1
5	2.3
7	2.4
10	2.6
20	2.8
30	2.8

%	Percent	LF	linear feet
ACR	Acre	LS	Lump sum
BCY	Bulk cubic yard	MO	Month
CY	Cubic yard	SF	Square foot
EA	Each	SY	Square yard
IC	Institutional control	WK	Week

TABLE C-2: ALTERNATIVE 2b -- COST OPINION FOR FOCUSED DREDGING AND BACKFILL WITH BENEFICIAL REUSE OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
A	**Focused Dredging**									
1	**Direct Cost**									
i	**Mobilization**									
	Permitting	EA	1	$ 75,000	1	$ 75,000	$ 75,000	$ 75,000		Assumed
	Mobilize heavy equipment (dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Both land- and water-based dredging will be required, so 2 mobilization will be needed.	Means 2010, #35 20 23 13 0100, Heavy Construction Cost Data - Unit Price
	Setup temporary office facilities (Trailer, decontamination area, toilets, fencing, and signs)	MO	2	$ 3,000	1.238	$ 3,714	$ 7,428	$ 8,171	Estimated time for dredging	Means 2005, #99 04 0103, #99 04 03 01, #99 04 0401 Envir. Remed. Cost Data - Unit Price
	Truck scale rental	MO	2	$ 3,221	1.238	$ 3,988	$ 7,975	$ 8,773	Estimated time for dredging	Means 2005, #33 01 0462, Envir. Remed. Cost Data - Unit Price
	Baseline monitoring/Hydrographic survey	EA	2	$ 10,000	1	$ 10,000	$ 20,000	$ 20,000		Assumed
	Health & safety program	EA	1	$ 20,000	1	$ 20,000	$ 20,000	$ 20,000		Assumed
	Subtotal							**$ 306,502**		
ii	**Sediment Removal, Backfill and Transport to Beneficial Reuse Site**									
	Utility clearance	EA	1	$ 3,000	1	$ 3,000	$ 3,000	$ 3,000		Assumed
	Dredging with environmental clamshell bucket	BCY	11,180	$ 14	1.238	$ 16.84	$ 188,235	$ 188,235		Means 2010, #35 20 23 13 0510, Heavy Construction Cost Data - Unit Price
	Construction Monitoring	LS	1	$ 10,000	1	$ 10,000	$ 10,000	$ 10,000		Assumed
	Backfill, Sand, 18 inch, Haul and Placed	BCY	6,760	$ 10	1	$ 10	$ 67,600	$ 67,600		Assumed
	Backfill, Rock, 12 inch, Haul and Placed	BCY	4,420	$ 15	1	$ 15	$ 66,300	$ 66,300		Assumed
	Transport and offload sediment to onshore site	BCY	11,180	$ 31	1.238	$ 39	$ 431,004	$ 431,004	Assuming Montezuma Wetlands and 100 miles roundtrip	Means 2010, #31 23 23 20 1084, Heavy Construction Cost Data - Unit Price
	Reuse site tipping fee	BCY	11,180	$ 28	1	$ 28	$ 313,040	$ 313,040		Quote from US Army Corps of Engineers
	Subtotal							**$ 1,079,179**		
iii	**Sampling and Analysis**									
	Confirmation sampling of sediment removal	EA	18	$ 1,000	1	$ 1,000	$ 18,000	$ 18,000	Assuming 1 per 100-foot interval	Assumed
	Subtotal							**$ 18,000**		

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxiii]
23	**Present-Value Cost: $2.2 million**	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-2. Tetra Tech. August 13, 2010.

TABLE C-2: ALTERNATIVE 2b -- COST OPINION FOR FOCUSED DREDGING AND BACKFILL WITH BENEFICIAL REUSE OF SEDIMENT
Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
iv	**Demobilize**									
	Demobilize heavy equipment (Dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Dredge and 2 On-site haul trucks	Means 2010, #35 20 23 13 0100, Heavy Construction Cost Data - Unit Price
	Subtotal							**$ 174,558**		
	Subtotal Direct Costs							**$ 1,578,239**		
	Contingencies (15% of subtotal direct costs)							$ 236,736		
	Insurance (5% of direct cost)							$ 78,912		
	Total Direct Cost							**$ 1,893,886**		
2	**Indirect Cost**									
i	**Construction Management**								Assuming 2 months dredging, mob/demob, transportation and site clean up	
	Construction Manager	WK	8	$ 1,647	1.238	$ 2,039	$ 16,312	$ 17,943	8 hour days	Means 2005, #99 01 0102, Envir. Remed. Cost Data - Unit Price
	Field Supervisor	WK	8	$ 1,575	1.238	$ 1,950	$ 15,599	$ 17,159	8 hour days	Means 2005, #99 01 0202, Envir. Remed. Cost Data - Unit Price
	Subtotal							**$ 35,102**		
	Office Overhead (5% of construction management staff cost)							$ 1,755		
	General & Administration (5% of construction management staff cost)							$ 1,755		
	Contingencies (15% of subtotal indirect cost)							$ 5,265		
	Total Indirect Cost							**$ 43,877**		
ii	**Other Cost**									
	Design (3% of direct cost)							$ 56,817		Assumed
	Subtotal							**$ 56,817**		
	Contingencies (15% of subtotal other cost)							$ 8,522		
	Total Other Cost							**$ 65,339**		
	Total Construction Direct Cost							**$ 2,003,103**		
B	**Post-Dredge Survey**									
	Sediment Profile Survey	EA	1	$10,000	1	$ 10,000	$ 10,000	$ 10,000	One event one year after implementing remedy	Assumed
	Subtotal							**$ 10,000**		
	Contingency (15% of subtotal IC cost)							$ 1,500		
	Total Post-Dredging Monitoring Cost							**$ 11,500**		

TABLE C-2: ALTERNATIVE 2b -- COST OPINION FOR FOCUSED DREDGING AND BACKFILL WITH BENEFICIAL REUSE OF SEDIMENT
Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
C	**Institutional Controls**									
1	**Capital Cost**									
	Planning (Documents, Meetings)	LS	1	$ 30,000	1	$ 30,000	$ 30,000	$ 30,000		Assumed
	IC Implementation	LS	1	$ 30,000	1	$ 30,000	$ 30,000	$ 30,000		Assumed
	Site Close-out Documentation (@ year 30)	LS	1	$ 50,000	1	$ 50,000	$ 50,000	$ 18,000		Assumed
2	**Periodical Cost**									
	Monitoring and inspection (start from 5th year, up to 30 years)	EA	6	$10,000	1	$ 10,000	$ 60,000	$ 21,600	Assuming once every 5 years	Assumed
	IC Enforcement (Annually for 30 years)	EA	30	$ 5,000	1	$ 5,000	$ 150,000	$ 54,000		Assumed
	5-year Review	EA	6	$ 15,000	1	$ 15,000	$ 90,000	$ 32,400		Assumed
	Subtotal							**$ 186,000**		
	Contingency (15% of subtotal ICs cost)							$ 27,900		
	Total ICs Cost							**$ 213,900**		
	Total Cost for Alternative 2 with Sediment Reuse							**$ 2,229,000**		

Notes:

Cost estimate was done using data from RS Means references (2010) and (2005), local contractor quote, and professional assumptions. Unit price obtained from Means Environmental Remediation, Heavy Construction Cost, and Site Work & Landscape were adjusted with a location multiplier of 1.238. Means Heavy Construction quotes were done in software, location adjustment was automatically included in the quoted prices
A bulking factor of 30 percent is assumed.
An escalation factor of 1.1 percent was used to escalate the value in 2005 to 2010 (Turner Building Cost Index 2010).
Final Cost was rounded to $1,000.

Discount factor = $\frac{1}{(1+i)^t}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and t = year (i.e., the present value of the dollar paid in year t)

Multi-year discount factor = $\frac{(1+i)^n - 1}{i(1+i)^n}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and n = total number of years

t	i (%)
3	2.1
5	2.3
7	2.4
10	2.6
20	2.8
30	2.8

%	Percent	LF	linear feet
ACR	Acre	LS	Lump sum
BCY	Bulk cubic yard	MO	Month
CY	Cubic yard	SF	Square foot
EA	Each	SY	Square yard
IC	Institutional control	WK	Week

TABLE C-3: ALTERNATIVE 3a -- COST OPINION FOR SIDE-WIDE DREDGING AND LANDFILL DISPOSAL OF SEDIMENT
Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Subtotal (2010$)	Quantity Assumptions	Unit Cost Assumptions
A	**Full-Scale Dredging**									
1	**Direct Cost**									
i	**Mobilization**									
	Permitting	EA	1	$ 75,000	1	$ 75,000	$ 75,000	$ 75,000		Assumed
	Mobilize heavy equipment (Dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Both land- and water-based dredging will be required, so 2 mobilization will be needed.	Means 2010, #35 20 23 13 0100, Heavy Construction Cost Data - Unit Price
	Setup temporary office facilities (Trailer, decontamination area, toilets, fencing, and signs)	MO	72	$ 3,000	1.238	$ 3,714	$ 267,408	$ 294,149	Estimated time for dewatering	Means 2005, #99 04 0103, #99 04 03 01, #99 04 0401 Envir. Remed. Cost Data - Unit Price
	Truck scale rental	MO	72	$ 3,221	1.238	$ 3,988	$ 287,107	$ 315,818	Estimated time for dewatering	Means 2005, #33 01 0462, Envir. Remed. Cost Data - Unit Price
	Baseline monitoring/Hydrographic survey	EA	2	$ 30,000	1	$ 30,000	$ 60,000	$ 60,000		Assumed
	Health & safety program	EA	1	$ 50,000	1	$ 50,000	$ 50,000	$ 50,000		Assumed
	Subtotal							**$ 969,525**		
ii	**Sediment Removal and Transport to Drying Facility**									
	Utility Clearance	EA	1	$ 5,500	1	$ 5,500	$ 5,500	$ 5,500		Assumed
	Dredging with Environmental Clamshell Bucket	BCY	214,000	$ 14	1.238	$ 17	$ 3,603,075	$ 3,603,075	CY calculated using Microstation	Means 2010, #35 20 23 13 0510, Heavy Construction Cost Data - Unit Price
	Construction Monitoring	LS	1	$ 30,000	1	$ 30,000	$ 30,000	$ 30,000		Assumed
	Subtotal							**$ 3,638,575**		
iii	**Construction and Operation of Drying Facility**									
	Equipment Mobilization	EA	8	$ 565	1.238	$ 699	$ 5,596	$ 5,596	Assume (4) Dozers, (4) loaders	Means 2010, #01 54 36.50 0400 Site Work & Landscape Cost Data - Unit Price (Earthwork)
	Site Preparation, Soil Scraping	CY	8,066	$ 2	1.238	$ 3	$ 23,466	$ 23,466	Assume 10 acre sites, 6" topsoil scraping	Means 2010, #31 14 13 23 1420, Heavy Construction Cost Data - Unit Price
	Soil berm	BCY	3,520	$ 26	1.238	$ 32	$ 113,302	$ 113,302	Assume berm is 3.5 feet high, 3 feet wide at top, 19 feet wide at bottom, 1:1 slope outside and 2:1 slope inside; cost includes cost of materials, equipment and labor for soil berm construction	Means 2010 #31 23 23 15 7080, Heavy Construction Cost Data - Unit Price
	Soil berm compaction	ECY	3,520	$ 0.4	1.238	$ 1	$ 1,874	$ 1,874	12-inch lifts; 2 passes	Means 2010 #31 23 23 15 7080, Heavy Construction Cost Data - Unit Price
	Gravel drainage base (spread and compacted)	SY	48,400	$ 10	1.238	$ 13	$ 626,156	$ 626,156	Assume 10 acre sites, 1' deep	Means 2010, #32 11 23.23 0400, Site Work & Landscape Cost Data - Unit Price
	Geotextile filter fabric	SY	12,099	$ 2	1.238	$ 3	$ 30,406	$ 30,405.95	Assume 10 acre sites	Means 2010, #33 46 26 10 0100, Site Work & Landscape Cost Data - Unit Price

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxiv]
24	Present-Value Cost: $21.0 million	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-3. Tetra Tech. August 13, 2010.

TABLE C-3: ALTERNATIVE 3a -- COST OPINION FOR SIDE-WIDE DREDGING AND LANDFILL DISPOSAL OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Subtotal (2010$)	Quantity Assumptions	Unit Cost Assumptions
	Piping to stormwater drainage system	LF	3,840	$ 13	1.238	$ 16	$ 60,375	$ 60,375	Assume 10 acre sites	Means 2010, #33 31 13 25 2080, Site Work & Landscape Cost Data - Unit Price
	Grading and tilling of sediments	CY	214,000	$ 1	1.238	$ 1	$ 267,581	$ 267,581		Means 2010, #31 22 16.10 1020, Site Work & Landscape Cost Data - Unit Price
	Water content testing (on-site)	EA	4,742	$ 4	1	$ 4	$ 16,598	$ 16,598	Assume weekly testing, 16 per week over 5.7 year period.	Assumed
	Subtotal							**$ 1,145,353**		
iv	**Sampling and Analysis**									
	Confirmation sampling of sediment removal	EA	16	$ 1,000	1	$ 1,000	$ 16,000	$ 16,000	Assume 1 per 5,000 SF	Assumed
	Sampling, analysis, and reporting of sediment chemistry	EA	43	$ 1,500	1	$ 1,500	$ 64,500	$ 64,500	Assume 1 per 5,000 CY	Assumed
	Subtotal							**$ 80,500**		
v	**Transportation & Disposal of Excavated Material**									
	Volume of sediments, berm, and gravel	CY	230,117						Total summation of sediments and berm materials	
	Sedimen Loading	TON	276,141	$3.50	1	$3.50	$966,492	$966,492	Assume 1.2 tons/cy moist density after drying	Quote from Waste Management for Altamont Landfill Class II Disposal
	Disposal	TON	276,141	$ 16	1	$ 16	$4,418,250	$4,418,250	Same as above	Quote from Waste Management for Altamont Landfill Class II Disposal
	Transportation via end dumps	TON	276,141	$ 15	1	$ 15	$4,142,110	$4,142,110	Same as above	Same as above
	Mob/Demob of loading equipment	LS	1	$ 1,300	1	$ 1,300	$1,300	$1,300		
	Subtotal							**$9,528,152**		
vi	**Demobilize**									
	Demobilize heavy equipment (Dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Dredge and 2 On-site haul trucks	Means 2010, #35 20 23 13 0100, #352023130120 Heavy Construction Cost Data - Unit Price
	General area cleanup	ACR	10	$ 323	1.238	$ 400	$ 4,002	$ 4,403	Drying Areas	Means 2005, #17 04 0101, Envir. Remed. Cost Data - Unit Price
	Subtotal							**$ 178,961**		
	Subtotal Direct Costs							**$ 15,541,066**		
	Contingencies (15% of subtotal direct costs)							$ 2,331,160		
	Insurance (5% of direct cost)							$ 777,053		
	Total Direct Cost							**$ 18,649,279**		
2	**Indirect Cost**									
i	**Construction Management Staff**								Assume 6 years mob., dredging and drying, demob	
	Construction Manager	WK	312	$ 1,647	1.238	$ 2,039	$ 636,164	$ 699,780	8 hour days	Means 2005, #99 01 0102, Envir. Remed. Cost Data - Unit Price
	Field Supervisor	WK	312	$ 1,575	1.238	$ 1,950	$ 608,353	$ 669,189	8 hour days	Means 2005, #99 01 0202, Envir. Remed. Cost Data - Unit Price

TABLE C-3: ALTERNATIVE 3a -- COST OPINION FOR SIDE-WIDE DREDGING AND LANDFILL DISPOSAL OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Subtotal (2010$)	Quantity Assumptions	Unit Cost Assumptions
	Subtotal							**$ 1,368,969**		
	Office Overhead (5% of construction management staff cost)							$ 68,448		
	General & Administration (5% of construction management staff cost)							$ 68,448		
	Contingencies (15% of subtotal indirect cost)							$ 205,345		
	Total Indirect Cost							**$ 1,711,211**		
ii	**Other Cost**									
	Design (3% of total direct cost)							$ 559,478		Assumed
	Subtotal							**$ 559,478**		
	Contingencies (15% of subtotal other cost)							$ 83,922		
	Total Other Cost							**$ 643,400**		
	Total Cost for Alternative 3 with Landfill Disposal							**$ 21,004,000**		

Notes:

Cost estimate was done using data from RS Means references (2010) and (2005), local contractor quote, and professional assumptions. Unit price obtained from Means Environmental Remediation, Heavy Construction Cost, and Site Work & Landscape were adjusted with a location multiplier of 1.238. Means Heavy Construction quotes were done in software, location adjustment was automatically included in the quoted prices

A bulking factor of 30 percent is assumed.

An escalation factor of 1.1 percent was used to escalate the value in 2005 to 2010 (Turner Building Cost Index 2010).

Final Cost was rounded to $10,000.

Discount factor = $\frac{1}{(1+i)^t}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and t = year (i.e., the present value of the dollar paid in year t)

Multi-year discount factor = $\frac{(1+i)^n - 1}{i(1+i)^n}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and n = total number of years

t	i (%)
3	2.1
5	2.3
7	2.4
10	2.6
20	2.8
30	2.8

%	Percent	LS	Lump sum
ACR	Acre	MO	Month
BCY	Bulk cubic yard	SF	Square foot
CY	Cubic yard	SY	Square yard
EA	Each	WK	Week
LF	linear feet		

TABLE C-4: ALTERNATIVE 3b -- COST OPINION FOR SITE-WIDE DREDGING AND BENEFICIAL REUSE OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
A	**Full-Scale Dredging**									
1	**Direct Cost**									
i	**Mobilization**									
	Permitting	EA	1	$ 75,000	1	$ 75,000	$ 75,000	$ 75,000		Assumed
	Mobilize heavy equipment (dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Both land- and water-based dredging will be required, so 2 mobilization will be needed.	Means 2010, #35 20 23 13 0100, Heavy Construction Cost Data - Unit Price
	Setup temporary office facilities (Trailer, decontamination area, toilets, fencing, and signs)	MO	6	$ 3,000	1.238	$ 3,714	$ 22,284	$ 24,512	Estimated time for dredging	Means 2005, #99040103, #99040301, #99040401 Envir. Remed. Cost Data - Unit Price
	Truck scale rental	MO	6	$ 3,221	1.238	$ 3,988	$ 23,926	$ 26,318	Estimated time for dredging	Means 2005, #33 01 0462, Envir. Remed. Cost Data - Unit Price
	Baseline monitoring/Hydrographic survey	EA	2	$ 30,000	1	$ 30,000	$ 60,000	$ 60,000		Assumed
	Health & safety program	EA	1	$ 50,000	1	$ 50,000	$ 50,000	$ 50,000		Assumed
	Subtotal							**$ 410,389**		
ii	**Sediment Removal and Transport to Beneficial Reuse Site**									
	Utility clearance	EA	1	$ 5,500	1	$ 5,500	$ 5,500	$ 5,500		Assumed
	Dredging with environmental clamshell bucket	BCY	214,000	$ 14	1.238	$ 17	$ 3,603,075	$ 3,603,075		Means 2010, #35 20 23 13 0510, Heavy Construction Cost Data - Unit Price
	Construction Monitoring	LS	1	$ 30,000	1	$ 30,000	$ 30,000	$ 30,000		Assumed
	Transport and offload sediment to onshore site	BCY	214,000	$ 31	1.238	$ 39	$ 8,249,982	$ 8,249,982	Assuming Montezuma Wetlands and 100 miles roundtrip	Means 2010, #31 23 23 20 1084, Heavy Construction Cost Data - Unit Price
	Reuse site tipping fee	BCY	214,000	$ 20	1	$ 20	$ 4,280,000	$ 4,280,000		Quote from US Army Corps of Engineers
	Subtotal							**$ 16,168,558**		
iii	**Sampling and Analysis**									
	Confirmation sampling of sediment removal	EA	165	$ 1,000	1	$ 1,000	$ 165,200	$ 165,200	Assume 1 per 5,000 SF	Assumed
	Subtotal							**$ 165,200**		
iv	**Demobilize**									
	Demobilize heavy equipment (Dredge, barge, transport vehicles)	LS	2	$ 70,500	1.238	$ 87,279	$ 174,558	$ 174,558	Dredge and 2 On-site haul trucks	Means 2010, #35 20 23 13 0100, Heavy Construction Cost Data - Unit Price
	Subtotal							**$ 174,558**		
	Subtotal Direct Cost							**$ 16,918,704**		
	Contingencies (15% of subtotal direct cost)							$ 2,537,806		
	Insurance (5% of direct cost)							$ 845,935		
	Total Direct Cost							**$ 20,302,445**		

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxv]
25	**Present-Value Cost: $23.9 million**	Table 2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Appendix C, Table C-4. Tetra Tech. August 13, 2010.

TABLE C-4: ALTERNATIVE 3b -- COST OPINION FOR SITE-WIDE DREDGING AND BENEFICIAL REUSE OF SEDIMENT

Feasibility Study, Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California

Phase	Item/Description	Unit	Quantity	Unit Cost	Location Multiplier	Adjusted Unit Cost	Line Item Subtotal	Line Subtotal (2010$)	Assumptions	Unit Cost Assumptions
2	**Indirect Cost**									
i	**Construction Management**								Assume 26 wk mob., dredging, demob	
	Construction Manager	WK	26	$ 1,647	1.238	$ 2,039	$ 53,014	$ 58,315	8 hour days	Means 2005, #99 01 0102, Envir. Remed. Cost Data - Unit Price
	Field Supervisor	WK	26	$ 1,575	1.238	$ 1,950	$ 50,696	$ 55,766	8 hour days	Means 2005, #99 01 0202, Envir. Remed. Cost Data - Unit Price
	Subtotal Indirect Cost							**$ 114,081**		
	Office Overhead (5% of construction management staff cost)							$ 5,704		
	General & Administration (5% of construction management staff cost)							$ 5,704		
	Contingencies (15% of subtotal indirect cost)							$ 17,112		
	Total Indirect Cost							**$ 142,601**		
ii	**Other Cost**									
	Design (3% of total direct cost)							$ 3,045,367		Assumed
	Subtotal							**$ 3,045,367**		
	Contingencies (15% of subtotal other cost)							$ 456,805		
	Total Other Cost							**$ 3,502,172**		
	Total Cost for Alternative 3 with Sediment Reuse							**$ 23,947,000**		

Notes:

Cost estimate was done using data from RS Means references (2010) and (2005), local contractor quote, and professional assumptions. Unit price obtained from Means Environmental Remediation, Heavy Construction Cost, and Site Work & Landscape were adjusted with a location multiplier of 1.238. Means Heavy Construction quotes were done in software, location adjustment was automatically included in the quoted prices

A bulking factor of 30 percent is assumed.

An escalation factor of 1.1 percent was used to escalate the value in 2005 to 2010 (Turner Building Cost Index 2010).

Final Cost was rounded to $10,000.

Discount factor = $\frac{1}{(1+i)^t}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and t = year (i.e., the present value of the dollar paid in year t)

Multi-year discount factor = $\frac{(1+i)^n - 1}{i(1+i)^n}$ where i = interest rate for year 3, 5, 7, 10, 20 years interpolated evenly between years and n = total number of years

t	i (%)
3	2.1
5	2.3
7	2.4
10	2.6
20	2.8
30	2.8

%	Percent	LS	Lump sum
ACR	Acre	MO	Month
BCY	Bulk cubic yard	SF	Square foot
CY	Cubic yard	SY	Square yard
EA	Each	WK	Week
LF	linear feet		

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxvi]
26	nine evaluation criteria	Section 2.8.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Sections 5.2 through 5.3.7. Tetra Tech. August 13, 2010.

- **Cost:** This criterion evaluates the capital and O&M costs for each alternative. The accuracy of costs developed for an FS typically ranges from minus 30 to plus 50 percent, in accordance with guidance from EPA (2000).

Modifying Criteria. The final two criteria will be evaluated following review of the FS Report and Proposed Plan and receipt of public comments on the Proposed Plan.

- **State Acceptance:** This criterion evaluates technical and administrative issues and concerns the state may have about each of the alternatives. This criterion will be addressed in the ROD after DTSC's and the Water Board's review and concurrence with this FS Report.

- **Community Acceptance:** This criterion evaluates the issues and concerns the public may have about each alternative. This criterion will be addressed in the Record of Decision once comments on the FS Report and the Proposed Plan have been received from the community.

The following section describes each alternative, assessed against seven of the nine evaluation criteria, and comparatively analyzes the alternatives to assess their relative performance with respect to these criteria. The remaining two modifying criteria will be addressed in the ROD when comments on the Proposed Plan are received from the agencies and public.

5.2 DETAILED EVALUATION OF ALTERNATIVES

This section summarizes the analysis of each alternative against seven of the nine evaluation criteria discussed in Section 5.1. The remaining two modifying criteria (state and community acceptance) will be addressed in the ROD when comments on the FS Report and the Proposed Plan have been received from the state and the public.

The analysis of the remedial alternatives against the seven criteria focuses on addressing potential risk to potential ecological receptor (diving ducks) from exposure to contaminated sediment. As discussed in Section 1.3, no unacceptable risk to human health is identified at Site 27. Therefore, the evaluation of remedial alternatives against the seven criteria focuses on risk to potential ecological receptors only and does not discuss protection of human health.

The detailed analysis of the alternatives rates the alternatives under each criterion. Overall protection of human health and environment and compliance with ARARs generally served as threshold determinations in that they must be met by any alternative for the alternative to be eligible for selection. Each alternative either passes or fails these two threshold criteria in the ranking system. For the five modifying criteria, alternatives were rated as very high, high, moderate, low to moderate, low, very low, or none depending on how closely the alternative matched the requirements of the individual criterion.

5.2.1 Alternative 1 – No Action

No remedial action would be taken under Alternative 1. No effort would be undertaken to contain, remove, monitor, or treat contaminated groundwater at the site. An evaluation of the no-action alternative is required under CERCLA to provide a baseline for comparison with other alternatives. The sediment conditions and hydrodynamic settings of Site 27 would remain unchanged. A detailed analysis of Alternative 1 against the threshold and balancing criteria is provided below.

5.2.1.1 Overall Protection of Human Health and the Environment

Site 27 does not pose current or future risk to human health. However, the area within 75 feet from shoreline contains lead shot within the top 2 feet of sediment and poses risk to diving ducks. Under Alternative 1, no action would be taken to reduce or eliminate the risk posed by the lead shot to diving ducks. Therefore, Alternative 1 would fail to meet the first threshold criterion and is not protective of the environment.

5.2.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

No chemical-, action-, or location-specific ARARs apply because Alternative 1 would not involve any actions, such as ICs or remedial actions. Therefore, the second threshold criterion is not applicable to Alternative 1.

5.2.1.3 Long-Term Effectiveness and Permanence

Existing lead shot contamination at Site 27 currently poses risk to the diving ducks within 75 feet of the shoreline because an immediate and complete exposure pathway exists. Alternative 1 does not include any remediation effort or controls to reduce or prevent exposure of lead shot to diving ducks. Therefore, Alternative 1 would not provide long-term effectiveness or permanence. Alternative 1 is not effective over the long term.

5.2.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Under this alternative, contaminated sediment would not be treated, contained, or removed. The alternative would not reduce the toxicity, mobility, or volume of contaminants at Site 27. Alternative 1 would not help or monitor the progress of natural attenuation. Therefore, Alternative 1 would not be effective in reducing the toxicity, mobility, or volume of chemicals through treatment.

5.2.1.5 Short-Term Effectiveness

This criterion examines the effectiveness of the alternative during construction and implementation of the remedy until the RAO is met. Under Alternative 1, no exposure risks to the community, workers, or the environment would result from remedial activities because no remedial action would occur. However, currently, there is a complete exposure pathway to ecological receptors at the nearshore area of Site 27. Alternative 1 is therefore not considered effective in the short term.

5.2.1.6 Implementability

No construction, operation, or resources would be required to implement Alternative 1. As a result, Alternative 1 would be highly implementable.

5.2.1.7 Costs

No capital or O&M costs are associated with Alternative 1 because no resources would be required and no ICs or remedial actions would be undertaken. Therefore, Alternative 1 would have the lowest cost.

5.2.2 Alternative 2 – Focused Dredging and Backfill, Off-Site Disposal of Sediment, Institutional Controls, and Sediment Monitoring

Under Alternative 2, sediments that contain lead shot at the nearshore area would be removed and the dredged area would be backfilled with clean materials that would be stable against erosional processes. ICs would be implemented at Site 27 to minimize sediment disturbance and re-suspension of lead shot from deeper sediment. When the Site 27 property is transferred, the deed would contain both a deed notice notifying future landowners of the existence of lead shot in the sediment and a restriction requiring (1) that the appropriate regulatory agencies, including the U.S. Army Corps of Engineers, be contacted and notified of the existence of the lead shot in sediment before any sediment dredging or fill and (2) that as part of any sediment dredging or fill, the property would comply with the pertinent parts of Section 404 of the Clean Water Act. After dredging, a post-remedy bathymetric survey followed by 5-year interval monitoring under ICs will be carried out to ensure RAOs are consistently achieved at Site 27.

Under this alternative, the contaminated sediments would either be dewatered and disposed of at a Class II landfill facility (Alternative 2a) or transported by barge and off-loaded at an upland beneficial reuse site such as Montezuma Wetlands (Alternative 2b). The two different sediment disposal processes will have a different impact under certain evaluation criteria and will be discussed separately in certain sections.

5.2.2.1 Overall Protection of Human Health and the Environment

Current conditions at Site 27 pose no risk to human health. Protection of the environment under Alternative 2 would be acceptable because contaminated sediments with lead shot in the top 2.5 feet, which is within reach of diving ducks (up to 2 feet), would be removed and ICs would be implemented to minimize site-wide sediment disturbance, thus eliminating the complete exposure pathway for diving ducks. Therefore, this alternative is considered protective of the environment.

5.2.2.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 2 relies on the effectiveness of focused dredging and backfill, off-site disposal of dredged sediments, ICs, and monitoring to eliminate the complete exposure route to potential receptors. Alternative 2 is expected to meet all chemical-, location-, and action-specific ARARs, as described below.

This alternative is expected to meet chemical-specific ARARs, including applicable sections of the federal Clean Water Act and state requirements including the Porter-Cologne Water Quality Act. There are no chemical-specific ARARs other than RCRA hazardous waste classification requirements. During dredging, clamshell dredging techniques would limit turbidity, thus minimizing the potential contamination of bay waters from disturbed sediments.

Location-specific ARARs are expected to be met through coordination with local regulatory agencies and use of engineering controls during implementation of Alternative 2. Potential location-specific ARARs include the ESA, the Migratory Bird Treaty Act, the Marine Mammal Protection Act, Clean Water Act Section 404, and the Rivers and Harbors Act of 1899. At least one endangered species is known to inhabit the offshore area; therefore, the ESA is an ARAR. Construction of rehandling and dewatering facilities on shore would not affect the historic buildings at NAVSTA TI, and it is anticipated that the City of San Francisco would approve temporary use of the proposed sediment dewatering areas. Engineering controls during construction are expected to minimize any effects to habitat for threatened or endangered species and, therefore, comply with the ESA. The Marine Mammal Protection Act will be an ARAR if marine mammals are found at the site. Clean Water Act Section 404 is an ARAR for the sediment removal alternative.

Action-specific ARARs relating to the temporary storage and treatment of potentially hazardous soils (sediments) would be met by complying with engineering and substantive permitting requirements for operation of temporary storage and dewatering areas. Although the sediments do not exceed the RCRA criteria defining hazardous waste, these ARARs will be used as guidelines for on-site storage and dewatering. Water Board waste discharge requirements would also be met for discharge of decant water to the bay. Action-specific ARARs for run-on and run-off control and handling of decant water are expected to be met through proper engineering and substantive permitting of sediment rehandling facilities. The handling and off-site disposal of sediments would comply with applicable disposal requirements.

Alternative 2 would ensure that the appropriate regulatory agencies would be notified and proper procedures would be followed before any activity takes place. This assurance would be provided by recording a deed containing both a notice and restriction informing landowners and regulatory agencies of the existence of the lead shot.

5.2.2.3 Long-Term Effectiveness and Permanence

Factors evaluated under long-term effectiveness and permanence include the magnitude of residual risks and adequacy and the reliability of controls.

- **Magnitude of Residual Risks**. The magnitude of residual risks associated with Alternative 2 is low because the pathway would be eliminated through the focused dredging and backfill within the first 75 feet from the shoreline and implementation of site-wide ICs. The final remedial design would take into account relevant hydrodynamic conditions and consider historical and current uses of the marina, including maintenance dredging.

- **Adequacy and Reliability of Controls**. Under ICs, the deed notice and deed restriction would be in the chain of title, which would put all future landowners on notice. This type of control has more permanence than government controls. ICs would reduce the possibility of uncontrolled dredging or disturbance of sediments without proper precautions. In addition, sediment monitoring under ICs will ensure RAOs are achieved.

Overall, Alternative 2 is considered highly effective over the long term.

5.2.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Implementation of Alternative 2 would not reduce the toxicity, mobility, or volume of hazardous substances through treatment.

5.2.2.5 Short-Term Effectiveness

The factors evaluated under short-term effectiveness and permanence include protection of the community and workers, environmental impact, and time required for remedial action. These factors are discussed below for Alternative 2a and Alternative 2b.

- **Protection of the Community.** For both Alternatives 2a and 2b, construction equipment operating on site, as well as transportation of dredged sediments, may result in short-term increases in traffic and noise. In addition, limited effects to the community would be expected during a dewatering process under Alternative 2a.

- **Protection of Workers.** Worker safety considerations associated with implementing Alternative 2 can be grouped in two categories: (1) general site hazards, and (2) potential chemical hazards. General site hazards include the following:
  - Heavy equipment hazards
  - Occupational noise exposure
  - Potential slip, trip, or fall hazards
  - Potential for contact with underground or overhead mechanical and electrical hazards or utility lines
  - Potential for water-related injuries (drowning)

General site hazards would be reduced by providing (1) a site-specific health and safety plan; (2) appropriate safety equipment to minimize exposure to noise and dust and to improve water safety; and (3) awareness training to orient personnel to the physical hazards at the site. Specific protection to be worn by on-site workers would be determined by the requirements in the contractor's site-specific health and safety plan.

Since the risk from exposure to lead shot is from ingestion to diving ducks, no chemical hazards to workers are associated with implementing Alternative 2.

- **Environmental Impact.** Suspension of sediments during dredging operations would affect habitat for marine organisms, including benthic invertebrates and shallow water fish species; however, these effects would be temporary, and habitat would recover over time. Suspension of sediments during dredging operations would be controlled through construction QC monitoring, use of silt curtains, and closed-bucket clamshell dredging techniques.

- **Time Required for Remedial Action.** Focused dredging is estimated to be completed within 1 to 2 months. For Alternative 2a, which involves a dewatering process, the time required to implement this alternative is strongly affected by the volume of sediments. About 6 months would be required for Class II landfill disposal after sediment dewatering. If the sediments are disposed of at an upland beneficial reuse site (Alternative 2b), the project could be completed in about 2 months for construction preparation, focused dredging, sediment transportation, and site cleanup time.

Given the limited dredging of sediment, the short-term effectiveness of Alternative 2a is considered low to moderate, and for Alternative 2b is considered moderate.

5.2.2.6 Implementability

The following paragraphs discuss the technical and administrative feasibility of Alternative 2, as well as the availability of resources required to implement the alternative.

- **Technical Feasibility.** Technically, the implementability of Alternative 2 is routine to moderate. This alternative would use standard focused dredging and dewatering techniques, modified for use with contaminated marine sediments.

- **Administrative Feasibility.** This alternative is considered administratively feasible. Coordination with the regulatory agencies would be necessary, and the Navy would be required to meet the substantive provisions of applicable permits for dredging and dewatering. Under Alternative 2a, there may be some difficulty in locating on-site areas for dewatering, and some additional storage time may be required. However, neither factor should present significant difficulty as long as the dewatering area is not scheduled for immediate rehabilitation and reuse by the City of San Francisco.

Therefore, implementability is considered low to moderate for Alternative 2a, and is considered moderate for Alternative 2b.

5.2.2.7 Cost

Including off-site disposal in a Class II landfill, Alternative 2a would cost approximately $2.8 million to implement. Anticipated costs include dredging the sediment from the site, drying on TI, and off-site disposal in a Class II landfill. Including off-site beneficial reuse in an upland reclamation area, Alternative 2b would cost approximately $2.2 million. The cost opinion was developed for a comparative analysis of the remedial alternatives; it is not intended to be a construction cost estimate. Construction cost is defined as the costs of materials, labor, and equipment required to install a remedial action (EPA 1988). The cost opinion for Alternative 2, presented in Appendix C, also incorporates elements or items to help meet the ARARs, including permitting; implementation of a health and safety program; utility clearance; construction monitoring during sediment removal, backfill, and transportation; collection of confirmation samples; post-remedy monitoring and inspection; IC enforcement; and 5-year reviews after the remedy is implemented. The cost opinion is expected to provide accuracy in the range of plus 50 percent or minus 30 percent of the total cost (EPA 1988).

5.2.3 Alternative 3 – Site-Wide Dredging and Off-Site Disposal of Sediment

Under Alternative 3, sediments that contain lead shots would be completely removed from the site, which would allow for unrestricted use of the property. The contaminated sediments would either be dewatered and disposed of at a Class II landfill facility (Alternative 3a) or transported by barge and off-loaded at an upland beneficial reuse site such as Montezuma Wetlands (Alternative 3b). The two different sediment disposal processes will have different impacts under certain evaluation criteria and will be discussed separately in some sections.

5.2.3.1 Overall Protection of Human Health and the Environment

Current conditions at Site 27 pose no risk to human health. Alternative 3 would protect the environment because it would involve removal and off-site disposal of contaminated sediments from Site 27, thereby eliminating the exposure pathway to potential ecological receptors. Alternative 3 meets the criterion of overall protection of the environment.

5.2.3.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 3 relies on the effectiveness of dredging and off-site disposal of dredged sediments to remove contaminated sediments from the site. Alternative 3 is expected to meet all chemical-, location-, and action-specific ARARs, as described below.

This alternative is expected to meet chemical-specific ARARs, including applicable sections of the federal Clean Water Act and state requirements, including the Porter Cologne Water Quality Act. During dredging, clamshell dredging techniques would limit turbidity and, therefore, the potential contamination of bay waters from disturbed sediments. There are no chemical-specific ARARs other than RCRA hazardous waste classification requirements.

Location-specific ARARs are expected to be met through coordination with local regulatory agencies and use of engineering controls during implementation of Alternative 3. Potential location-specific ARARs include the ESA, the Migratory Bird Treaty Act, the Marine Mammal Protection Act, the Clean Water Act Section 404, and the Rivers and Harbors Act of 1899. At least one endangered species is known to inhabit the offshore area; therefore, the ESA is an ARAR. Construction of rehandling and dewatering facilities on shore would not affect the historic buildings at NAVSTA TI. Engineering controls during construction are expected to minimize any effects to habitat for threatened or endangered species and, therefore, comply with the ESA. The Marine Mammal Protection Act will be an ARAR if marine mammals are found at the site. Clean Water Act Section 404 is an ARAR for the sediment removal alternative.

Action-specific ARARs relating to temporary storage and treatment of potentially hazardous soils (sediments) would be met by complying with engineering and substantive permitting requirements for operation of temporary storage and dewatering areas. Although the sediments do not exceed the RCRA criteria that define hazardous waste, these ARARs will be used as guidelines for on-site storage and dewatering. Water Board waste discharge requirements would also be met for discharge of decant water to the bay. Action-specific ARARs for run-on and run-off control and handling of decant water are expected to be met through proper engineering and substantive permitting of sediment rehandling facilities. The handling and off-site disposal of sediments would comply with applicable disposal requirements.

5.2.3.3 Long-Term Effectiveness and Permanence

Factors evaluated under long-term effectiveness and permanence include the magnitude of residual risks and the adequacy and reliability of controls.

- **Magnitude of Residual Risks**. The magnitude of residual risks associated with Alternative 3 is low because contaminated sediments would be dredged and disposed of off site.

- **Adequacy and Reliability of Controls**. The long-term adequacy and reliability of controls would depend on the controls implemented during dredging, handling, and disposal to prevent the re-suspension of lead shot in the sediment; if controls are inadequate, lead shot could become available to diving ducks.

Overall, long-term effectiveness is considered very high for Alternative 3.

5.2.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Implementation of Alternative 3 would not reduce the toxicity, mobility, or volume of hazardous substances through treatment.

5.2.3.5 Short-Term Effectiveness

The factors evaluated under short-term effectiveness and permanence include protection of the community and workers, environmental impact, and time required for remedial action. The same factors discussed in Section 5.2.2.5 for Alternative 2 apply in this section for Alternative 3.

Based on the area to be dredged and the volume of sediment to be removed, dredging is estimated to be completed in 4 months. The time required for Alternative 3b, landfill disposal of sediment, would be about 4.5 years, assuming 10-acre dewatering sites would be available. If the material is disposed of at a beneficial reuse site (Alternative 3b), the project would be completed in about 6 months. The longer performance period will result in more traffic and noise around Site 27. Therefore, short-term effectiveness is considered very low under Alternative 3a and low under Alternative 3b.

5.2.3.6 Implementability

The same factors discussed in Section 5.2.2.6 for Alternative 2 apply in this section for Alternative 3. However, given the large area to be dredged and the large volume of sediments to be removed and dewatered under Alternative 3a, the implementability of Alternative 3a is considered very low. However, implementability of Alternative 3b, where dewatering will not be necessary, is considered low.

5.2.3.7 Cost

Including disposal in a Class II landfill, Alternative 3a would cost approximately $20.6 million to implement. Anticipated costs include dredging the sediment from the site, drying on TI, and off-site disposal in a Class II landfill. Including beneficial reuse in an upland reclamation area, Alternative 3b would cost approximately $23.9 million. The cost opinion was developed for a comparative analysis of the remedial alternatives; it is not intended to be a construction cost estimate. Construction cost is defined as the costs of materials, labor, and equipment required to install a remedial action (EPA 1988). The cost opinion for Alternative 3, presented in Appendix C, also incorporates elements or items to help meet the ARARs, including permitting; implementation of a health and safety program; utility clearance; construction monitoring during sediment removal and transportation; and collection of confirmation samples. The cost opinion is expected to provide accuracy in the range of plus 50 percent or minus 30 percent of the actual cost (EPA 1988).

5.3 COMPARATIVE ANALYSIS OF ALTERNATIVES

Following EPA RI/FS guidance (EPA 1988), this section provides a comparative analysis of the recommended alternatives for remediation at Site 27. The evaluation of alternatives will largely depend on the relative performance and effectiveness of each alternative against seven of the nine NCP evaluation criteria. Advantages and disadvantages of each alternative will be factors in the decision-making process, providing a basis for selecting the final remedy.

5.3.1 Overall Protection of the Environment

Sediment accretion at Site 27 has created an effective barrier between the sediment surface and lead shot contamination, except in the nearshore area. Current potential ecological risk exists for diving ducks in the nearshore area. Therefore, Alternative 1 may not be protective of the environment. Alternative 2 would remove lead shot contaminated sediments to a minimum depth of 2.5 feet below the existing sediment surface, within the first 75 feet from the shoreline, followed by backfilling, ICs, and monitoring. A post-remedy bathymetric survey and the following 5-year interval monitoring under ICs will ensure RAOs are consistently achieved. Implementation of ICs will restrict sediment disturbance and prevent and minimize lead shot re-suspension from deeper buried sediments in the remainder of the site. Alternative 2 is considered protective of the environment. Alternative 3 would also be considered protective of the environment because contaminated sediments would be removed throughout the site.

5.3.2 Compliance with Applicable or Relevant and Appropriate Requirements

No chemical-, action-, or location-specific ARARs would apply to Alternative 1. Alternatives 2 and 3 are expected to meet all chemical-, location-, and action-specific ARARs.

5.3.3 Long-Term Effectiveness and Permanence

Alternative 1 would provide no long-term effectiveness or permanence because no remedial action would be conducted to mitigate ecological risk. Alternative 2 would be effective and permanent because the complete exposure route for diving ducks in the nearshore area would be eliminated. A post-remedy bathymetric survey and implementation of ICs would ensure RAOs are consistently achieved. Alternative 3 would be most effective in the long term because no contamination would remain on site and the alternative would not rely on institutional controls to prevent exposure.

5.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 1, 2, and 3 would not use treatment to reduce toxicity, mobility, or volume. None of the alternatives is considered effective under this criterion.

5.3.5 Short-Term Effectiveness

Alternative 1 would provide no protection to the environment because no action would be conducted to limit the risk posed by lead shot within 75 feet of the shoreline. During construction, implementation of Alternatives 2 and 3 could affect the public, environment, and workers by potential re-suspension of lead shot, traffic, and noise, although effects would be minimized through implementation of construction QC monitoring and environmentally sensitive construction practices, other monitoring protocols, and health and safety plans. Short-term effectiveness of Alternative 2a will be considered low to moderate, and for Alternative 2b moderate because of the limited dredging area and relatively shorter performance period. However, the effectiveness of Alternative 3a would be considered very low, and Alternative 3b low in the short term given the large area to be dredged and the amount of sediment to be removed, as well as the longer performance period.

5.3.6 Implementability

Alternative 1 would be the easiest to implement because no action is required. Technically, Alternative 2 would be moderate in difficulty to implement; however, it would be less straightforward than Alternative 1 because construction would take place and monitoring and ICs would be implemented. In terms of the difference in dewatering processes between Alternative 2a and 2b, implementability of Alternative 2a is considered low to moderate, and for Alternative 2b moderate. Alternative 3 will be the least implementable given the large of sediment that needs to be removed. Similarly, in terms of the difference in dewatering processes between Alternative 3a and 3b, implementability of Alternative 3a is considered very low, and Alternative 3b is considered low.

5.3.7 Cost

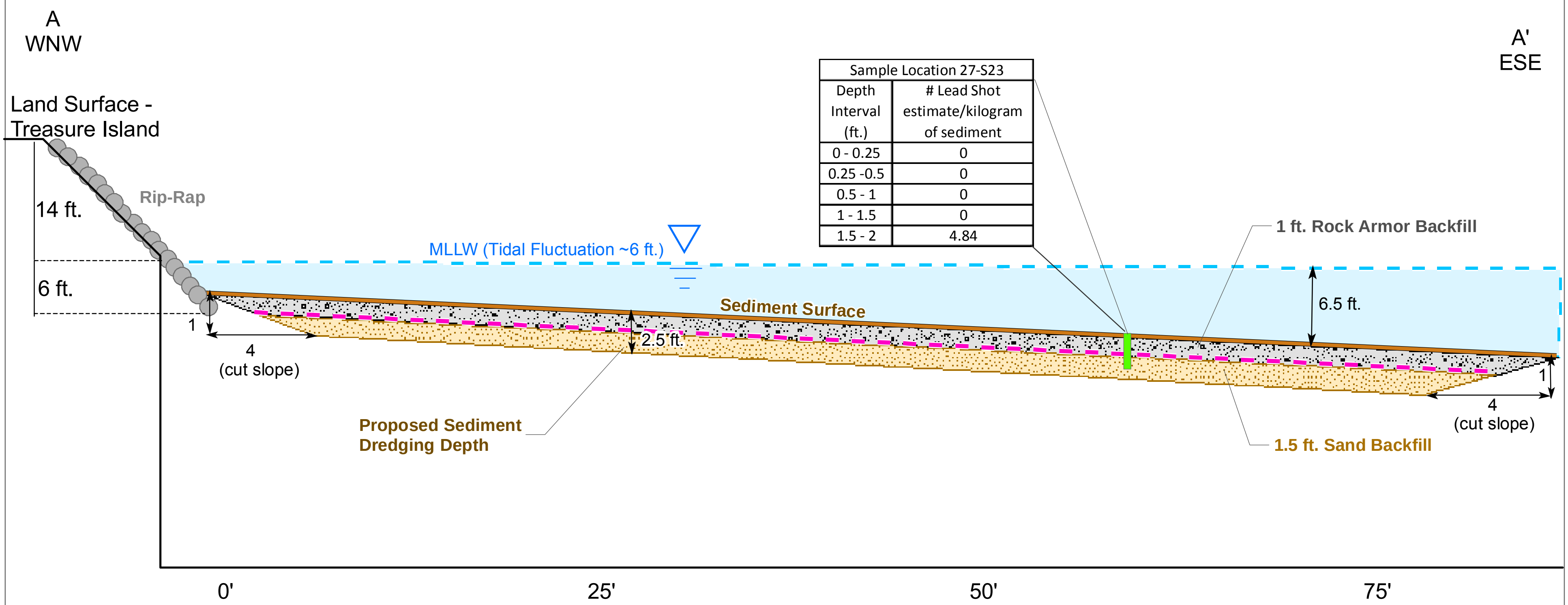
No cost would be associated with Alternative 1. Implementation of Alternative 2 would cost \$2.2 million for off-site beneficial reuse at a reclamation site and \$2.8 million for on-site drying and disposal at a Class II landfill facility. Alternative 3 would cost \$23.9 million for off-site beneficial reuse at a reclamation site and \$20.6 million for on-site drying and disposal at a Class II landfill facility.

5.4 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Existing conditions are protective of human health under the current site configuration and current use of Site 27 as an infrequently used commercial/industrial site. However, risks to potential ecological receptors trigger the need to evaluate remedial alternatives to address lead shot in sediment at Site 27. The comparative analysis for the alternatives is summarized below, as well as in Table 5.

The alternatives were evaluated against seven of the nine criteria specified in the NCP. The final two criteria, (1) state acceptance and (2) community acceptance, will be evaluated after the FS report and Proposed Plan have been reviewed and public comments have been received on the Proposed Plan. Of the seven screening criteria used in this evaluation, two are threshold and five are modifying criteria. The two threshold criteria, (1) overall protection of human health and the environment, and (2) compliance with ARARs, must be met by any alternative for it to be eligible for selection. Alternative 1 (no action) is evaluated for comparison as required by the NCP, to provide a comparative baseline to evaluate the other alternatives; however, Alternative 1 would not be protective of the environment or comply with ARARs under current land-use scenarios. As a result, this alternative would not meet the threshold criteria and therefore is not eligible for selection. Alternative 2a, 2b, 3a, and 3b meet the threshold criteria; therefore, these alternatives were further evaluated against the modifying criteria. The five modifying criteria are as follows: (1) long-term effectiveness; (2) reduction of toxicity, volume, or mobility through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. These five modifying criteria were used to evaluate how closely the alternatives match the requirements of the individual criterion. Modifying criteria were all weighted equally. A summary of the alternatives evaluation against the modifying criteria is presented below.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxvii]
27	**focused dredging and backfill**	Section 2.9	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Figure 13. Tetra Tech. August 13, 2010.



Sample Location 27-S23	
Depth Interval (ft.)	# Lead Shot estimate/kilogram of sediment
0 - 0.25	0
0.25 -0.5	0
0.5 - 1	0
1 - 1.5	0
1.5 - 2	4.84

Notes:
All units in feet. No vertical exaggeration.

ESE - East-south-east
ft. - Foot
MLLW - Mean low level water
WNW - West-north-west

TETRA TECH EM INC.

Naval Station Treasure Island
Department of the Navy, BRAC PMO West, San Diego, CA

FIGURE 13
ALTERNATIVE 2
FOCUSED DREDGING AND BACKFILL CROSS SECTION

Clipper Cove Skeet Range Feasibility Study

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxviii]
28	removing sediment	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.1. Tetra Tech. August 13, 2010.

samples indicate that acceptable levels of lead shot are present in surrounding sediment, the dredged area would be backfilled with a mixture of a sandy base layer and an exposed rock armor layer. The final thickness of the backfill layers, the required amount of excavation to accommodate the backfill, as well as the type and size of rock required, would be established during the remedial design. Before it would be used as backfill, analytical testing will be conducted on the imported material to verify that it is below appropriate screening levels. After dredging and backfilling, site-wide ICs will be implemented to restrict disturbance of the remaining sediment, which will prevent or minimize re-suspension of lead shot from deeper sediments in the undredged portion of the site. Therefore, a complete exposure pathway to diving ducks will be eliminated since (1) all sediments that contain lead shot within the top 2.5 feet will be removed; and (2) lead shot in the remaining offshore area of Site 27 is buried under at least 2 feet of sediment, which is not accessible to diving ducks.

Approximately 2 months to 1 year would be required from construction preparation to post-construction site cleanup for Alternative 2, depending on the sediment disposal method. A post-remedy bathymetric survey will be conducted 1 year after dredging, followed by 5-year interval sediment monitoring under ICs to ensure RAOs are consistently achieved.

4.2.1 Focused Dredging and Backfill

Dredging involves removal of sediment below water and transport to a disposal site. Within 0 to 75 feet from the shoreline, lead shot are present in the upper 0 to 2 foot layer of sediment, where the shot are accessible to potential ecological receptors and currently poses unacceptable risk. The contaminated sediments would be removed to achieve the goal of eliminating the immediate complete exposure route of lead shot to diving duck in this area. A dredging depth of 2.5 feet is proposed (Figures 12 and 13). This proposed dredging depth would be considered protective since the maximum accessible depth of diving ducks is 2 feet. A 2.5-foot thick layer of clean fill material will then be backfilled to cover the exposed lower layer sediments, and the original bottom profile would be maintained. The dredged area would be backfilled with sand and rock armor. The vertical extent of dredging and the backfill design (including final thickness and type and size of armor rock if required), will be determined during remedial design and will take into account relevant hydrodynamic conditions and consider historic and current uses of the marina.

Mechanical dredging using a closed clamshell bucket is the method proposed for this alternative because it minimizes turbidity and the water content of the dredged material. However, some turbidity and contaminant transport would still be expected. A double-walled silt curtain would therefore be used to encircle the excavation in areas close to shore to reduce sediment transport to adjacent areas. Construction QC monitoring for turbidity and suspended solids would be conducted around the perimeter of the dredge areas to verify that excessive sediment is not escaping the silt curtains. Sediments would be placed into an adjacent barge, and the free water that is extracted along with the sediment would be pumped back to the bay inside of the silt curtain. Bathymetric survey methods would be used during construction to ensure that the required removal depths are achieved. Both land-based and floating excavation would be involved because the dredging would involve shallow and deep water.

A cut slope of 4:1 (horizontal to vertical) would not be exceeded at the dredging boundaries to maintain the stability of the vicinity sediments when dredging and before the clean material is placed as backfill. The clean material would be placed in the dredged area using a bucket from the barge. Before it is backfilled, sediment core confirmation samples would be collected for analysis of total lead shot outside the southern perimeter of the dredged area at a frequency of one sample every 100 feet along the perimeter. Additionally, approximately two confirmation samples would be collected east of the southeast corner of the dredged area and west of the southwest corner of the dredged area (75 feet from the shoreline) to ensure that the exposure pathway is removed. Thus, a total of approximately 18 samples would be collected. If the confirmation samples indicate that acceptable levels of lead shot are present in surrounding sediment, the dredged area would be backfilled with 2.5 feet of clean material (1.5–foot base sand layer and 1-foot rock armor layer). The focused dredging is estimated to be completed in 1 month.

The area for sediment removal under this alternative would be the portion of Site 27 within 75 feet from the shore (Figure 12) and covers an area of approximately 92,500 square feet (ft^2). About 8,600 cy (or 11,100 bulk cubic yards [bcy], assuming 30 percent bulking factor) of contaminated sediments would be dredged from Site 27 given the assumed 2.5-foot dredging depth. The material would be mechanically dredged, followed by either off-site disposal at a permitted Class II landfill facility after on-site dewatering (Alternative 2a) or transport and reuse at an upland beneficial reuse site (Alternative 2b).

4.2.2 Sediment Disposal

After dredging, rehandling and disposing of dredged sediments will be required. Both landfill disposal and beneficial reuse as potential sediment disposal options are evaluated in this FS Report. Under Alternative 2a, dredged sediments would require dewatering before disposal at a Class II disposal facility (landfill). Land-based dewatering would not be required for Alternative 2b – sediments beneficial reuse. Instead, Under Alternative 2b, sediments will be excavated and placed on a barge for subsequent transport and off-load to a beneficial use site, such as Montezuma Wetlands in Solano County, California. No railroad is readily available from Site 27 to a Class II landfill or to a beneficial reuse site.

4.2.2.1 Alternative 2a: Disposal at Landfill after Dewatering

Under Alternative 2a, dredged sediments would be disposed of at a Class II landfill after on-site dewatering. Dewatering beds, drying ponds, and mechanical dewatering are the three most popular dewatering methods. At NAVSTA TI, dewatering beds would be considered most cost-effective for this alternative because the requirement to rehandle water is minimal, a low cost is associated, and a large area for construction of dewatering beds is readily available.

For this alternative, 2.5 acres of on-site drying area was assumed to be available on NAVSTA TI. Based on estimates from an actual facility at Port Sonoma, with 3-foot depth of soil the average drying rate to lower the moisture to 50 percent is about 5,000 cy of sediment per year for each acre of drying area. Under this drying rate, with the 2.5-acre area, and assuming a 3-foot bed depth, about 0.9 year (11 months) would be necessary to complete the drying

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxix]
29	**beneficial reuse**	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.2.2. Tetra Tech. August 13, 2010.

Dewatered sediment would be evaluated to confirm it meets the acceptable criteria for a Class II landfill and would then be transported by truck to an off-site Class II landfill for disposal.

4.2.2.2 Alternative 2b: Beneficial Reuse

Beneficial reuse of dredged sediment without dewatering would also be evaluated before transport to a potential reuse site (such as Montezuma Wetlands in Solano County, California). For cost estimation purposes, it is assumed that the Site 27 dredging will be scheduled to be concurrent with other regular bay dredging projects. Therefore, the clean capping material used to cap the dredged lead shot-contaminated sediment, as required at the sediment disposal facility, will be free, if available, and only transportation costs and an off-loading fee will be associated with confined disposal at Montezuma Wetlands. A regular 1.5-acre area cell for sediment disposal at Montezuma Wetlands was assumed. A tipping fee of $28/cy was assumed for the small volume of sediment to be disposed of at the site. For this alternative, 2 months would be required, including construction preparation, dredging, sediment transportation to the upland beneficial reuse site, and post-construction site cleanup.

4.2.3 Post-Remedy Survey and 5-Year Interval Sediment Monitoring

After the focused dredging and backfill placement is complete, lead shot will still remain in place in the remainder of the site. There is also the potential for lead shot to remain below the backfilled area as there are no data to verify that all of the lead will be removed by the focused dredging in the nearshore area; therefore, post-construction monitoring would be conducted a year after construction to ensure RAOs are consistently achieved. Bathymetric surveys would be conducted in the areas where clean backfill is placed as a means of monitoring to ensure the backfill remains in place. It was concluded that, with the exception of the area within 150 feet of the shoreline, the Clipper Cove Skeet Range is a low-energy depositional environment with a net accumulation rate of 1.5 inches per year (EPA and others 1996). At the nearshore area, 1-foot-thick rock armor backfill is assumed to be stable under dynamic erosional conditions. The post-remedy sediment monitoring will confirm this assumption. Therefore, it can be assumed that no future concern for re-suspension of lead shot from deep sediment (at least 2 to 3 feet beneath the existing sediment surface) would be expected under implementation of ICs if sediments continue to be stable at the first 3 years after focused dredging.

The post-remedy monitoring would consist of subsurface bathymetric surveys to confirm consistent sediment profile against erosion before and post remedy. Sediment would be monitored 1 year after the remedy has been implemented and every 5 years thereafter. The monitoring results for the first year after the remedy is implemented would be summarized and presented in an annual review report, and subsequent 5-year monitoring results would be summarized and presented in 5-year review reports.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxx]
30	sediment monitoring	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.3. Tetra Tech. August 13, 2010.

Dewatered sediment would be evaluated to confirm it meets the acceptable criteria for a Class II landfill and would then be transported by truck to an off-site Class II landfill for disposal.

4.2.2.2 Alternative 2b: Beneficial Reuse

Beneficial reuse of dredged sediment without dewatering would also be evaluated before transport to a potential reuse site (such as Montezuma Wetlands in Solano County, California). For cost estimation purposes, it is assumed that the Site 27 dredging will be scheduled to be concurrent with other regular bay dredging projects. Therefore, the clean capping material used to cap the dredged lead shot-contaminated sediment, as required at the sediment disposal facility, will be free, if available, and only transportation costs and an off-loading fee will be associated with confined disposal at Montezuma Wetlands. A regular 1.5-acre area cell for sediment disposal at Montezuma Wetlands was assumed. A tipping fee of $28/cy was assumed for the small volume of sediment to be disposed of at the site. For this alternative, 2 months would be required, including construction preparation, dredging, sediment transportation to the upland beneficial reuse site, and post-construction site cleanup.

4.2.3 Post-Remedy Survey and 5-Year Interval Sediment Monitoring

After the focused dredging and backfill placement is complete, lead shot will still remain in place in the remainder of the site. There is also the potential for lead shot to remain below the backfilled area as there are no data to verify that all of the lead will be removed by the focused dredging in the nearshore area; therefore, post-construction monitoring would be conducted a year after construction to ensure RAOs are consistently achieved. Bathymetric surveys would be conducted in the areas where clean backfill is placed as a means of monitoring to ensure the backfill remains in place. It was concluded that, with the exception of the area within 150 feet of the shoreline, the Clipper Cove Skeet Range is a low-energy depositional environment with a net accumulation rate of 1.5 inches per year (EPA and others 1996). At the nearshore area, 1-foot-thick rock armor backfill is assumed to be stable under dynamic erosional conditions. The post-remedy sediment monitoring will confirm this assumption. Therefore, it can be assumed that no future concern for re-suspension of lead shot from deep sediment (at least 2 to 3 feet beneath the existing sediment surface) would be expected under implementation of ICs if sediments continue to be stable at the first 3 years after focused dredging.

The post-remedy monitoring would consist of subsurface bathymetric surveys to confirm consistent sediment profile against erosion before and post remedy. Sediment would be monitored 1 year after the remedy has been implemented and every 5 years thereafter. The monitoring results for the first year after the remedy is implemented would be summarized and presented in an annual review report, and subsequent 5-year monitoring results would be summarized and presented in 5-year review reports.

Item	Reference or Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record[xxxi]
31	site-wide ICs	Section 2.9.2	Final Feasibility Study, Site 27 Clipper Cove Skeet Range, Naval Station Treasure Island, San Francisco, California. Section 4.2.4. Tetra Tech. August 13, 2010.

4.2.4 Institutional Controls

ICs would be implemented at Site 27 after dredging to restrict sediment disturbing activities. When Site 27 is transferred, the deed would contain both a deed notice to notify future landowners of the existence of lead shot in the sediment and a restriction requiring (1) that the appropriate regulatory agencies, including the U.S. Army Corps of Engineers, be contacted and notified of the existence of the lead shot in sediment within the IR Site 27 boundary before any sediment dredging or fill, and (2) that as part of any sediment dredging or fill, the property would comply with the pertinent parts of Section 404 of the Clean Water Act. The Navy would execute a land use covenant in accordance with the March 2000 Memorandum of Agreement (MOA) between the Navy and DTSC. The MOA addresses LUCs, which will be discussed in further detail in the remedial design plan (including a LUC remedial design) or site management plan.

The following ICs and measures would be required under Alternative 2:

- A deed notice would be recorded to notify the public about the existence of the contamination.
- ICs would be implemented that would require monitoring and reporting on the effectiveness of dredging.
- A remedial action work plan (RAWP) would be developed to specify the roles and responsibilities for implementing, monitoring, and enforcing the ICs (DoD 2004).
- Five-year reviews and reporting would be conducted to ensure the continued effectiveness of the ICs.
- ICs could be implemented, such as restrictions on vessel speed and controls on dredging within the IR Site 27 boundary; long-term monitoring of the backfill will be required to reduce the likelihood of activities that may cause sediment disturbance and re-suspension of buried lead shot at the site.

The post-remedy survey would include a subsurface bathymetric survey. The post-remedy bathymetric survey would be followed by monitoring 1 year after the remedy has been implemented and every 5 years after the remedy has been implemented under ICs. For cost estimation, it was assumed that the life cycle for maintaining, monitoring, and ICs would be 30 years. Detailed post-remedy survey and the annual monitoring plan and 5-year interval monitoring plans under ICs would be developed from the general framework approach from EPA (2004b) and will be presented in the RAWP.

4.3 Alternative 3 – Site-Wide Dredging and Off-Site Disposal of Sediment

Under Alternative 3, site-wide sediment to a depth of 7 feet would be removed by means of dredging (Figures 14 and 15). The objective of this alternative would be to allow unrestricted use of the site by complete removal of the sediments that contain lead shot. The area of sediment removal for this alternative would cover the whole offshore portion of Site 27, with an area of

ATTACHMENT D
ADMINISTRATIVE RECORD

(Administrative Record Provided on CD Only)

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N60028_000331 ORDR NONE 0	**10-20-1993** 11-29-1999 5090.3.A. NONE	 CRWQCB	ORDER NO. 93-130, SITE CLEANUP REQUIREMENTS FOR NSTI SKEET RANGE	ADMIN RECORD	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0008 41106473
AR_N60028_000440 CORRESPONDENCE NONE 2	**10-04-1995** 11-29-1999 5090.3.A. NONE	GALANG, E. NAVY CASSA, M. DTSC	UPDATE STATUS OF REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) AT INSTALLATION RESTORATION (IR) SITE 27 - CLIPPER COVE SKEET RANGE	INFO REPOSITORY	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0011 41106473
AR_N60028_000441 CORRESPONDENCE NONE 2	**10-10-1995** 11-29-1999 5090.3.A. NONE	GALANG, E. NAVY CASSA, M. DTSC	CLARIFICATION OF STATUS OF THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) AT INSTALLATION RESTORATION (IR) SITE 27 - CLIPPER COVE SKEET RANGE	INFO REPOSITORY	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0011 41106473
AR_N60028_000507 CORRESPONDENCE NONE 21	**12-15-1995** 11-29-1999 5090.3.A. NONE	HEHN, P. RESTORATION ADVISORY BOARD MEMBER SULLIVAN, J. BRAC PMO WEST	COMMENTS ON DRAFT FINAL PHASE II ECOLOGICAL RISK ASSESSMENT (ERA) WORK PLAN FROM TECHNICAL SUBCOMMITTEE MEETING - 12 DECEMBER 1995	ADMIN RECORD	SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0012 41106473
AR_N60028_000463 CORRESPONDENCE NONE 3	**01-18-1996** 11-29-1999 5090.3.A. NONE	GALANG, E. NAVY CASSA, M. DTSC	ENVIRONMENTAL SAMPLING AT CLIPPER COVE SKEET RANGE	ADMIN RECORD	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0011 41106473

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AR_N60028_000511 REPORT N62474-88-D-5086 2	**05-07-1996** 11-29-1999 5090.3.A. 00199	TOBIAS, S. PRC ENVIRONMENTAL MANAGEMENT, INC. GALANG, E. NAVY	REVISED COVER PAGE FOR PHASE II ECOLOGICAL RISK ASSESSMENT (ERA) FINAL WORK PLAN AND FIELD SAMPLING PLAN (FSP) SUBMITTED 12 APRIL 1996	ADMIN RECORD	SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0012 41106473
SF_N60028_000540 REPORT N62474-88-D-5086 246	**06-28-1996** 11-29-1999 5090.3.C. 00199	TOBIAS, S. PRC ENVIRONMENTAL MANAGEMENT, INC. GALANG, E. NAVY	PHASE II ECOLOGICAL RISK ASSESSMENT (ERA), DRAFT FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP)	SITE FILE	SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0013 41106473
AR_N60028_000539 CORRESPONDENCE N62474-88-D-5086 2	**07-10-1996** 11-29-1999 5090.3.A. 00199	GALANG, E. NAVY KAO, C. DTSC	SUBMISSION OF PHASE II ECOLOGICAL RISK ASSESSMENT (ERA), DRAFT FINAL QUALITY ASSURANCE PROJECT PLAN (QAPP) - 28 JUNE 1996	INFO REPOSITORY	SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0013 41106473
SF_N60028_000590 REPORT N62474-88-D-5086 194	**10-22-1996** 11-29-1999 5090.3.C. 00199	TOBIAS, S. PRC ENVIRONMENTAL MANAGEMENT, INC. GALANG, E. NAVY	DRAFT ECOLOGICAL RISK ASSESSMENT (ERA) OF THE CLIPPER COVE SKEET RANGE, IR SITE 27	SITE FILE	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0015 41106473
AR_N60028_000589 NONE CORRESPONDENCE N62474-88-D-5086 2	**10-25-1996** 11-29-1999 5090.3.A. 00199	GALANG, E. NAVY KAO, C. DTSC	SUBMISSION OF DRAFT ECOLOGICAL RISK ASSESSMENT (ERA) OF THE CLIPPER COVE SKEET RANGE, IR SITE 27 - 22 OCTOBER 1996	ADMIN RECORD	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0015 41106473
AR_N60028_000611 CORRESPONDENCE NONE 6	**12-24-1996** 11-29-1999 5090.3.A. NONE	HEHN, P. RESTORATION ADVISORY BOARD MEMBER KAO, C. DTSC	COMMENTS ON THE CLIPPER COVE SKEET RANGE	ADMIN RECORD	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0015 41106473

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AR_N60028_000626 CORRESPONDENCE NONE 6	**02-05-1997** 11-29-1999 5090.3.A. NONE	SIMONS, R. U.S. EPA - SAN FRANCISCO, CA GALANG, E. NAVY	COMMENTS ON THE DRAFT ECOLOGICAL ASSESSMENT (ERA) OF THE CLIPPER COVE SKEET RANGE - 22 OCTOBER 1996	ADMIN RECORD	SITE 00027	FRC - PERRIS	L181-03-0181 BX 0015 41106473
AR_N60028_000867 NONE CORRESPONDENCE N62474-94-D-7609 2	**06-01-1998** 11-29-1999 5090.3.A. 00194	GALANG, E. NAVY RIST, D. DTSC - BERKELEY, CA	SUBMISSION OF THE DRAFT REMEDIAL INVESTIGATION (RI), OFFSHORE SEDIMENTS OPERABLE UNIT (OU), VOLUMES 1 AND 2 - 01 JUNE 1998	ADMIN RECORD	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0022 41106473
SF_N60028_000868 NONE REPORT N62474-94-D-7609 1000	**06-01-1998** 11-29-1999 5090.3.C. 00194	ROSE, C. TETRA TECH GALANG, E. NAVY	DRAFT REMEDIAL INVESTIGATION (RI), OFFSHORE SEDIMENTS OPERABLE UNIT (OU), VOLUME 1 OF 2 - TEXT, TABLES, AND FIGURES	SITE FILE	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0022 41106473
SF_N60028_000869 NONE REPORT N62474-94-D-7609 1000	**06-01-1998** 11-29-1999 5090.3.C. 00194	ROSE, C. TETRA TECH GALANG, E. NAVY	DRAFT REMEDIAL INVESTIGATION (RI), OFFSHORE SEDIMENTS OPERABLE UNIT (OU), VOLUME 2 OF 2 - APPENDICES	SITE FILE	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0022 41106473
AR_N60028_000927 CMNT NONE 21	**07-20-1998** 11-29-1999 5090.3.A. NONE	 MEC SFRA	TECHNICAL REVIEW OF THE DRAFT CONTRACT REPORT ENTITLED, "COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II) REMEDIAL INVESTIGATION OFFSHORE SEDIMENTS O	ADMIN RECORD	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0023 41106473
AR_N60028_000898 NONE CORRESPONDENCE NONE 8	**08-06-1998** 11-29-1999 5090.3.A. NONE	BRENNAN, N. RESTORATION ADVISORY BOARD MEMBER SULLIVAN, J. BRAC PMO WEST	COMMENTS ON THE OFFSHORE REMEDIAL INVESTIGATION (RI) REPORT	ADMIN RECORD	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0022 41106473

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SF_N60028_000978 REPORT N62474-94-D-7609 2000	**03-19-1999** 11-29-1999 5090.3.C. 00194	ROSE, C. TETRA TECH GALANG, E. NAVY	DRAFT FINAL REMEDIAL INVESTIGATION (RI) OFFSHORE SEDIMENTS OPERABLE UNIT (OU), VOLUME 1 OF 2, TEXT, TABLES, AND FIGURES	SITE FILE	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0024 41106473
SF_N60028_000979 REPORT N62474-94-D-7609 2000	**03-19-1999** 11-29-1999 5090.3.C. 00194	ROSE, C. TETRA TECH GALANG, E. NAVY	DRAFT FINAL REMEDIAL INVESTIGATION (RI) OFFSHORE SEDIMENTS OPERABLE UNIT (OU), VOLUME 2 OF 2, APPENDICES	SITE FILE	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0024 41106473
AR_N60028_000995 CORRESPONDENCE NONE 3	**04-22-1999** 11-29-1999 5090.3.A. NONE	KRAUSE, P. MEC GALANG, E. NAVY	COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION (RI) OFFSHORE SEDIMENTS OPERABLE UNIT (OU)	ADMIN RECORD	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0025 41106473
AR_N60028_001006 CORRESPONDENCE NONE 5	**05-11-1999** 11-29-1999 5090.3.A. NONE	RIST, D. DTSC - BERKELEY, CA GALANG, E. NAVY	COMMENTS ON THE DRAFT FINAL OFFSHORE SEDIMENTS OPERABLE UNIT REMEDIAL INVESTIGATION (OU/RI) REPORT - 19 MARCH 1999	ADMIN RECORD	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0025 41106473
AR_N60028_001017 CORRESPONDENCE NONE 2	**05-24-1999** 11-29-1999 5090.3.A. NONE	LELAND, D. CRWQCB GALANG, E. NAVY	COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION (RI) OFFSHORE SEDIMENTS OPERABLE UNIT (OU) REPORT - 19 MARCH 1999	ADMIN RECORD	OFFSHORE O SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0025 41106473

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SF_N60028_001107 SWDIV SER 6225EG/L0034-3 MINUTES NONE 30	**02-03-2000** 03-31-2000 5090.3.C. NONE	GALANG, E. NAVFAC - SOUTHWEST MULTIPLE AGENCIES	REMEDIAL PROJECT MANAGER AND BRAC CLEANUP TEAM (RPM/BCT) MEETING MINUTES - 14 DECEMBER 1999: FINAL - STRATEGIC PLANNING SESSION 1 (INCLUDES 4 ATTACHMENTS: AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS)	SITE FILE	BLDG 0001133 BLDG 0001205 BLDG 0001207 BLDG 0001209 BLDG 0001231 BLDG 0001232 BLDG 0001233 BLDG 0001244 BLDG 0001251 BLDG 0001253 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00009B SITE 00010 SITE 00011 SITE 00011B SITE 00012 SITE 00012B SITE 00013 SITE 00014 SITE 00014B SITE 00015 SITE 00015B SITE 00016 SITE 00017 SITE 00017A SITE 00019 SITE 00020 SITE 00020B	FRC - PERRIS	L181-03-0181 BX 0027 41106473

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					SITE 00021 SITE 00021B SITE 00021C SITE 00022 SITE 00022B SITE 00024 SITE 00024B SITE 00025 SITE 00025B SITE 00027 SITE 00028 SITE 00029 SITE 0006B		

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SF_N60028_001119 SWDIV SER 6225EG/L0088-1 MINUTES NONE 40	**03-28-2000** 05-03-2000 5090.3.C. NONE	GALANG, E. NAVFAC - SOUTHWEST MULTIPLE AGENCIES	TRANSMITTAL OF REMEDIAL PROJECT MANAGER (RPM)/BRAC CLOSURE TEAM (BCT) MEETING MINUTES OF 1 FEBRUARY AND 8 FEBRUARY 2000 RE: REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) (W/ENCLOSURES) (*SEE COMMENT FIELD BELOW)	SITE FILE	BLDG 0001127 BLDG 0001207 BLDG 0001313 BLDG 0001315 BLDG 0001317 BLDG 0001321 BLDG 0001323 BLDG 0001325 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 UST 0000227 UST 0000270	FRC - PERRIS	L181-03-0186 BX 0003 41031802

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
					WELL 025-MW02 WELL 025-MW04 WELL 143-MW1 WELL 143-MW2		
AR_N60028_000088 NONE MM NONE 11	**05-16-2000** 08-30-2000 5090.3.A. NONE	 NAVFAC - SOUTHWEST NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES - 18 APRIL 2000 (MEETING NO. 66)	ADMIN RECORD INFO REPOSITORY	SITE 00012 SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0003 41106473
AR_N60028_000109 NONE MM NONE 70	**05-16-2000** 11-08-2000 5090.3.A. NONE	S. BALBONI MARY HILLABRAND, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING TRANSCRIPT OF 16 MAY 2000 (MEETING NO. 67)	ADMIN RECORD INFO REPOSITORY	SITE 00011 SITE 00012 SITE 00013 SITE 00021 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0003 41106473
AR_N60028_001122 NONE MM NONE 20	**06-20-2000** 06-21-2000 5090.3.A. NONE	 TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) AGENDA FOR MEETING NO. 68 SCHEDULED FOR 20 JUNE 2000 AND RAB MEETING MINUTES OF 16 MAY 2000 (MEETING NO. 67) - (INCLUDES AGENDA, SIGN-IN SHEETS AND HANDOUTS)	ADMIN RECORD	BLDG 0001133 BLDG 0001207 BLDG 0001209 SITE 00011 SITE 00012 SITE 00013 SITE 00021 SITE 00027	FRC - PERRIS	L181-03-0186 BX 0003 41031802

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SF_N60028_000117 TC.0308.10712 MM N62474-94-D-7609 50	**10-03-2000** 12-19-2000 5090.3.C. 00308	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT - REMEDIAL PROJECT MANAGER	SITE FILE	SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00015 SITE 00017 SITE 00019 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029	FRC - PERRIS	L181-03-0181 BX 0003 41106473

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SF_N60028_000113 TC.0308.10622 & SWDIV SER 06CA.JS MINUTES N62474-94-D-7609 30	**10-09-2000** 12-18-2000 5090.3.C. 00308	SULLIVAN, J. NAVFAC - SOUTHWEST MULTIPLE AGENCIES	FINAL - REMEDIAL PROJECT MANAGER AND BRAC CLEANUP TEAM (RPM/BCT) MEETING MINUTES - 13 AND 14 JUNE 2000 - INCLUDES AGENDA, SIGN-IN SHEET, SUMMARY OF SITES 13 & 27 AND COMPILATION OF ACTION ITEMS (WITH ATTACHMENTS)	SITE FILE	SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029	FRC - PERRIS	L181-03-0181 BX 0003 41106473
SF_N60028_000119 TC.0308.10767 & SWDIV SER 06CA.JS/1041 MINUTES N62474-94-D-7609 90	**12-20-2000** 01-11-2001 5090.3.C. 00308	 TETRA TECH EM, INC. VARIOUS AGENCIES	REMEDIAL PROJECT MANAGER AND BRAC CLEANUP TEAM (RPM/BCT) MEETING MINUTES - 14 NOVEMBER 2000 - INCLUDES AGENDA, SIGN-IN SHEET, & ACTION ITEM LIST (WITH ATTACHMENTS)	SITE FILE	SITE 00001 SITE 00003 SITE 00005 SITE 00007 SITE 00012 SITE 00013 SITE 00017 SITE 00021 SITE 00024 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0003 41106473

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N60028_000654 DS.0232.17065 & SWDIV SER 06CA.JS/1354 REPORT N62474-94-D-7609 1500	**12-28-2001** 03-01-2002 5090.3.A. 00232	ROSE, C. TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	FINAL REMEDIAL INVESTIGATION OFFSHORE SEDIMENTS OPERABLE UNIT - VOLUMES 1 AND 2 OF 2 INCLUDES ELECTRONIC VERSION OF APPENDICES, SWDIV TRANSMITTAL LETTER BY J. SULLIVAN AND SUMMARY OF CHANGES MADE BETWEEN DRAFT FINAL AND FINAL VERSION OF THIS REPORT	ADMIN RECORD INFO REPOSITORY	SITE 00013 SITE 00027	FRC - PERRIS	L181-03-0181 BX 0017 41106473

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N60028_000652 TC.0308.11322 & SWDIV SER 06CA.JS/0021 MINUTES N62474-94-D-7609 100	**01-08-2002** 03-01-2002 5090.3.C. 00308	SULLIVAN, J. NAVFAC - SOUTHWEST MULTIPLE AGENCIES	DRAFT MEETING MINUTES FROM THE REMEDIAL PROJECT MANAGER AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (RPM/BCT) FROM MEETING HELD ON 4 DECEMBER 2001 - INCLUDES SIGN-IN SHEET AND AGENDA AND HANDOUTS (WITH ATTACHMENTS)	SITE FILE	BLDG 0000066 BLDG 0000099 BLDG 0000240 BLDG 0000530 BLDG 0001100 BLDG 0001102 BLDG 0001104 BLDG 0001106 BLDG 0001246 BLDG 0001248 BLDG 0001252 BLDG 0001254 BLDG 0001311 BLDG 0001413 SITE 00004 SITE 00006 SITE 00007 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00019 SITE 0001A SITE 0001E SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00029 SITE 0002C SITE 00201 SITE 00368A	FRC - PERRIS	L181-03-0181 BX 0016 41106473

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					SITE 00368B UST 0000180C UST 0000227 UST 0000234 UST 0000240A UST 0000240B		
SF_N60028_000656 TC.0308.11381 & SWDIV SER 06CA.JS/0103 MINUTES N62474-94-D-7609 84	**01-31-2002** 03-01-2002 5090.3.C. 00308	SULLIVAN, J. NAVFAC - SOUTHWEST MULTIPLE AGENCIES	DRAFT MEETING MINUTES FROM THE REMEDIAL PROJECT MANAGER/BRAC CLEANUP TEAM (RPM/BCT) MONTHLY MEETING HELD ON 8 JANUARY 2002 - INCLUDES SIGN-IN SHEET AND AGENDA AND HANDOUTS (WITH ATTACHMENTS)	SITE FILE	BLDG 0001100 BLDG 0001246 BLDG 0001248 BLDG 0001254 PARCEL T-008 PARCEL T-056 PARCEL T-089 PARCEL T-090 PARCEL T-100 PARCEL T-111 PARCEL T-116 PARCEL YB019 PARCEL YB026 SITE 00012 SITE 00024 SITE 00027	FRC - PERRIS	L181-03-0186 BX 0001 41031802

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AR_N60028_001131 DS.A016.10057 & SWDIV SER 06CA.JS/0878 MISC N68711-00-D-0005 150	**08-01-2002** 09-23-2002 5090.3.A. DO 16	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	ENVIRONMENTAL CLOSEOUT STRATEGY/SCHEDULES - INCLUDES SWDIV TRANSMITTAL LETTER BY J. SULLIVAN	ADMIN RECORD INFO REPOSITORY	BLDG 0000003 BLDG 0000041 BLDG 0000062 BLDG 0000099 BLDG 0000257 BLDG 0000289 BLDG 0000290 BLDG 0000325 BLDG 0000335 SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029	FRC - PERRIS	L181-03-0186 BX 0003 41031802

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SF_N60028_001149 DS.A016.10454 MINUTES N68711-00-D-0005 30	**02-04-2003** 03-19-2003 5090.3.C. 00016	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES FROM MEETING HELD ON 04 FEBRUARY 2002 - INCLUDES AGENDA, SIGN-IN SHEET, HANDOUTS AND SWDIV TRANSMITTAL BY J. SULLIVAN (WITH ATTACHMENTS)	SITE FILE	BLDG 0000335 SITE 00009 SITE 00010 SITE 00011 SITE 00013 SITE 00016 SITE 00027	FRC - PERRIS	L181-03-0186 BX 0004 41031802
SF_N60028_001179 DS.A026.10875 & SWDIV SER 06CA.LL/0062 REPORT N68711-00-D-0005 80	**01-27-2004** 02-06-2004 5090.3.C. DO 0026	ROSE, C. TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	DRAFT FEASIBILITY STUDY FOR THE CLIPPER COVE SKEET RANGE [INCLUDES SWDIV TRANSMITTAL LETTER]	SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001282 NONE CORRESPONDENCE NONE 1	**03-19-2004** 06-17-2005 5090.3.A. NONE	L. LANDERS NAVFAC - SOUTHWEST P. COLLINS USEPA	ELECTRONIC MAIL CONFIRMATION OF THE U.S. EPA'S SUGGESTION TO REVISE THE DRAFT FEASIBILITY STUDY (FS)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001209 DS.B006.13044 & SWDIV SER. 06CA.JS/0523 MINUTES N68711-03-D-5104 12	**04-06-2004** 06-09-2004 5090.3.C. 00006	SULTECH NAVFAC - SOUTHWEST DIVISION	DRAFT MINUTES FOR REMEDIAL PROJECT MANAGER BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MONTHLY MEETING (INCLUDES SWDIV TRANSMITTAL LETTER)	SITE FILE	BLDG 0000502 SITE 00008 SITE 00013 SITE 00027 SITE 00030 SITE 00031	NAVFAC - SOUTHWEST	
SF_N60028_001208 SWDIV SER 06CA.LL/0559 OTHER NONE 7	**05-27-2004** 06-08-2004 5090.3.C. NONE	LANDERS, L. NAVFAC - SOUTHWEST NAVFAC - SOUTHWEST DIVISION	BRAC CLEAN TEAM (BCT) DID SUBMIT COMMENTS TO NAVY ON REDEFINING INSTALLATION RESTORATION BOUNDARY, FORMER CLIPPER COVE SKEET RANGE, [INCLUDES BOUNDARY MAP], (PORTION OF MAILING LIST IS SENSITIVE)	SENSITIVE SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	

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SF_N60028_001232 DS.B006.13060 MINUTES N68711-03-D-5104 15	**08-03-2004** 12-06-2004 5090.3.C. 00006	SULTECH NAVFAC - SOUTHWEST DIVISION	DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	BLDG 0000062 BLDG 0000180 BLDG 0000450 BLDG 0000454 BLDG 0000530 SITE 00006 SITE 00012 SITE 00015 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00033 SITE 00227	NAVFAC - SOUTHWEST	
SF_N60028_001234 DS.B006.13064 MINUTES N68711-03-D-5104 17	**10-05-2004** 12-06-2004 5090.3.C. 00006	SULTECH NAVFAC - SOUTHWEST DIVISION	02 SEPTEMBER 2004 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	BLDG 0000233 BLDG 0000343 BLDG 0000344 SITE 00002 SITE 00010 SITE 00012 SITE 00014 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00030 SITE 00031 SITE 00227	NAVFAC - SOUTHWEST	
AR_N60028_001371 NONE MISC NONE 1	**11-05-2004** 08-02-2006 5090.3.A. NONE	SULLIVAN, J. BRAC PMO WEST NAVFAC - SOUTHWEST DIVISION	HISTORICAL DREDGING	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	

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SF_N60028_001238 DS.B043.14444 & SWDIV SER BPMOW.LNL/0184 REPORT N68711-03-D-5104 75	**12-10-2004** 12-27-2004 5090.3.C. 00043	ROSE, C. SULTECH NAVFAC - SOUTHWEST DIVISION	REVISED DRAFT FEASIBILITY STUDY, CLIPPER COVE SKEET RANGE [INCLUDES SWDIV TRANSMITTAL LETTER] {PORTION OF MAILING LIST IS CONFIDENTIAL}	SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001281 NONE CORRESPONDENCE NONE 9	**12-10-2004** 06-17-2005 5090.3.A. NONE	 NAVFAC - SOUTHWEST MULTIPLE AGENCIES	RESPONSES TO AGENCY COMMENTS ON THE DRAFT FEASIBILITY STUDY (FS)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001354 NONE CORRESPONDENCE NONE 20	**02-08-2005** 05-23-2006 5090.3.A. NONE	RIST, D. DTSC - BERKELEY, CA L. LANDERS BRAC PMO WEST	COMMENTS ON THE REVISED DRAFT FEASIBILITY STUDY (FS), CLIPPER COVE SKEET RANGE (PORTION OF THE MAILING LIST IS CONFIDENTIAL)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001258 BRAC SER BPMOW.LNL/0392 CORRESPONDENCE NONE 6	**02-10-2005** 02-16-2005 5090.3.A. NONE	SULLIVAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL SERVES AS FORMAL NOTIFICATION ON REDEFINING INSTALLATION RESTORATION SITE 27 BOUNDARY AT THE FORMER CLIPPER COVE SKEET RANGE, INLCUDES BOUNDARY MAP AND FIGURE DETAILING THE ONSHORE AREA {PORTION OF MAILING LIST IS CONFIDENTIAL}	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001316 NONE CORRESPONDENCE NONE 40	**04-27-2005** 01-10-2006 5090.3.C. NONE	 NAVFAC - SOUTHWEST MULTIPLE AGENCIES	DRAFT RESPONSES TO REGULATORY AGENCY AND COMMENTS ON REVISED DRAFT FEASIBILITY STUDY, CLIPPER COVER SKEET RANGE	SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	

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AR_N60028_001280 NONE MTG MINS NONE 7	**05-03-2005** 06-17-2005 5090.3.A. NONE	TETRA TECH EM, INC. NAVFAC - SOUTHWEST DIVISION	FINAL MEETING MINUTES OF THE 03 MAY 2005 TECHNICAL MEETING OF THE CLIPPER COVER SKEET RANGE - INCLUDES AGENDA AND SIGN-IN SHEET	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001355 NONE CORRESPONDENCE NONE 9	**05-09-2005** 06-08-2006 5090.3.A. NONE	J. POLISINI DTSC - GLENDALE D. RIST OMF - BERKELEY	COMMENTS ON THE RESPONSE TO COMMENTS ON THE REVISED DRAFT FEASIBILITY STUDY (FS), CLIPPER COVE	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001214 DS.B006.14490 PUB NOTICE NONE 15	**07-13-2005** 07-27-2005 5090.3.A. NONE	SULTECH NAVFAC - SOUTHWEST DIVISION	POINT PAPER FOR THE EVALUATION OF SEDIMENT DEPOSITION AT THE CLIPPER COVE SKEET RANGE	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001322 NONE PUB NOTICE N68711-03-D-5104 30	**02-22-2006** 02-24-2006 5090.3.A. NONE	ROSE, C. SULTECH NAVFAC - SOUTHWEST DIVISION	POINT PAPER FOR THE EVALUATION OF SEDIMENT DISPOSITION AT THE CLIPPER COVE SKEET RANGE, REVISION 1	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001594 TTEM-0055-FZN6-0210 MINUTES N62467-04-D-0055 59	**10-17-2006** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	17 OCTOBER 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 126 (INCLUDES VARIOUS HANDOUTS AND CD COPY)	ADMIN RECORD INFO REPOSITORY	SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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AR_N60028_001595 TTEM-0055-FZN6-0211 MINUTES N62467-04-D-0055 34	**12-19-2006** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	19 DECEMBER 2006 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 127 (INCLUDES VARIOUS HANDOUTS AND CD COPY)	ADMIN RECORD INFO REPOSITORY	BLDG 0000001 BLDG 0000061 BLDG 0000083 BLDG 0000233 BLDG 0000240 BLDG 0001311 BLDG 0001313 BLDG 0001325 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001502 TTEM.0055.FZN6.01 07 MINUTES N62467-04-D-0055 60	**01-09-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	09 JANUARY 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) {INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	BLDG 0000233 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001503 TTEM.0055.FZN6.00 16 MINUTES N62467-04-D-0055 45	**02-06-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	06 FEBRUARY 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) {INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS} (CD COPY ENCLOSED) [SEE AR # 1501 - BRAC PMO WEST TRANSMITTAL LETTER]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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AR_N60028_001596 TTEM-0055-FZN6-0003 MINUTES N62467-04-D-0055 40	**02-20-2007** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	20 FEBRUARY 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 128 (INCLUDES VARIOUS HANDOUTS AND CD COPY)	ADMIN RECORD INFO REPOSITORY	SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031	NAVFAC - SOUTHWEST	
SF_N60028_001504 TTEM.0055.FZN6.0009 MINUTES N62467-04-D-0055 50	**03-06-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	06 MARCH 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) {INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS} (CD COPY ENCLOSED) [SEE AR # 1501 - BRAC PMO WEST TRANSMITTAL LETTER]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001500 TTEM.0055.FZN6.0011 MINUTES N62467-04-D-0055 30	**04-03-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	03 APRIL 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001505 TTEM.0055.FZN6.0012 MINUTES N62467-04-D-0055 40	**04-03-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	03 APRIL 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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AR_N60028_001597 TTEM-0055-FZN6-0008 MINUTES N62467-04-D-0055 63	**04-17-2007** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	17 APRIL 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 129 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	BLDG 0001311 BLDG 0001313 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00030 SITE 00031	NAVFAC - SOUTHWEST	
SF_N60028_001446 DS.B043.21244 REPORT N68711-03-D-5104 60	**05-01-2007** 05-25-2007 5090.3.C. 00043	G. SWANSON SULTECH BRAC PMO WEST	DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE (SEE AR #1445 - BRAC PMO WEST TRANSMITTAL LETTER BY J. SULLIVAN)	SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001499 TTEM.0055.FZN6.0014 MINUTES N62467-04-D-0055 30	**05-01-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	01 MAY 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00024 SITE 00025 SITE 00027 SITE 00030 SITE 00031 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001506 TTEM.0055.FZN6.0015 MINUTES N62467-04-D-0055 35	**05-01-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	01 MAY 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
AR_N60028_001445 BRAC SER BPMOW.CP/0549 CORRESPONDENCE N68711-03-D-5104 2	**05-11-2007** 05-25-2007 5090.3.A. 00043	SULLIVAN, J. BRAC PMO WEST WONG, H. DTSC - BERKELEY, CA	TRANSMITTAL OF DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE (W/OUT ENCLOSURE) {SEE AR # 1446 - DRAFT SAP}	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001498 TTEM.0055.FZN6.0017 MINUTES N62467-04-D-0055 30	**06-05-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	05 JUNE 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, DRAFT AGENDA FOR THE 19 JUNE 2007 RAB MEETING, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001507 TTEM.0055.FZN6.0018 MINUTES N62467-04-D-0055 40	**06-05-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	05 JUNE 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
AR_N60028_001855 NONE CORRESPONDENCE NONE 2	**06-11-2007** 08-10-2011 5090.3.A. NONE	FARRES, A. CRWQCB - OAKLAND, CA PERRY, C. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE	ADMIN RECORD	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001854 NONE CORRESPONDENCE NONE 8	**06-13-2007** 08-10-2011 5090.3.A. NONE	WONG, H. DTSC - BERKELEY, CA SULLIVAN, J. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE (INCLUDES REVIEW AND COMMENTS BY POLISINI, J. FROM DTSC - BERKELEY, CA)	ADMIN RECORD	SITE 00027	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N60028_001598 TTEM-0055-FZN6-0098 MINUTES N62467-04-D-0055 30	**06-19-2007** 03-18-2009 5090.3.A. CTO FZN6	 TETRA TECH EM, INC. RAB MEMBERS	19 JUNE 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 130 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	SITE 00006 SITE 00006A SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029	NAVFAC - SOUTHWEST	
AR_N60028_001856 NONE CORRESPONDENCE NONE 7	**06-22-2007** 08-10-2011 5090.3.A. NONE	FOOTE, G. GEOMATRIX CONSULTANTS, INC. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE	ADMIN RECORD	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001508 TTEM.0055.FZN6.0021 MINUTES N62467-04-D-0055 45	**07-10-2007** 05-20-2008 5090.3.C. FZN6	 TETRA TECH EM, INC. BRAC PMO WEST	10 JULY 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001496 TTEM.0055.FZN6.0023 MINUTES N62467-04-D-0055 70	**08-08-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	08 AND 09 AUGUST 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) {INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS} (CD COPY ENCLOSED)	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001509 TTEM.0055.FZN6.0024 MINUTES N62467-04-D-0055 200	**08-08-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	08 AND 09 AUGUST 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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AR_N60028_001599 TTEM-0055-FZN6-0101 MINUTES N62467-04-D-0055 32	**08-21-2007** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	21 AUGUST 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 131 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001495 TTEM.0055.FZN6.0026 MINUTES N62467-04-D-0055 30	**09-11-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	11 SEPTEMBER 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001510 TTEM.0055.FZN6.0027 MINUTES N62467-04-D-0055 40	**09-11-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	11 SEPTEMBER 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001494 TTEM.0055.FZN6.0029 MINUTES N62467-04-D-0055 30	**10-02-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	02 OCTOBER 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001511 TTEM.0055.FZN6.0030 MINUTES N62467-04-D-0055 40	**10-02-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	02 OCTOBER 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
AR_N60028_001469 SULT.5104.0043.0024 CORRESPONDENCE N68711-03-D-5104 8	**10-12-2007** 10-29-2007 5090.3.A. 00043	SULTECH NAVFAC - SOUTHWEST	RESPONSE TO REGULATORY AGENCY COMMENTS ON THE DRAFT SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE (CD COPY IS ENCLOSED)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001600 TTEM-0055-FZN6-0104 MINUTES N62467-04-D-0055 19	**10-16-2007** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	16 OCTOBER 2007 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 132 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	SITE 00008 SITE 00012 SITE 00027 SITE 00028 SITE 00029	NAVFAC - SOUTHWEST	

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SF_N60028_001493 TTEM.0055.FZN6.0032 MINUTES N62467-04-D-0055 30	**11-06-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	06 NOVEMBER 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001512 TTEM.0055.FZN6.0033 MINUTES N62467-04-D-0055 40	**11-06-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	06 NOVEMBER 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001492 TTEM.0055.FZN6.0035 MINUTES N62467-04-D-0055 30	**12-04-2007** 05-15-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	04 DECEMBER 2007 DRAFT MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001513 TTEM.0055.FZN6.0036 MINUTES N62467-04-D-0055 40	**12-04-2007** 05-20-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	04 DECEMBER 2007 FINAL MEETING MINUTES, REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000233 SITE 00006 SITE 00009 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
AR_N60028_001478 SULT.5104.0043.0003 REPORT N68711-03-D-5104 100	**01-01-2008** 02-27-2008 5090.3.A. 00043	SWANSON, K. SULTECH BRAC PMO WEST	FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE (CD COPY ENCLOSED) [SEE AR # 1477 - BRAC PMO WEST TRANSMITTAL LETTER]	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	

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AR_N60028_001477 BRAC SER BPMOW.CP/0226 CORRESPONDENCE NONE 2	**01-31-2008** 02-27-2008 5090.3.A. NONE	SULLIVAN, J. BRAC PMO WEST MIYA, R. DTSC - BERKELEY	TRANSMITTAL OF FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE SKEET RANGE (W/OUT ENCLOSURE) [SEE AR # 1478 - FINAL SAP]	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001602 TTEM-0055-FZN6-0124 MINUTES N62467-04-D-0055 59	**02-05-2008** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	05 FEBRUARY 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 134 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	BLDG 0000233 BLDG 0000343 BLDG 0000344 SITE 00006A SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029	NAVFAC - SOUTHWEST	
AR_N60028_001483 SULL.5104.0043.0004 REPORT N68711-03-D-5104 140	**03-01-2008** 04-01-2008 5090.3.A. 00043	HENRY, K. SULTECH BRAC PMO WEST	FINAL HEALTH AND SAFETY PLAN FOR THE FIELD INVESTIGATION OF LEAD SHOT AT CLIPPER COVE STREET RANGE (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	

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SF_N60028_001558 TTEM.0055.FZN6.0117 MINUTES N62467-04-D-0055 43	**04-01-2008** 12-04-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	01 APRIL 2008 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) AND CLEANUP TEAM (BCT) MEETING MINUTES (INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	BLDG 0000233 BLDG 0001207 BLDG 0001209 BLDG 0001231 BLDG 0001233 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00012 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001620 TTEM-0055-FZN6-0118 MINUTES N62467-04-D-0055 43	**04-01-2008** 06-04-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	01 APRIL 2008 FINAL REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS] {CD COPY ENCLOSED}	SITE FILE	BLDG 0000233 BLDG 0001207 BLDG 0001209 BLDG 0001233 BLDG 0001319 BLDG 0001321 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00030 SITE 00031	NAVFAC - SOUTHWEST	
AR_N60028_001603 TTEM-0055-FZN6-0127 MINUTES N62467-04-D-0055 45	**04-15-2008** 03-18-2009 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RAB MEMBERS	15 APRIL 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 135 (INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	BLDG 0000233 BLDG 0000343 BLDG 0000344 SITE 00011 SITE 00012 SITE 00027 SITE 00031	NAVFAC - SOUTHWEST	

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SF_N60028_001559 TTEM.0055.FZN6.0120 MINUTES N62467-04-D-0055 47	**05-06-2008** 12-04-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	06 MAY 2008 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) AND CLEANUP TEAM (BCT) MEETING MINUTES (INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	BLDG 0000233 BLDG 0000343 BLDG 0001123 BLDG 0001207 BLDG 0001209 BLDG 0001231 BLDG 0001233 BLDG 0001321 BLDG 0001321A BLDG 0001325 SITE 00011 SITE 00012 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001621 TTEM-0055-FZN6-0121 MINUTES N62467-04-D-0055 47	**05-06-2008** 06-04-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	06 MAY 2008 FINAL REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS] {CD COPY ENCLOSED} (CONTAINS SENSITIVE MAPS)	SENSITIVE SITE FILE	BLDG 0000233 BLDG 0001207 BLDG 0001209 BLDG 0001231 BLDG 0001233 BLDG 0001319 BLDG 0001321 SITE 00011 SITE 00012 SITE 00024 SITE 00027 SITE 00030 SITE 00031	NAVFAC - SOUTHWEST	

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SF_N60028_001848 NONE CORRESPONDENCE NONE 2	**05-30-2008** 08-10-2011 5090.3.C. NONE	WALLACE, J. TREASURE ISLAND ENTERPRISES, LLC SULLIVAN, J. BRAC PMO WEST	REVIEW AND COMMENTS ON THE 01 APRIL 2008 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) AND CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001560 TTEM.0055.FZN6.0141 MINUTES N62467-04-D-0055 81	**06-03-2008** 12-04-2008 5090.3.C. FZN6	TETRA TECH EM, INC. BRAC PMO WEST	03 JUNE 2008 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) AND CLEANUP TEAM (BCT) MEETING MINUTES (INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	BLDG 0000233 BLDG 0000461 BLDG 0001319 BLDG 0001321 SITE 00012 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001622 TTEM-0055-FZN6-0142 MINUTES N62467-04-D-0055 82	**06-03-2008** 06-04-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	03 JUNE 2008 FINAL REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES [INCLUDES AGENDA, SIGN-IN SHEET, AND VARIOUS HANDOUTS] {CD COPY ENCLOSED} (CONTAINS SENSITIVE MAP)	SENSITIVE SITE FILE	BLDG 0000001 BLDG 0000003 BLDG 0000180 BLDG 0000233 BLDG 0000240 BLDG 0000461 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001624 TTEM-0055-FZN6-0145 MINUTES N62467-04-D-0055 85	**07-08-2008** 07-01-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	08 - 09 JULY 2008 FINAL REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES [INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0000225 BLDG 0000233 BLDG 0000344 BLDG 0001202 BLDG 0001211 BLDG 0001213 BLDG 0001215 BLDG 0001217 BLDG 0001228 BLDG 0001232 BLDG 0001235 BLDG 0001237 BLDG 0001311 BLDG 0001313 BLDG 0001315 BLDG 0001317 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00020 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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AR_N60028_001767 TTEM-0055-FZN6-0133 MINUTES N62467-04-D-0055 29	**08-19-2008** 12-20-2010 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RESTORATION ADVISORY BOARD	19 AUGUST 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NUMBER 137 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD SENSITIVE	BLDG 0000099 BLDG 0001123 BLDG 0001133 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001627 TTEM-0055-FZN6-0157 MINUTES N62467-04-D-0055 50	**11-05-2008** 07-01-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	05 NOVEMBER 2008 FINAL REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES [INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0001211 BLDG 0001213 BLDG 0001235 BLDG 0001237 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00006 SITE 00007 SITE 00010 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001681 TTEM-0055-FZN6-0156 MINUTES N62467-04-D-0055 120	**11-05-2008** 05-20-2010 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	05 NOVEMBER 2008 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY)	SITE FILE	BLDG 0001211 BLDG 0001213 BLDG 0001235 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00007 SITE 00010 SITE 00012 SITE 00027 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001628 TTEM-0055-FZN6-0160 MINUTES N62467-04-D-0055 47	**12-03-2008** 07-01-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	03 DECEMBER 2008 FINAL REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES [INCLUDES AGENDA, SIGN-IN SHEET, VARIOUS HANDOUTS, AND CD COPY]	SITE FILE	BLDG 0001145 BLDG 0001302 BLDG 0001306 BLDG 0001313 BLDG 0001315 BLDG 0001317 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00006 SITE 00011 SITE 00012 SITE 00020 SITE 00021 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	

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AR_N60028_001769 TTEM-0055-FZN6-0139 MINUTES N62467-04-D-0055 44	**12-16-2008** 12-20-2010 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RESTORATION ADVISORY BOARD	16 DECEMBER 2008 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING NUMBER 139 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD SENSITIVE	BLDG 0000461 BLDG 0001123 BLDG 0001228 BLDG 0001311 BLDG 0001413 SITE 00006 SITE 00008 SITE 00012 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
AR_N60028_001583 BRAC SER BPMOW.CP/1166 CORRESPONDENCE NONE 2	**12-29-2008** 02-17-2009 5090.3.A. NONE	SULLIVAN, J. BRAC PMO WEST MIYA, R. DTSC - BERKELEY, CA	TRANSMITTAL OF THE SECOND REVISED DRAFT FEASIBILITY STUDY, CLIPPER COVE SKEET RANGE (W/OUT ENCLOSURE)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001584 DS.B043.14444.R2 REPORT N68711-03-D-5104 1200	**12-29-2008** 02-17-2009 5090.3.C. CTO 0043	HENRY, K. SULTECH BRAC PMO WEST	SECOND REVISED DRAFT FEASIBILITY STUDY, CLIPPER COVE SKEET RANGE (CD COPY ENCLOSED)	SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	

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SF_N60028_001631 TTEM-0055-FZN6-0167 MINUTES N62467-04-D-0055 11	**01-07-2009** 07-30-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	07 JANUARY 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	BLDG 0001123 BLDG 0001321 SITE 00006 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00031 SITE 00032 WELL 00035 WELL 00038	NAVFAC - SOUTHWEST	
AR_N60028_001843 NONE CORRESPONDENCE NONE 5	**02-02-2009** 08-09-2011 5090.3.A. NONE	MIYA, R. DTSC - BERKELEY, CA SULLIVAN, J. BRAC PMO WEST	REVIEW AND COMMENTS ON THE SECOND REVISED DRAFT FEASIBILITY STUDY, CLIPPER COVE SKEET RANGE	ADMIN RECORD	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001632 TTEM-0055-FZN6-0170 MINUTES N62467-04-D-0055 13	**02-04-2009** 07-30-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	04 FEBRUARY 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001638 NONE CORRESPONDENCE NONE 12	**02-04-2009** 07-30-2009 5090.3.C. NONE	FOOTE, G. AMEC GEOMATRIX, INC. MULTIPLE AGENCIES	REVIEW AND COMMENTS ON THE 07 JANUARY 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	BLDG 0001123 SITE 00006 SITE 00012 SITE 00024 SITE 00027	NAVFAC - SOUTHWEST	

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AR_N60028_001689 TTEM-0055-FZN6-0200 MINUTES N62467-04-D-0055 31	**02-17-2009** 07-22-2010 5090.3.A. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. RESTORATION ADVISORY BOARD	17 FEBRUARY 2009 FINAL RESTORATION ADVISORY BOARD MEETING MINUTES (MEETING NO. 140) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000233 BLDG 0000343 BLDG 0000344 BLDG 0000461 BLDG 0000463 BLDG 0001319 BLDG 0001325 SITE 00006 SITE 00008 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001633 TTEM-0055-FZN6-0173 MINUTES N62467-04-D-0055 11	**03-04-2009** 07-30-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	04 MARCH 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001642 NONE CORRESPONDENCE NONE 14	**03-06-2009** 07-30-2009 5090.3.C. NONE	FOOTE, G. AMEC GEOMATRIX, INC. MULTIPLE AGENCIES	REVIEW AND COMMENTS ON THE 04 FEBRUARY 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00034	NAVFAC - SOUTHWEST	

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AR_N60028_001883 NONE CORRESPONDENCE NONE 3	**03-09-2009** 08-15-2011 5090.3.A. NONE	BOX, C. SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION - SAN FRANCISCO, CA SULLIVAN, J. BRAC PMO WEST	REVIEW AND COMMENTS ON THE SECOND REVISED DRAFT FEASIBILITY STUDY, CLIPPER COVE SKEET RANGE	ADMIN RECORD	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001634 TTEM-0055-FZN6-0176 MINUTES N62467-04-D-0055 11	**04-01-2009** 07-30-2009 5090.3.C. CTO FZN6	TETRA TECH EM, INC. BRAC PMO WEST	01 APRIL 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001645 NONE CORRESPONDENCE NONE 12	**04-01-2009** 07-30-2009 5090.3.C. NONE	FOOTE, G. AMEC GEOMATRIX, INC. MULTIPLE AGENCIES	REVIEW AND COMMENTS ON THE 04 MARCH 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00034	NAVFAC - SOUTHWEST	

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SF_N60028_001630 TTEM-0055-FZN6-0194 REPORT N62467-04-D-0055 150	**04-16-2009** 07-06-2009 5090.3.C. CTO FZN6	RASH, M. TETRA TECH EM, INC. BRAC PMO WEST	DRAFT SITE MANAGEMENT PLAN (CD COPY ENCLOSED)	SITE FILE	SITE 00001 SITE 00003 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001656 TTEM-0055-FZN6-0182 MINUTES N62467-04-D-0055 8	**06-03-2009** 03-01-2010 5090.3.C. CTO FZN6	 TETRA TECH EM, INC. BRAC PMO WEST	03 JUNE 2009 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00027 SITE 00030 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	

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SF_N60028_001648 NONE CORRESPONDENCE NONE 12	**06-25-2009** 07-30-2009 5090.3.C. NONE	FOOTE, G. AMEC GEOMATRIX, INC. MULTIPLE AGENCIES	REVIEW AND COMMENTS ON THE 01 APRIL 2009 DRAFT REMEDIAL PROJECT MANAGER (RPM) AND BASE REALIGNMENTS AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00034	NAVFAC - SOUTHWEST	
SF_N60028_001657 TTEM-0055-FZN6-0185 MINUTES N62467-04-D-0055 9	**07-01-2009** 03-01-2010 5090.3.C. CTO FZN6	 TETRA TECH EM, INC. BRAC PMO WEST	01 JULY 2009 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	
SF_N60028_001659 TTEM-0055-FZN6-0191 MINUTES N62467-04-D-0055 11	**09-02-2009** 03-01-2010 5090.3.C. CTO FZN6	 TETRA TECH EM, INC. BRAC PMO WEST	02 SEPTEMBER 2009 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE CLEANUP (BRAC) TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	BLDG 0000003 BLDG 0001231 BLDG 0001233 BLDG 0001244 BLDG 0001246 BLDG 0001319 BLDG 0001321 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00032	NAVFAC - SOUTHWEST	

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AR_N60028_001684 TTEM-0055-FZN6-0197 REPORT N62476-04-D-0055 148	**09-28-2009** 05-26-2010 5090.3.A. CTO FZN6	RASH, M. TETRA TECH EM, INC. BRAC PMO WEST	FINAL SITE MANAGEMENT PLAN (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00003 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00026 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001699 TTEM-0055-FZN6-0216 MINUTES N62467-04-D-0055 10	**10-07-2009** 09-24-2010 5090.3.C. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. BRAC PMO WEST	07 OCTOBER 2009 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	BLDG 0001121 BLDG 0001123 BLDG 0001124 BLDG 0001232 BLDG 0001237 BLDG 0001238 BLDG 0001244 BLDG 0001246 BLDG 0001311 BLDG 0001313 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001700 TTEM-0055-FZN6-0221 MINUTES N62467-04-D-0055 9	**11-04-2009** 09-24-2010 5090.3.C. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. BRAC PMO WEST	04 NOVEMBER 2009 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	BLDG 0000233 BLDG 0000445 BLDG 0001123 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00032	NAVFAC - SOUTHWEST	

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SF_N60028_001726 NONE CORRESPONDENCE NONE 10	**12-01-2009** 11-09-2010 5090.3.C. NONE	FOOTE, G. TREASURE ISLAND DEVELOPMENT AUTHORITY NAVFAC - SOUTHWEST	REVIEW AND COMMENTS ON THE 1) 5 AUGUST 2009, 2) 2 SEPTEMBER 2009, AND 3) 7 OCTOBER 2009 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	BLDG 0001121 BLDG 0001123 BLDG 0001124 BLDG 0001237 BLDG 0001238 BLDG 0001244 BLDG 0001246 BLDG 0001311 BLDG 0001313 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00012 SITE 00024 SITE 00027 SITE 00032	NAVFAC - SOUTHWEST	

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AR_N60028_001694 TTEM-0055-FZN6-0236 MINUTES N62467-04-D-0055 33	**12-15-2009** 07-22-2010 5090.3.A. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. RESTORATION ADVISORY BOARD	15 DECEMBER 2009 FINAL RESTORATION ADVISORY BOARD MEETING MINUTES (MEETING NO. 145) [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD INFO REPOSITORY	BLDG 0000099 BLDG 0000201 BLDG 0000260 BLDG 0000269 BLDG 0000273 BLDG 0001123 BLDG 0001205 BLDG 0001215 BLDG 0001224 BLDG 0001226 BLDG 0001227 BLDG 0001237 BLDG 0001238 BLDG 0001239 BLDG 0001240 BLDG 0001244 BLDG 0001246 BLDG 0001312 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00029 SITE 00031 SITE 00032 WELL MW-38	NAVFAC - SOUTHWEST	

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SF_N60028_001701 TTEM-0055-FZN6-0238 MINUTES N62467-04-D-0055 11	**02-03-2010** 09-24-2010 5090.3.C. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. BRAC PMO WEST	03 FEBRUARY 2010 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	BLDG 0000092 BLDG 0000233 BLDG 0001321 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033 WELL MW38	NAVFAC - SOUTHWEST	
AR_N60028_001764 TTEM-0055-FZN6-0254 MINUTES N62467-04-D-0055 42	**02-16-2010** 12-20-2010 5090.3.A. CTO FZN6	 TETRA TECH EM, INC. RESTORATION ADVISORY BOARD	16 FEBRUARY 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 146 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD INFO REPOSITORY	BLDG 0000233 BLDG 0001313 BLDG 0001321 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 WELL MW-38	NAVFAC - SOUTHWEST	

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SF_N60028_001702 TTEM-0055-FZN6-0247 MINUTES N62467-04-D-0055 13	**03-03-2010** 09-24-2010 5090.3.C. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. BRAC PMO WEST	03 MARCH 2010 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	BLDG 0001121 BLDG 0001123 SITE 00011 SITE 00012 SITE 00021 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00031 SITE 00032 SITE 00033 WELL 21-MW09A	NAVFAC - SOUTHWEST	
SF_N60028_001703 TTEM-0055-FZN6-0250 MINUTES N62467-04-D-0055 18	**04-07-2010** 09-24-2010 5090.3.C. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. BRAC PMO WEST	07 APRIL 2010 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES (CD COPY ENCLOSED)	SITE FILE	BLDG 0000233 BLDG 0000343 BLDG 0000344 BLDG 0001121 BLDG 0001123 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00030 SITE 00031 SITE 00032 SITE 00033 UST 0000240	NAVFAC - SOUTHWEST	

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AR_N60028_001686 TTEM-0055-FZN6-0241 REPORT N62467-04-D-0055 151	**04-19-2010** 06-15-2010 5090.3.A. CTO FZN6	RASH, M. TETRA TECH EM, INC. BRAC PMO WEST	DRAFT 2010 SITE MANAGEMENT PLAN (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000066 BLDG 0000180 BLDG 0000227 BLDG 0000530 PARCEL T-086 SITE 00004 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00032 SITE 00033 UST 0000001 UST 0000001A UST 0000001B UST 0000001C UST 0000001D UST 0000001E UST 0000001F UST 0000002 UST 0000002A UST 0000002C	NAVFAC - SOUTHWEST	

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					UST 0000469 UST QR-8		
AR_N60028_001765 TTEM-0055-FZN6-0257 MINUTES N62467-04-D-0055 34	**04-20-2010** 12-20-2010 5090.3.A. CTO FZN6	TETRA TECH EM, INC. RESTORATION ADVISORY BOARD	20 APRIL 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING # 147 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD INFO REPOSITORY	BLDG 0000233 BLDG 0001121 BLDG 0001123 BLDG 0001233 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00006 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00030 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	
SF_N60028_001737 NONE CORRESPONDENCE NONE 11	**04-26-2010** 11-10-2010 5090.3.C. NONE	FOOTE, G. TREASURE ISLAND DEVELOPMENT AUTHORITY MERRIFIELD, C. TETRA TECH EM, INC.	REVIEW AND COMMENTS ON THE 3 FEBRUARY 2010 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP TEAM (BCT) MEETING MINUTES	SITE FILE	BLDG 0000233 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
SF_N60028_001741 NONE CORRESPONDENCE NONE 14	**04-26-2010** 11-10-2010 5090.3.C. NONE	FOOTE, G. TREASURE ISLAND DEVELOPMENT AUTHORITY MERRIFIELD, C. TETRA TECH EM, INC.	REVIEW AND COMMENTS ON THE 3 MARCH 2010 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE CLEANUP (BRAC) TEAM (BCT) MEETING MINUTES	SITE FILE	BLDG 0001121 BLDG 0001123 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00031 SITE 00032 SITE 00033 WELL 00021-MW09A	NAVFAC - SOUTHWEST	
AR_N60028_001766 TTEM-0055-FZN6-0260 MINUTES N62467-04-D-0055 41	**06-15-2010** 12-20-2010 5090.3.A. CTO FZN6	 TETRA TECH EM, INC. RESTORATION ADVISORY BOARD	15 JUNE 2010 FINAL RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MEETING 148 [INCLUDES AGENDA, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000040 BLDG 0000096 BLDG 0000099 BLDG 0000233 BLDG 0001121 BLDG 0001123 BLDG 0001319 BLDG 0001321 BLDG 0001325 SITE 00012 SITE 00021 SITE 00024 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031 SITE 00032 SITE 00033	NAVFAC - SOUTHWEST	

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SF_N60028_001744 NONE CORRESPONDENCE NONE 18	**08-02-2010** 11-10-2010 5090.3.C. NONE	FOOTE, G. TREASURE ISLAND DEVELOPMENT AUTHORITY MERRIFIELD, C. TETRA TECH EM, INC.	REVIEW AND COMMENTS ON THE 7 APRIL 2010 DRAFT REMEDIAL PROJECT MANAGERS AND BASE REALIGNMENT AND CLOSURE CLEANUP (BRAC) TEAM (BCT) MEETING MINUTES	SITE FILE	BLDG 0000233 BLDG 0000343 BLDG 0000344 BLDG 0001121 BLDG 0001123 BLDG 0001319 BLDG 0001321 SITE 00006 SITE 00012 SITE 00024 SITE 00027 SITE 00028 SITE 00031 SITE 00032	NAVFAC - SOUTHWEST	
AR_N60028_001712 BRAC SER BPMOW.LKB/0706 CORRESPONDENCE NONE 2	**08-13-2010** 10-07-2010 5090.3.A. NONE	SULLIVAN, J. BRAC PMO WEST SUNGA, R. DTSC - BERKELEY, CA	TRANSMITTAL OF THE FINAL FEASIBILITY STUDY, CLIPPER COVE SKEET RANGE	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001713 TTEM-0055-FZN6-0245 REPORT N62467-04-D-0055 1292	**08-13-2010** 10-07-2010 5090.3.A. CTO FZN6	HENRY, K. TETRA TECH EM, INC. BRAC PMO WEST	FINAL FEASIBILITY STUDY, CLIPPER COVE SKEET RANGE (INCLUDES BRIEFING PAPER AND CD COPY)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00025 SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001721 BRAC SER BPMOW.SDA/0719 CORRESPONDENCE NONE 2	**08-20-2010** 10-25-2010 5090.3.A. NONE	SULLIVAN, J. BRAC PMO WEST SUNGA, R. DTSC - BERKELEY, CA	TRANSMITTAL OF THE FINAL POINT PAPER FOR REDEFINING BOUNDARY UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N60028_001722 TTEM-0055-FZN6-0277 OTHER N62467-04-D-0055 6	**08-20-2010** 10-25-2010 5090.3.A. CTO FZN6	CANEPA, J. TETRA TECH EM, INC. NAVFAC - SOUTHWEST	FINAL POINT PAPER FOR REDEFINING BOUNDARY UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) {CD COPY ENCLOSED}	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00027	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N60028_001772 TTEM-0055-FZN6-0243 REPORT N62467-04-D-0055 164	**10-29-2010** 01-06-2011 5090.3.A. CTO FZN6	RASH, M. TETRA TECH EM, INC. BRAC PMO WEST	FINAL 2010 SITE MANAGEMENT PLAN (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000066 BLDG 0000180 BLDG 0000227 BLDG 0000233 BLDG 0000530 PARCEL T-086 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030 SITE 00031	NAVFAC - SOUTHWEST	

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SF_N60028_001806 CHAD-3213-0084-0002 REPORT N62473-07-D-3213 22	**02-01-2011** 03-29-2011 5090.3.C. CTO 0084	CHADUX TT, JOINT VENTURE BRAC PMO WEST	DRAFT PROPOSED PLAN / DRAFT REMEDIAL ACTION PLAN (CD COPY ENCLOSED)	SENSITIVE SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	
PF_N60028_001805 BRAC SER BPMOW.LKB/0365 CORRESPONDENCE NONE 2	**02-10-2011** 03-29-2011 5090.3.B. NONE	SULLIVAN, J. BRAC PMO WEST SUNGA, R. DTSC - BERKELEY, CA	TRANSMITTAL OF THE DRAFT PROPOSED PLAN / DRAFT REMEDIAL ACTION PLAN	POST DECISION FILE	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001831 BRAC SER BPMOW.LBK/0627 CORRESPONDENCE NONE 2	**05-27-2011** 06-29-2011 5090.3.A. NONE	SULLIVAN, J. BRAC PMO WEST SUNGA, R. DTSC - BERKELEY, CA	TRANSMITTAL OF THE PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN, FORMER CLIPPER COVE SKEET RANGE	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_N60028_001832 CHAD-3213-0084-0005 PUBLIC NOTICE N62473-07-D-3213 19	**06-01-2011** 06-29-2011 5090.3.A. CTO 0084	CHADUX TT, JOINT VENTURE PUBLIC	PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN, FORMER CLIPPER COVE SKEET RANGE (CD COPY ENCLOSED)	ADMIN RECORD INFO REPOSITORY SENSITIVE	SITE 00013 SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001835 CHAD-3213-0084-0004 PUBLIC NOTICE N62473-07-D-3213 3	**06-02-2011** 07-08-2011 5090.3.A. CTO 0084	SAN FRANCISCO CHRONICLE - SAN FRANCISCO, CA PUBLIC	PUBLIC NOTICE OF AVAILABILITY OF THE PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN AND PUBLIC COMMENT PERIOD FOR FORMER CLIPPER COVE SKEET RANGE (INCLUDES PROOF OF PUBLICATION, AND CD COPY)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001906 NONE CORRESPONDENCE NONE 3	**06-28-2011** 12-16-2011 5090.3.A. NONE	BURNAM, J. ANCHOR QEA - SAN FRANCISCO, CA SULLIVAN, J. BRAC PMO WEST	REVIEW AND COMMENTS ON THE PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN, FORMER CLIPPER COVE SKEET RANGE (SEE RECORD # 1832 - PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN, FORMER CLIPPER COVE SKEET RANGE)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
AR_N60028_001917 NONE CORRESPONDENCE NONE 2	**11-04-2011** 01-18-2012 5090.3.A. NONE	HENRY, K. CHADUX TT, JOINT VENTURE SUNGA, R. DTSC - BERKELEY, CA	TRANSMITTAL OF THE DRAFT RECORD OF DECISION/FINAL REMEDIAL ACTION PLAN FOR FORMER CLIPPER COVE SKEET RANGE (ENCLOSURE IS RECORD # 1918)	ADMIN RECORD INFO REPOSITORY	SITE 00027	NAVFAC - SOUTHWEST	
SF_N60028_001918 CHAD-3213-0084-0007 REPORT N62473-07-D-3213 126	**11-04-2011** 01-18-2012 5090.3.C. CTO 0084	CHADUX TT, JOINT VENTURE BRAC PMO WEST	DRAFT RECORD OF DECISION/FINAL REMEDIAL ACTION PLAN FOR FORMER CLIPPER COVE SKEET RANGE (CD COPY ENCLOSED) [SEE RECORD # 1917 - CHADUX TT JV TRANSMITTAL LETTER]	SENSITIVE SITE FILE	SITE 00027	NAVFAC - SOUTHWEST	

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AR_N60028_001928 TRVT-4403-0000-0073 REPORT N62473-10-C-4403 163	**12-28-2011** 02-03-2012 5090.3.A. NONE	TREVET BRAC PMO WEST	FINAL 2011 SITE MANAGEMENT PLAN (CD COPY ENCLOSED) [SEE RECORD # 1927 - BRAC PMO WEST TRANSMITTAL LETTER]	ADMIN RECORD INFO REPOSITORY SENSITIVE	BLDG 0000066 BLDG 0000180 BLDG 0000227 BLDG 0000233 BLDG 0000530 PARCEL T086 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 SITE 00027 SITE 00028 SITE 00029 SITE 00030	NAVFAC - SOUTHWEST	

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Total Estimated Record Page Count: 15,347

Total Records: 148

[UIC NUMBER]='N60028'
No Keywords
Sites=SITE 00027
No Classification

ATTACHMENT E
STATEMENT OF REASONS

STATEMENT OF REASONS
SITE 27
FORMER NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Site 27 is located at former Naval Station Treasure Island (NAVSTA TI), San Francisco, California. Former NAVSTA TI is a closed military facility under the custody and control of the Navy. The Navy is addressing the release or threatened release of hazardous substances at Site 27 according to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and their implementing regulations in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Department of Defense (DoD) was delegated the authority to address the release or threatened release of CERCLA hazardous substances by Executive Order 12580. The DoD, in turn, delegated its authority to respond to releases of CERCLA hazardous substances on property under the custody and control of the Navy to the Navy. The Navy prepared this Record of Decision/Final Remedial Action Plan (ROD/Final RAP) and selected the remedy for Site 27 according to CERCLA, SARA, and the NCP.

The Navy has prepared a Statement of Reasons as an attachment to the ROD/Final RAP to comply with state law in *California Health and Safety Code* Section (§) 25356.1. This Statement of Reasons describes how the Navy's investigations, assessment of risk to human health and the environment, and evaluation of remedial alternatives under CERCLA result in compliance with *Health and Safety Code* § 25356.1.

The Navy developed three remedial alternatives to address potential risk to diving ducks from lead shot in sediment at Site 27. The remedial alternatives were evaluated against the nine criteria specified in the NCP at 40 *Code of Federal Regulations* (CFR) § 300.430(e): overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARAR); long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost; community acceptance; and state acceptance. The Navy presented its preferred alternative to the public on June 2, 2011. The preferred alternative consists of focused dredging and backfill of the area within 75 feet of the shoreline to remove a potentially complete exposure pathway to diving ducks, off-site disposal of sediment at a beneficial reuse site, site-wide institutional controls (IC) to minimize sediment-disturbing activity that could expose lead shot currently buried at the site, and sediment monitoring to ensure the effectiveness of ICs and the integrity of the backfill material. Section 2.9 of this ROD/Final RAP describes the remedy selected for Site 27.

In addition to complying with CERCLA, SARA, and the NCP, this ROD/Final RAP complies with *California Health and Safety Code* § 25356.1. Relevant provisions of *California Health and Safety Code* § 25356.1(d) require that all RAPs be based on the NCP and specifically, six listed factors. The ROD/Final RAP describes how it is based on and complies with the NCP. The sections below describe how this ROD/Final RAP complies with *California Health and Safety Code* § 25356.1(d).

California Health and Safety Code § 25356.1(d)(1) – Health and Safety Risks

Site 27 investigations identified lead shot as the only contaminant of concern and incidental ingestion of lead shot by diving ducks, foraging for food or grit, as the receptor pathway of concern. Two feet beneath the sediment surface is considered the maximum depth that is accessible by diving ducks. Lead shot has been found within the top 2 feet of sediment in the area within 75 feet from the shoreline, but lead shot is buried by 2 feet or more of sediment in the remainder of the site. Accordingly, there is a current complete exposure pathway within 75 feet of the shoreline and a potentially complete exposure pathway in the remainder of the site under future conditions where dredging could expose lead shot buried beneath 2 feet of sediment. The selected remedy will eliminate current and potential complete exposure pathways. Section 2.5.2 of the ROD/Final RAP describes in detail the ecological risk assessment completed for Site 27.

No human health risk assessment has been conducted at Site 27 because there is no pathway for exposure to chemicals of concern in sediment for humans.

California Health and Safety Code § 25356.1(d)(2) – Effect of contamination on present, future, and probable beneficial uses of contaminated, polluted, or threatened resources

Section 2.4 of the ROD/Final RAP presents the current and potential future uses of Site 27. A small portion of the southwestern section of Site 27 is currently part of the Treasure Island Marina. The remainder of Site 27 consists of sediment and open water. According to the Revised Draft Treasure Island and Yerba Buena Island Design for Development, dated February 2011, Site 27 will be used as a marina in the future. There is no groundwater at Site 27. There are no known mineral, cultural, or archeological resources at Site 27. Therefore, the resources at Site 27 consist of sediment, bay water, and any wildlife that may inhabit the sediment or bay water at Site 27.

The remedy will be implemented by removing sediment located within 75 feet from the shoreline to a depth of at least 2.5 feet (the focused dredging area). All sediment that contains lead shot within the top 2.5 feet will be removed; and lead shot in the remaining offshore area of Site 27 will remain buried under at least 2 feet of sediment. Institutional controls will be implemented at Site 27 to restrict disturbance of the remaining sediment, which will prevent or minimize re-suspension of lead shot from deeper sediments in the undredged portion of the site. Water quality will be temporarily impaired during the dredging period, anticipated to last 6 months. However, methods may be employed to prevent the spread of sediment and minimize impacts to water quality outside of the dredge area, such as a silt curtain. Any water quality degradation will be temporary, and water quality is expected to recover after dredging is completed. The Department of Toxic Substances Control (DTSC) concluded that the remedy does not have the potential to degrade the quality of the environment or have substantial negative impacts on fish or wildlife species. Any lead shot that remains is unlikely to affect present, future, or probable beneficial uses of contaminated, polluted, or threatened resources.

California Health and Safety Code § 25356.1(d)(3) – Effect of alternative remedial action measures on the reasonable availability of groundwater resources for present, future, and probable beneficial uses, and the availability of treatment technologies to significantly reduce the volume, toxicity, or mobility of the hazardous substances

There is no groundwater at Site 27. Section 2.9.4 presents the statutory determinations required under CERCLA, including the CERCLA preference for treatment as a principle element of the remedy. The selected remedy would not reduce the toxicity, mobility, or volume of hazardous substances through treatment because no treatment is being used.

California Health and Safety Code § 25356.1(d)(4) – Site-specific characteristics and the potential for off-site migration

Section 2.3 and Table 1 of the ROD/Final RAP describe previous investigations by the Navy to characterize the conditions and contamination at Site 27. The Navy has conducted sediment, pore water, and bay water investigations at Site 27 and concluded that the only contaminant of concern is lead shot. The remedy will remove lead shot in the upper 2.5 feet of sediment within 75 feet of the shoreline, cover any remaining lead shot in the dredge area with backfill, and allow lead shot in the remainder of the site to remain buried by overlying sediment. After remedial actions are completed, lead shot will be buried by either backfill or sediment, and site-wide institutional controls will limit actions that could re-suspend buried lead shot. Therefore, the potential for lead shot to migrate off site is very low.

California Health and Safety Code § 25356.1(d)(5) – Cost effectiveness of the remedial action

Section 2.8.2 and Table 3 of the ROD/Final RAP present the comparative analysis of the alternatives evaluated for Site 27 in the feasibility study, and Table 2 presents the costs associated with each alternative. The selected remedy is cost-effective and will provide the best overall effectiveness proportional to its cost.

California Health and Safety Code § 25356.1(d)(6) – Potential environmental impacts of the remedial action

Section 2.8.2 and Table 3 of the ROD/Final RAP present the comparative evaluation of alternatives against the nine NCP criteria, including the short-term environmental impacts associated with implementation of the selected remedy. The selected remedy would present some short-term environmental impacts from sediment dredging. These effects are temporary, however, and can be minimized with proper planning. The selected remedy will not create any significant long-term environmental impacts.

California Health and Safety Code § 25356.1(e) requires that state remedial action plans contain a preliminary non-binding allocation of responsibility (NBAR) among all identifiable potentially responsible parties (PRP). HSC § 25356.3(a) allows potentially responsible parties with an aggregate allocation in excess of 50 percent to convene an arbitration proceeding by submitting to binding arbitration before an arbitration panel. Based on available information regarding the former NAVSTA TI, DTSC determined that the Navy is a responsible party with aggregate alleged liability in excess of 50 percent of the costs of removal and remedial action pursuant to HSC § 25356.3.

The sole purpose of the NBAR is to establish which PRPs will have an aggregate allocation in excess of 50 percent and can therefore convene arbitration if they so choose. The NBAR, which is based on the evidence available to DTSC, is not binding on anyone, including PRPs, DTSC, or the arbitration panel. If a panel is convened, its proceedings are *de novo* and do not constitute a review of the provisional allocation. The arbitration panel's allocation will be based on the panel's application of the criteria spelled out in HSC § 25356.3(c) to the evidence produced at the arbitration hearing. Once arbitration is convened, or waived, the NBAR has no further effect, in arbitration, litigation, or any other proceeding, except that both the NBAR and the arbitration panel's allocation are admissible in a court of law, pursuant to HSC § 25356.7 for the sole purpose of showing the good faith of the parties who have discharged the arbitration panel's decision.

DTSC sets forth the following preliminary NBAR for former NAVSTA TI: The Navy is allocated 100 percent responsibility.

ATTACHMENT F
FINAL SITE 27 PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN

PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN
FORMER NAVAL STATION TREASURE ISLAND

Installation Restoration Site 27
Former Clipper Cove Skeet Range

San Francisco, California June 2011

THE DEPARTMENT OF THE NAVY ANNOUNCES PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN

1.0 INTRODUCTION

The Department of the Navy presents this ***Proposed Plan/Draft Remedial Action Plan (RAP)*** for remediation of ***Installation Restoration (IR)*** Site 27 (Site 27), the former Clipper Cove Skeet Range, at the former Naval Station Treasure Island (NAVSTA TI) in San Francisco, California (Figure 1). The Navy is presenting this plan in cooperation with the California Environmental Protection Agency (Cal/EPA) ***Department of Toxic Substances Control (DTSC)***, the Cal/EPA ***Regional Water Quality Control Board (Water Board)***, the ***U.S. Environmental Protection Agency (EPA)***, and the Treasure Island Development Authority (TIDA).

The Navy is responsible for investigating and remediating contamination that resulted from historical Navy operations at former NAVSTA TI. This Proposed Plan/Draft RAP presents the Navy's ***preferred remedial alternative*** to address ***lead shot*** in sediment associated with historical activities at Site 27. The Navy proposes to remediate Site 27 by:

- Removing contaminated sediment where there is a current complete exposure pathway, and backfilling the area to prevent exposure to diving ducks, the ecological receptor of concern.
- Implementing ***institutional controls (IC)*** throughout the site to restrict activities that might disturb sediment.

This Proposed Plan/Draft RAP summarizes the site history, the environmental investigations conducted at the site, and the remedial alternatives evaluated in accordance with the ***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)***, as amended by the ***Superfund Amendments and Reauthorization Act (SARA)***, and explains the basis for choosing the preferred remedial alternative. The Navy will consider and respond to public comments on this Proposed Plan/Draft RAP in a responsiveness summary to be included in the ***Record of Decision/Final Remedial Action Plan (ROD/Final RAP)*** for Site 27.

Note: Specialized or technical terms are highlighted in bold the first time they appear and are defined in the glossary on page 14.

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— NOTICE —

Public Comment Period
June 2 to July 2, 2011

Public Meeting
June 14, 2011

Casa de la Vista, Building 271
Treasure Island
6:30 to 8:30 p.m

This public meeting is an opportunity for the community to hear about the Navy's Proposed Plan and to provide formal oral and written comments.

ABOUT THIS PROPOSED PLAN/ DRAFT RAP

The Navy is issuing this Proposed Plan/Draft RAP as part of its public participation responsibilities under Section 117(a) of CERCLA, Section 300.430(f)(2) of the ***National Oil and Hazardous Substances Pollution Contingency Plan (NCP)***, and Chapter 6.8 of the California Health and Safety Code (HSC). Figure 2 illustrates the status of Site 27 in the CERCLA and California Health and Safety Code Section 25356.1 Process.

This Proposed Plan/Draft RAP summarizes information detailed in the ***remedial investigation (RI)*** report and ***feasibility study (FS)*** report, along with other documents contained in the administrative record file for Site 27. The administrative record contains the reports and historical documents used to select remedial alternatives. The Navy encourages the public to review these documents to gain an understanding of Site 27 and the environmental assessments and investigations that have been conducted. The documents are available for public review at the locations listed on page 13.

A public comment period will be held from June 2 through July 2, 2011. Public comments can be submitted by mail, fax, or e-mail throughout the comment period to James Sullivan, BRAC Environmental Coordinator, BRAC Program Management Office West, 1455 Frazee Road, Suite 900, San Diego, California 92108-4310, (619) 532-0983 (fax), james.b.sullivan2@navy.mil. A public meeting will be held from 6:30 to 8:30 p.m. on June 14, 2011 at the Casa de la Vista, Building 271, Treasure Island. Members of the public may also submit written and oral comments on this Proposed Plan/Draft RAP at the public meeting.

In consultation with the regulatory agencies, the Navy may modify the preferred remedial alternative or select another remedial alternative based on feedback from the community or new information. Therefore, the community is encouraged to review and comment on this Proposed Plan/Draft RAP. A final decision on the remedy to be implemented will be documented in the ROD/Final RAP.

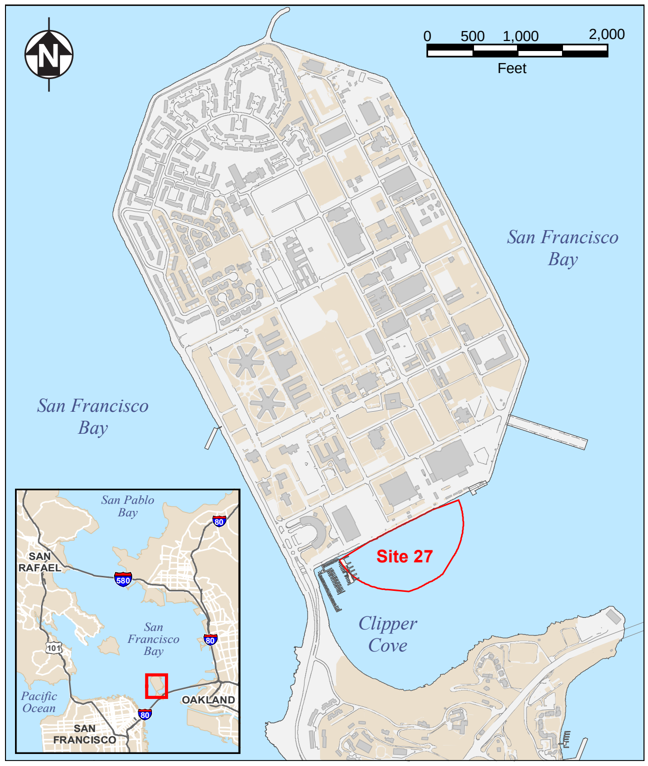

Figure 1. Location of Former Naval Station Treasure Island and Site 27

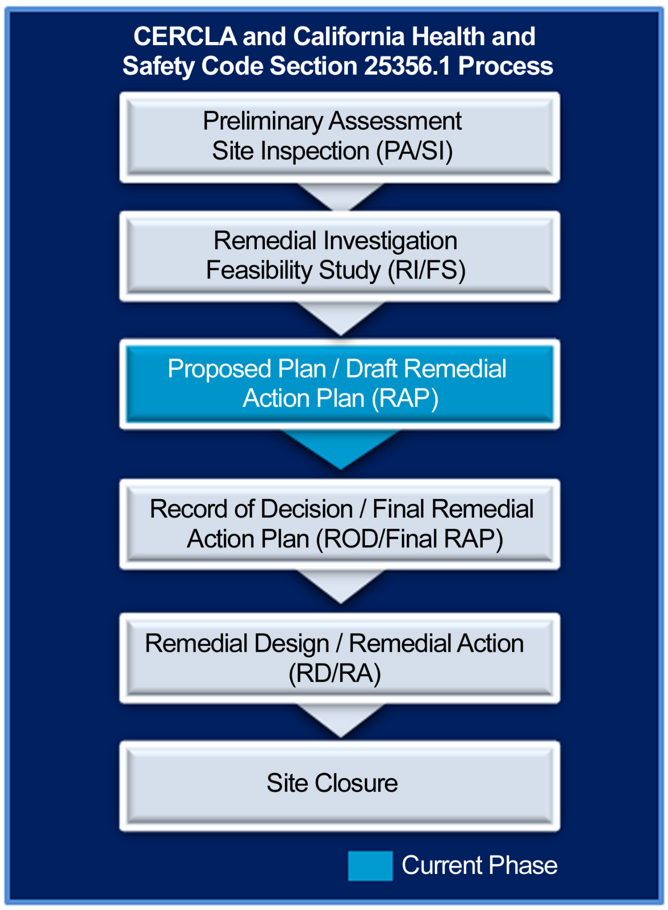

Figure 2. The CERCLA and California Health and Safety Code Section 25356.1 Process

2.0 SITE BACKGROUND

Former NAVSTA TI lies in San Francisco Bay (Figure 1) and consists of two contiguous islands: Treasure Island (TI) and Yerba Buena Island (YBI). TI was constructed on the shoals of YBI with San Francisco Bay fill between 1936 and 1937 for use as an airport for the City of San Francisco. It was also the site of the 1939 Golden Gate International Exposition. Navy operations at the island began in 1941, primarily for training, administration, housing, and other support services to the U.S. Pacific Fleet. In 1993, the Defense Base Closure and Realignment Commission recommended closure of NAVSTA TI; the facility was subsequently closed on September 30, 1997.

Clipper Cove is located directly between TI and YBI (Figure 1). A portion of Clipper Cove was used as a naval skeet range until 1989. As clay targets (skeet) were launched from the shoreline, naval personnel fired lead shot over the water, which resulted in a fan–shaped shot fall zone. The original boundary of Site 27 was established based on the onshore location of one skeet range. The boundary of Site 27 was revised in August 2004 to include a second adjacent skeet range, the onshore area of Site 27, and the full shot fall zone. The extent of lead shot contamination was determined to be no more than 750 feet from the firing point.

The onshore area of Site 27 was investigated further after the area had been included in the site boundary; however, no unacceptable risk to human health or the environment was found. In 2010, the Navy redefined the boundary for Site 27 under CERCLA because no further action is necessary for the onshore portion. The redefinition of the Site 27 CERCLA boundary excluded the onshore portion of the site (less than 1 acre landward of the mean high water line), so that Site 27 currently consists of approximately 19 offshore acres (Figure 1). The new site boundary will be used for this Proposed Plan/Draft RAP and all future site documentation. As a result, the former onshore portion of Site 27 is not discussed further in this document.

Currently, a small portion of the southwestern section of Site 27 is part of the marina (Figure 1). The remainder of Site 27 consists of sediment and open water. According to the Treasure Island and Yerba Buena Island Design for Development, Site 27 will be used as a marina in the future.

Previous Investigations

In 1993, the Water Board issued Order No. 93-130, requiring the Navy to investigate and manage contamination attributable to the skeet range in the Clipper Cove area of NAVSTA TI. The order set forth specific compliance requirements and tasks. The Navy subsequently conducted sampling investigations at Site 27 to comply with the substantive requirements of the order. The following sections describe the investigations previously performed at Site 27.

The Phase I and Phase II investigations were not limited to Site 27 and also included Site 13. Site 13 consists of stormwater outfall areas surrounding former NAVSTA TI within Navy property. Even though sediment samples were collected and analyzed from both sites, only samples from Site 27 were evaluated to help characterize chemicals thought to be associated with the former skeet range. These chemicals included lead shot, lead, and ***polycyclic aromatic hydrocarbons (PAH)*** (a component of the skeet target), which were targeted as potential ***chemicals of concern (COC)*** at Site 27.

Previous Investigations at Site 27

- Phase I Remedial Investigation Offshore Sampling (1993)
- Site 27 Clipper Cove Skeet Range Offshore Investigation (1996)
- Phase II Remedial Investigation for Offshore Sediments (1997)
- Lead Shot Investigation in the Nearshore Area of Site 27 (conducted during Feasibility Study) (2008)
- Feasibility Study (2001–2010)

Phase I Remedial Investigation Offshore Sampling

Offshore data were first collected during the 1993 Phase I RI sampling at NAVSTA TI. Sediment and storm-water samples were collected within Clipper Cove and were analyzed for metals, pesticides, polychlorinated biphenyls (PCB), and PAHs. None of the samples collected within the Site 27 boundary contained concentrations of lead or PAHs above the ***screening values***.

1996 Site 27 Clipper Cove Skeet Range Offshore Investigation

As a direct result of Water Board Order No. 93-130, sediment and bay water samples were collected and analyzed to define the vertical and horizontal extent of lead, lead shot, and PAHs in offshore sediments and overlying surface water that may have resulted from the skeet range operations.

Lead (excluding lead shot pellets) was detected in all sediment samples collected from Site 27; however, lead concentrations were similar to those detected in other offshore areas of NAVSTA TI outside of Clipper Cove. PAHs were not detected in the sediment at Site 27 at concentrations that exceeded screening values.

Sediment samples were collected at depths of up to 5 feet below the sediment surface. The number of lead shot pellets was counted in every sample location in 1-foot segments. Lead shot was detected in all but one location.

Water samples were collected and analyzed for total lead and PAHs, but neither was detected.

Phase II Remedial Investigation for Offshore Sediments

Sediment sampling conducted during the 1997 Phase II RI focused on further characterizing Clipper Cove both within and outside the boundary of Site 27, and tracking contaminants from onshore sources to offshore sediments through storm-water outfalls.

Sampling revealed that lead concentrations in sediment were below the screening value at all Phase II sampling locations, except for three samples where lead was detected at concentrations just slightly above the screening value. One of these samples was collected between 6 and 8 feet below the sediment surface within Site 27; the two other samples were located outside of Site 27. Concentrations of PAHs did not exceed the screening value at any location.

Field Investigation of Lead Shot in the Nearshore Area

A ***bathymetric survey*** conducted in 2005 indicated that the nearshore area of Clipper Cove (within 150 feet of the shoreline) was a dynamic area where sediment both accretes and erodes, resulting in limited sediment accumulation. The remainder of Clipper Cove is known as a "depositional environment," where sediment accumulates at a rate of about 1 to 2 inches each year and lead shot is expected to be buried under more than 2 feet of clean sediment, where it is out of the reach of diving ducks. Based on the results of the 2005 survey, the Navy investigated the nearshore area in 2008 to characterize lead shot in the top 2 feet of sediment and evaluate whether there was a potential risk to diving ducks. Samples were collected to a depth of 2 feet below the sediment surface from 30 locations in the nearshore area. The sediment samples were analyzed for lead shot, which was detected within the top 2 feet of the sediment within 75 feet of the shoreline, where waterfowl foraging for food or grit could ingest the shot. No lead shot was found in the samples collected in the top 2 feet of sediment from 75 feet to 150 feet from the shoreline. The concentrations of total lead, not including the lead shot, in sediment were consistent with levels elsewhere in the area and were similar to other locations around Treasure Island. The investigation concluded that lead shot was a COC at Site 27, but that total lead was not a COC at the site.

As part of this investigation, ***benthic organisms*** were recovered from surface samples, indicating that there is a source of food for diving ducks in the nearshore area, and diving ducks were observed at Site 27 during the field investigation.

3.0 SUMMARY OF SITE RISKS

"Risk" is the likelihood or probability that a hazardous chemical, when released into the environment, will cause adverse effects to exposed humans or other organisms. An ***ecological risk assessment (ERA)*** was conducted to assess the risk as part of the Phase II RI for offshore sediments. The ERA was revised based on the results of the 2008 lead shot investigation in the nearshore area. No human health risk assessment was conducted because there is no pathway for exposure to lead shot in sediment for humans.

Surf scoter. Photo courtesy of Joyce Gross.

Exposure Routes And Receptors Of Concern

Incidental ingestion of lead shot by diving ducks was identified as the primary receptor pathway. Diving ducks such as the surf scoter (*Melanitta perspicillata*) can penetrate the sediment surface from depths ranging from the length of their head (5 to 6.5 inches) to the length of their entire body (17 to 21 inches) while they forage for food in water as deep as 40 feet. Sediment deposition in the offshore area has effectively covered the lead shot, eliminating the ingestion exposure pathway to diving ducks over most of the site. However, the 2008 nearshore investigation found lead shot buried under as little as 1 foot of sediment within 75 feet of the shoreline, which is within the reach of diving ducks. Therefore, there is a current potential risk to diving ducks from lead shot in the nearshore area of Site 27. A conceptual site model depicting the exposure pathway for diving ducks is presented on Figure 3.

The risk to aquatic receptors from PAHs was evaluated based on a separate study conducted to assess the concentration and composition of PAHs in clay targets used in skeet shooting. The study found that trap and skeet targets are composed partly of PAH-containing petroleum pitch, which is relatively insoluble in water and has low toxicity to aquatic organisms. The study concluded that it was unlikely that PAHs would leach from the clay targets, and therefore the targets were not likely to be toxic to aquatic organisms.

When compared to screening values, concentrations of lead in sediment in a small number of locations within Site 27 fell between the level at which adverse effects to aquatic organisms rarely occur, and the level at which adverse effects frequently occur.

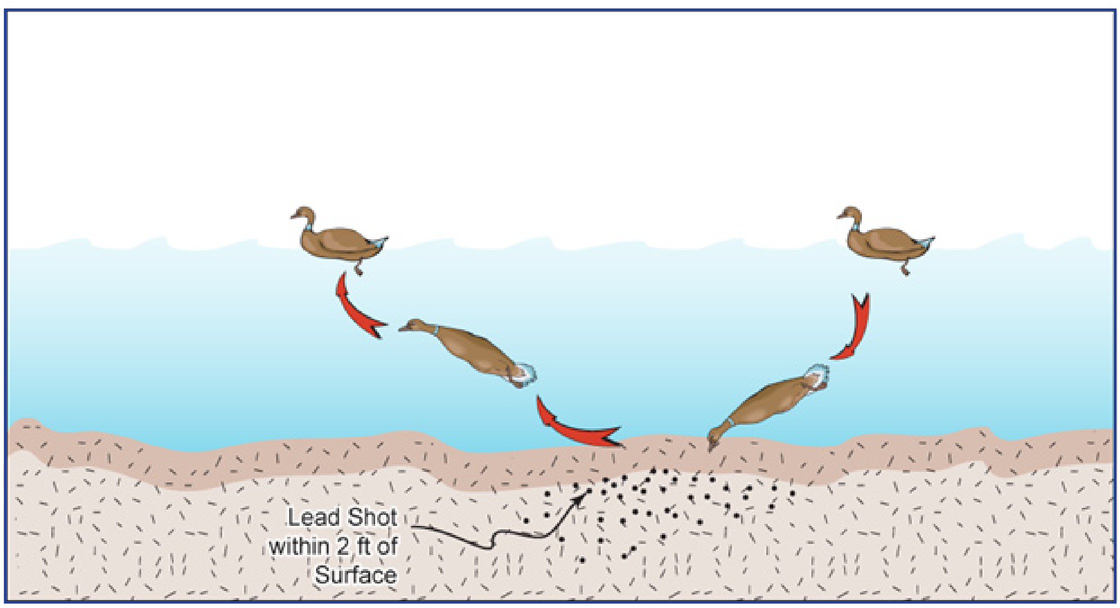

Figure 3. Conceptual Site Model for the Nearshore Area

Concentrations of lead at Site 27 were consistent with other offshore samples collected at Treasure Island and in San Francisco Bay. Therefore, lead in sediment is not considered a chemical of concern; the only contaminant of concern for Site 27 is lead shot.

Risk Evaluation Conclusions

The Phase II RI for offshore sediments concluded that chemicals in sediment at Site 27 posed no current unacceptable risk to human health or the environment. However, lead shot beneath 2 feet of sediment was recognized to pose a potential future risk to ecological receptors if exposed. This conclusion was revised in the FS after the 2008 lead shot investigation in the nearshore area was conducted. The investigation showed that there is current potential risk to diving ducks near the shoreline where sediment does not accumulate as steadily as in areas farther from the shoreline and lead shot remains closer to the sediment surface. This Proposed Plan/Draft RAP addresses the potential for current risk to diving ducks in the nearshore area, as well as future risk to diving ducks in the rest of the site if lead shot in the sediment were exposed by dredging or other activities that disturb sediment.

Feasibility Study

Based on the Phase II RI for offshore sediments and the lead shot investigation in the nearshore area, the Navy proceeded with an FS to address potential risks to diving ducks associated with lead shot in sediment. The FS identified ***remedial action objectives (RAOs)*** and remedial alternatives for contaminated sediment at Site 27. The remedial alternatives identified in the FS were evaluated against seven of the nine criteria required by CERCLA and as specified in the NCP. The last two criteria will be addressed through the public comment and regulatory agency review periods. Figure 4 describes the nine remedial alternative evaluation criteria.

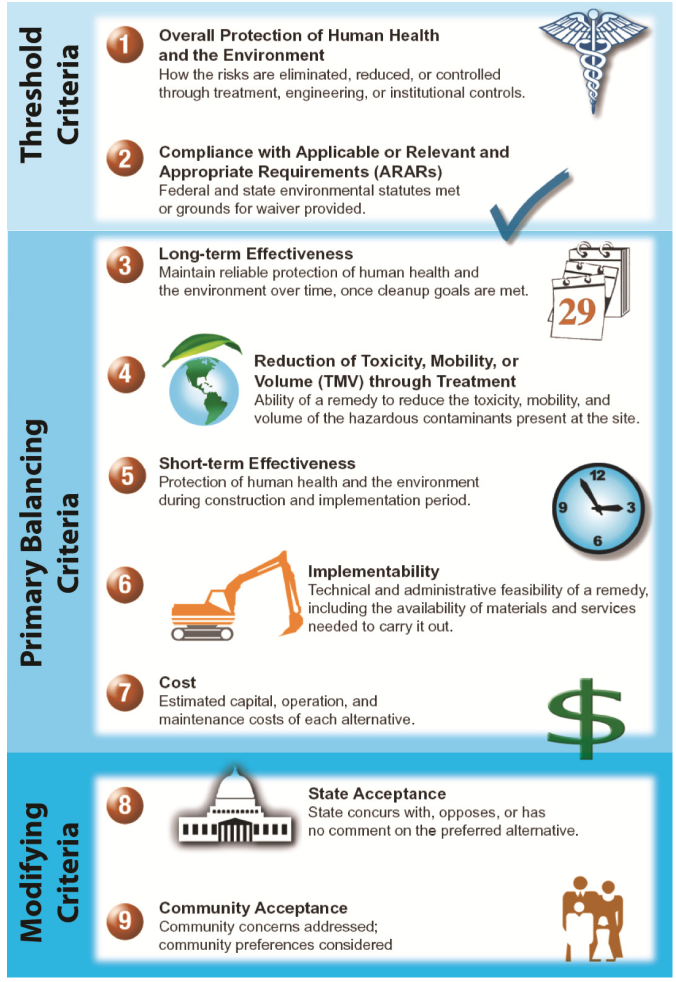

Figure 4. Criteria for Comparison of Remedial Alternatives

4.0 REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific (such as soil and groundwater) goals for protecting human health and the environment that provide the foundation used to develop remedial alternatives. No human health risks were identified for Site 27; therefore, the RAOs are based solely on exposure to lead shot by diving ducks under both current and future use scenarios. Under the current use scenario, there is a complete exposure pathway near the shore. Under a future use scenario in which the cove is dredged to expand the marina, there could be a complete exposure pathway to diving ducks in the rest of the site. The RAOs for Site 27 are:

- Prevent or minimize ingestion of lead shot by diving ducks within 75 feet of the shoreline, where there is a complete exposure pathway under current conditions.
- Prevent or minimize ingestion of lead shot by diving ducks site-wide, where there is a potentially complete exposure pathway for diving ducks under future conditions where lead shot is currently buried below at least 2 feet of sediment.

RAOs can be achieved either by reducing concentrations of COCs or by eliminating the exposure pathways.

5.0 SUMMARY OF REMEDIAL ALTERNATIVES

This section summarizes the remedial alternatives developed in the Final Feasibility Study, Site 27 Clipper Cove Skeet Range. The Navy evaluated several remedial technologies, including capping, solidification/stabilization, physical separation, biological treatment, chemical treatment, thermal desorption, and soil washing. After screening the alternatives, the Navy further developed and considered three remedial alternatives in the FS:

- Alternative 1: No action
- Alternative 2: Focused dredging and backfill (Figure 5), off-site disposal of sediment, institutional controls, and sediment monitoring
- Alternative 3: Site-wide dredging (Figure 5) and off-site disposal of sediment

Alternatives 2 and 3 are split into "a" and "b" alternatives because of two possible disposal options. Under Alternatives 2a and 3a, dredged sediments would be disposed of at a landfill after on site dewatering that could take up to 1 year for Alternative 2a and 6 years for Alternative 3a. Under Alternatives 2b and 3b, dredged sediment would be transported by barge to an upland beneficial reuse site where sediment is being collected to create a restored wetland (the lead-shot contaminated sediment would be covered by clean sediment so that it would not pose a risk to diving ducks); land-based dewatering would not be required. Each of the alternatives and their associated costs are described in Table 1.

6.0 EVALUATION OF REMEDIAL ALTERNATIVES

The remedial action alternatives considered represent a range of distinct environmental restoration strategies that fulfill the RAOs associated with lead shot contamination in sediment at Site 27. The alternatives were evaluated against the nine EPA criteria listed in Figure 4.

These criteria are used to evaluate the cleanup alternatives proposed for this site. The first seven criteria are discussed in the following comparison of

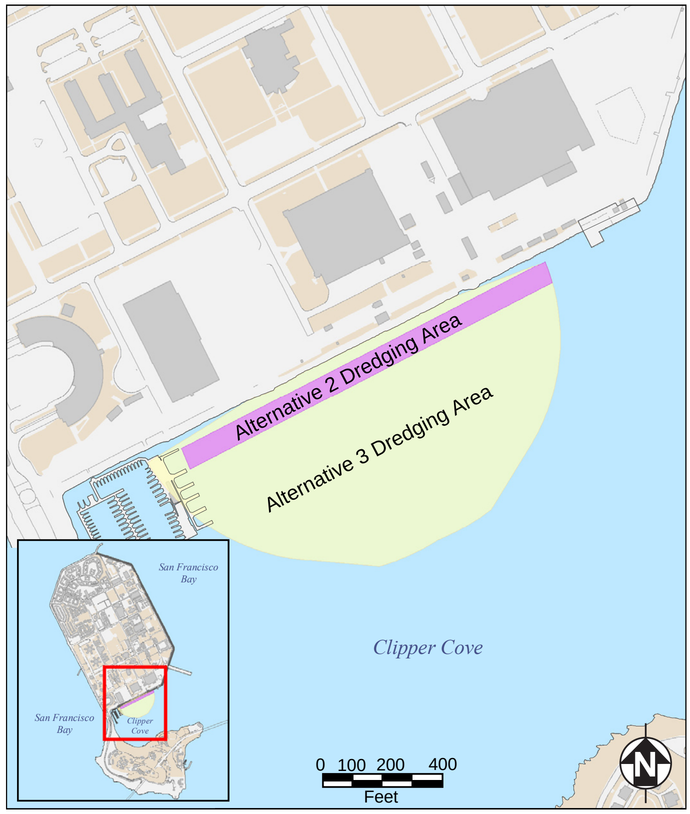

Figure 5. Comparison of Alternative 2 and Alternative 3 Proposed Dredging and Backfill Areas

alternatives. The last two criteria will be addressed through the public comment and regulatory agency review periods. The Navy will then make the final decision on the remedy for Site 27 after public input has been received and evaluated.

Of the seven evaluation criteria, two are threshold and five are primary balancing criteria. To be eligible for selection, an alternative must meet the two threshold criteria: (1) overall protection of human health and the environment, and (2) compliance with ***applicable or relevant and appropriate requirements (ARARs)***. Alternative 1 (no action) was evaluated in the FS, as required by the NCP, to provide a comparative baseline to evaluate the other alternatives; however, Alternative 1 would not be protective of the environment or comply with ARARs under current land-use scenarios. As a result, this alternative would not meet the threshold criteria and therefore is not eligible for selection.

Table 1. Summary Of Remedial Alternatives For Sediment At Site 27			
Remedial Alternative	**Components of Remedial Alternative**	**Cost**	**Estimated Time to Complete**
1: No Action	Under Alternative 1, no remedial action or monitoring would be conducted. By law, the no-action alternative must be evaluated to establish a baseline for comparison with other alternatives that involve cleanup actions. Under this alternative, no response actions would be conducted at Site 27; therefore, there would be no associated costs. No attempt would be made to monitor or control exposure to lead shot in sediment.	$0	Not Applicable
2a: Focused Dredging and Backfill, Landfill Disposal of Sediment, Institutional Controls, and Sediment Monitoring,	Under Alternative 2, contaminated sediments would be removed where there is a current complete exposure pathway to diving ducks, followed by backfill of the area to prevent exposure (Figure 5). Alternative 2a sediment removal would be followed by sediment dewatering and off-site disposal at a landfill, whereas Alternative 2b sediment removal would be followed by transport by barge to an upland beneficial reuse site. Implementation of ICs would reduce the likelihood of activities that may cause sediment disturbance and resuspension of buried lead shot at the site. Post-remedy sediment monitoring consisting of bathymetric surveys would be conducted 1 year after the remedy is complete and every 5 years after to confirm consistent sediment profile against erosion. Alternative 2 would remove the current complete exposure pathway and ensure the pathway remained incomplete throughout the site.	$2.9 Million	1 Year
2b: Focused Dredging and Backfill, Beneficial Reuse of Sediment, Institutional Controls, and Sediment Monitoring		$2.2 Million	2 Months
3a: Site-wide Dredging and Landfill Disposal of Sediment	Under Alternative 3, contaminated sediments would be completely removed from the site by full-scale dredging (Figure 5). Alternative 3a sediment removal would be followed by sediment dewatering and off-site disposal at a landfill, whereas sediment removal under Alternative 3b would be followed by transport by barge to an upland beneficial reuse site. Alternative 3 would allow for unrestricted use of the site.	$21.0 Million	6 Years
3b: Site-wide Dredging and Beneficial Reuse of Sediment		$23.9 Million	6 Months

A ranking analysis of the remedial alternatives was also conducted to provide a comparison of the alternatives against the first seven NCP criteria. To conduct the ranking analysis, a score from 1 to 5 was assigned to each alternative for each specific NCP evaluation criterion, with a score of 5 being best and 1 being least satisfactory. The results of this ranking analysis are summarized in Table 2.

Table 2: Comparative Ranking of Alternatives					
		Alternative 2: Focused Dredging and Backfill, Off-Site Disposal of Sediment, Institutional Controls, and Sediment Monitoring		Alternative 3: Site-Wide Dredging and Off-Site Disposal of Sediment	
Criterion Type	Criterion	2A: Landfill Disposal of Sediment	2B: Sediment Beneficial Reuse	3A: Landfill Disposal of Sediment	3B: Sediment Beneficial Reuse
Threshold	Overall Protection of Human Health and Environment	5	5	5	5
	Compliance with ARARs	5	5	5	5
Primary Balancing	Long-Term Effectiveness/ Permanence	4	4	5	5
	Reduction of Toxicity, Mobility, or Volume through Treatment	0	0	0	0
	Short-Term Effectiveness	2.5	3	1	2
	Implementability	2.5	3	1	2
	Cost	3	3	1	1
Score		22	23	18	20
Rank		**2nd**	**1st**	**4th**	**3rd**

Note: Each individual rating was on a scale from 1 to 5, with 5 being the highest rating. Individual ratings for each criterion were then summed up to yield a total score or relative ranking. Since there were seven criteria, the maximum total score is 35.

The following is a comparative analysis of the remedial alternatives:

Threshold Criteria

1. Overall Protection of Human Health and the Environment

Alternatives 2 and 3 would protect the environment because both would eliminate the exposure pathway to diving ducks, whereas Alternative 1 would not. Alternatives 2 and 3 were ranked equally based on this criterion.

2. Compliance with ARARs

ARARs are federal and state laws and regulations that are identified for each remedial alternative. No chemical-, action-, or location-specific ARARs would apply to Alternative 1. Alternatives 2 and 3 are expected to meet all chemical-, location-, and action-specific ARARs.

Because Alternative 1 fails to meet the two threshold criteria, it is not evaluated under the primary balancing criteria in this Proposed Plan/Draft RAP.

Primary Balancing Criteria

3. Long-Term Effectiveness and Permanence

Long-term effectiveness is considered high for Alternative 2, as the exposure pathway would be eliminated through focused dredging, backfilling, and IC implementation. Long-term effectiveness is considered very high for Alternative 3, as the exposure pathway would be eliminated through dredging to completely remove all contaminated sediments within the site boundary. Figure 5 presents a visual comparison of the proposed excavation and backfill areas for Alternatives 2 and 3.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Implementation of Alternative 2 or 3 would not reduce the toxicity, mobility, or volume of hazardous substances through treatment; therefore, neither alternative is considered effective under this criterion.

5. Short-Term Effectiveness

During construction, implementation of Alternatives 2 and 3 could affect the public, environment, and workers because of potential resuspension of lead shot, traffic, and noise. Effects would be minimized through implementation of construction quality control (QC) monitoring and environmentally sensitive construction practices, other monitoring protocols, and health and safety plans. Short-term effectiveness for Alternative 2a would be considered low to moderate and for Alternative 2b moderate because of the limited dredging area and shorter performance period than Alternative 3. Short-term effectiveness for Alternative 3a would be considered very low and for Alternative 3b low given the large area to be dredged and the amount of sediment to be removed, as well as the longer performance period than Alternative 2.

6. Implementability

Alternative 2 would be moderately difficult to implement, requiring construction, monitoring, and ICs. Alternative 3 would be the least easily implementable given the large quantity of sediment that would require removal. Alternatives 2a and 3a are less easily implementable than Alternatives 2b and 3b because dewatering is required. Therefore, implementability is considered low to moderate for Alternative 2a and moderate for Alternative 2b. Similarly, implementability is considered very low for Alternative 3a and low for Alternative 3b.

7. Cost

The cost for Alterative 2 is moderate. The estimated cost for Alternative 2a is $2.9 million, while the cost for Alternative 2b is $2.2 million.

The cost for Alterative 3 is very high. The estimated cost for Alternative 3a is $21.0 million, while the cost for Alternative 3b is $23.9 million.

7.0 THE PREFERRED REMEDIAL ALTERNATIVE

The preferred remedial alternative is Alternative 2b, focused dredging and backfill, off-site disposal of sediment at a beneficial reuse site, ICs, and sediment monitoring. Alternative 2b would be implemented by removing sediment located within 75 feet from the shoreline to a depth of at least 2.5 feet. Therefore, a complete exposure pathway to diving ducks would be eliminated since (1) all sediment that contains lead shot within the top 2.5 feet would be removed; and (2) lead shot in the remaining offshore area of Site 27 is buried under at least 2 feet of sediment, which is not accessible to diving ducks.

After dredging, the area would be backfilled with a mixture of a sandy base layer and an exposed rock armor layer. The vertical extent of dredging and the backfill design would be established during remedial design and would take into account relevant hydrodynamic conditions and consider current and historical uses of the marina, including maintenance dredging. Dredged sediment would be transported by barge to an upland beneficial reuse site, and dewatering would not be required.

After dredging and backfilling, site-wide ICs would be implemented to restrict disturbance of the remaining sediment, which would prevent or minimize re-suspension of lead shot from deeper sediments in the undredged portion of the site. ICs could include restrictions on vessel speed, controls on dredging within the boundary of Site 27, and long-term monitoring of the backfill. Five-year reviews and reporting would be conducted to ensure the continued effectiveness of the ICs. A remedial action work plan (RAWP) would be developed to specify the roles and responsibilities for implementing, monitoring, and enforcing the ICs.

When Site 27 is transferred, the deed would contain both a deed notice to notify future landowners of the existence of lead shot in the sediment and a restriction requiring (1) that the appropriate regulatory agencies be contacted and notified of the existence of the lead shot in sediment within the boundary of Site 27 before any sediment dredging or fill, and (2) that as part of any sediment dredging or fill, the property would comply with the pertinent parts of Section 404 of the Clean Water Act.

Sediment monitoring would consist of baseline monitoring before dredging, construction quality control monitoring during dredging, and post-remedy monitoring. A post-remedy bathymetric survey would be followed by monitoring 1 year after the remedy has been implemented and every 5 years after the remedy has been implemented. Detailed post-remedy survey and monitoring plans would be developed and presented in the RAWP.

Alternative 2b was selected because it:

(1) Provides overall protection of the environment by removing the current complete exposure pathway for diving ducks and ensures the pathway will remain incomplete throughout the site.

(2) Is the most effective in the short term and would have the least effect on the community, remedial workers, and the environment because of the limited dredging area and the relatively shorter performance period.

(3) Would be implemented in the shortest period of time. Periodic costs will include long-term monitoring to ensure RAOs are consistently achieved.

(4) Meets federal and state ARARs.

(5) Is the most cost effective to implement.

The preferred remedial alternative is protective of human health and the environment and eliminates, reduces, or controls exposures to human and environmental receptors through all potential exposure pathways currently and in the future.

MULTI-AGENCY PARTICIPATION

The ***Base Realignment and Closure (BRAC)*** Cleanup Team (BCT) for NAVSTA TI includes remedial project managers (RPM) from the Navy, DTSC, Water Board, and EPA. The primary goals of the RPMs are to protect human health and the environment, coordinate environmental investigations, and expedite the environmental restoration of former NAVSTA TI. The RPMs have coordinated on all major documents and investigations associated with Site 27, including the RI and FS reports. Based on these reviews and discussions of key documents, the regulatory agencies support the Navy's preferred remedial alternative. The preferred remedial alternative may be modified in response to public comments or new information.

REGULATORY SUMMARY

California Health and Safety Code (HSC)

This document is intended to meet the requirements of California HSC Section 25356.1 for hazardous substance release sites, as required by DTSC. The HSC requires preparation of a RAP for sites that are not listed on the ***National Priorities List (NPL)***, such as NAVSTA TI. Therefore, this document also serves as a draft RAP to fulfill the public notice and comment requirements of the HSC. The final RAP will be incorporated in the ROD for this site.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

DTSC has prepared an initial study to evaluate potential impact of the proposed project on the environment. The findings of the initial study indicate that the project would not have a significant effect on public health or the environment. Therefore, DTSC has prepared a proposed negative declaration for the Site 27 cleanup. Both the initial study and proposed negative declaration are available for review and comment during the public comment period.

NONBINDING ALLOCATION OF RESPONSIBILITY

HSC Section 25356.1(e) requires DTSC to prepare a preliminary nonbinding allocation of responsibility among all identifiable potentially responsible parties. HSC Section 25356.3(a) allows potentially responsible parties with an aggregate allocation in excess of 50 percent to convene an arbitration proceeding by submitting to binding arbitration before an arbitration panel. Based on available information regarding the former NAVSTA TI, DTSC concludes that the Navy is a responsible party with aggregate alleged liability in excess of 50 percent of the costs of removal and remedial action pursuant to HSC Section 25356.3. The Navy may convene arbitration if it so chooses.

8.0 COMMUNITY PARTICIPATION

The Navy, DTSC, Water Board, and EPA encourage the public to gain a more thorough understanding of Site 27 and the CERCLA activities that have been conducted at former NAVSTA TI by visiting the information repository, reviewing the administrative record file, attending public meetings, and signing up for the mailing list to receive regular project information. The information repository was established to provide public access to technical reports and other IR Program information that supports the remedial action alternative decision. The administrative record contains the reports and historical documents used to select remedial alternatives. Restoration Advisory Board Meetings are also held on the third Tuesday of every other month and are open to the public.

Consideration of public input is an important part of the remedy selection process. The Navy, DTSC, Water Board, and EPA encourage all community members, business owners, and other interested stakeholders to provide input on the proposed remedy. The dates of the public comment period and the date, location, and time of the public meeting are provided on pages 1 and 12 of this Proposed Plan/Draft RAP.

THE NEXT STEP

The Navy and DTSC will consider all public comments received during the public comment period, or in person at the public meeting, before they make a final decision for Site 27. The final decision will be documented in the ROD/Final RAP, which will include the responses to all comments received on this Proposed Plan/Draft RAP. Input will be collected after the alternatives are presented to the public, and a final decision will be made after regulatory agency and community input on the Proposed Plan/Draft RAP has been reviewed. The Navy will then issue a ROD/Final RAP, and DTSC will approve the RAP to select the final remedy. A public notice will be placed in the *San Francisco Chronicle* announcing when the Site 27 ROD/Final RAP will become available to the public in the information repositories listed on page 13.

OPPORTUNITIES FOR INVOLVEMENT

Public Meeting, June 14, 2011

Location: Casa de la Vista, Building 271, Treasure Island

You are invited to the public meeting to discuss and comment on the Proposed Plan/Draft RAP for Site 27. The Navy and DTSC will conduct a formal Proposed Plan/Draft RAP presentation at 6:30 p.m., which will be followed by an open house until 8:30 p.m. Highlights of the Proposed Plan/Draft RAP will be presented at different information displays during the open house. You will have the opportunity to visit these displays at your own pace, discuss, and ask questions about the Proposed Plan/Draft RAP one-on-one with representatives of the Navy and DTSC. You will also have the opportunity to formally comment on the Navy's preferred remedial alternative for Site 27 as presented in this Proposed Plan/Draft RAP during both the presentation and open house.

Public Comment Period
June 2 through July 2, 2011

We encourage you to comment on this Proposed Plan/Draft RAP during the public comment period. You may provide comments on the Proposed Plan/Draft RAP orally at the public meeting or submit your comments in writing at or after the public meeting. You may mail or email written comments on this Proposed Plan/Draft RAP to the Navy contact person provided on page 13, postmarked no later than July 2, 2011.

Information Repositories

Two information repositories and the administrative record file provide public access to technical reports and other IR Program information that support this Proposed Plan/Draft RAP.

San Francisco Public Library
Government Publications Section
100 Larkin Street
San Francisco, California 94102
(415) 557-4400

Navy BRAC Caretaker Support Office
1 Avenue of the Palms, Suite 161
Treasure Island
San Francisco, California 94130
(415) 743-4729

Administrative Record File
ATTN: Diane Silva, Command Records Manager
NAVFAC Southwest
1220 Pacific Highway
Code EV33, NSDB Building 3519
San Diego, California 92132
(619) 556-1280
diane.silva@navy.mil

Administrative hours are 8 a.m. to 5 p.m. Monday through Friday. Documents may not be removed from the facility; however, they may be photocopied. Please contact Ms. Silva to make an appointment.

Site 27 documents are available in the information repositories and in the administrative record locations listed above. Other information such as meeting minutes and fact sheets related to Site 27 can be found on the Navy's website at: www.bracpmo.navy.mil. Select "Prior BRAC," then "Former Naval Station Treasure Island."

Project Contacts

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9.0 GLOSSARY OF TERMS

Applicable or Relevant and Appropriate Requirements (ARARs): Federal, state, and local regulations and standards determined to be legally applicable or relevant and appropriate to remedial actions at a CERCLA site.

Base Realignment and Closure (BRAC): Program established by Congress under which Department of Defense installations undergo closure, environmental cleanup, and property transfer to other federal agencies or communities for reuse.

Bathymetric survey: A survey that measures the depth of the water and studies the shape of the seabed.

Benthic organisms: Animals that live on or near the bottom of a stream, lake, or ocean. Benthic populations often indicate sediment quality.

Chemical of Concern (COC): A chemical that has been identified as having the potential to pose a significant threat to human health or the environment.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law designed to identify and cleanup sites contaminated with hazardous substances that may endanger public health or the environment.

Department of Toxic Substances Control (DTSC): A part of the California Environmental Protection Agency and California's lead environmental regulatory agency. Its mission is to protect public health and the environment from toxic substances.

Ecological Risk Assessment (ERA): An analysis of the potential ecological effects caused by exposure to hazardous substances at a site.

Feasibility Study (FS): A study to identify, screen, and compare remedial alternatives for a site.

Installation Restoration (IR): The IR Program is the Department of Defense's comprehensive program to investigate and clean up environmental contamination at military facilities in full compliance with CERCLA.

Institutional Controls (IC): ICs are legal and administrative mechanisms used to implement land use and access restrictions that limit exposure of landowners or users of the property to hazardous substances and to maintain the integrity of the remedial action to ensure that remediation goals are achieved. Monitoring and inspections are conducted to ensure that the land use restrictions are being followed.

Lead shot: A collective term for small pellets of lead used as ammunition at the skeet and trap range. Waterfowl such as ducks can ingest spent pellets and be poisoned.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The regulatory basis for government responses to oil and hazardous substances spills, releases, and sites where these materials have been released.

National Priorities List (NPL): The federal list of Superfund sites nationwide. NPL sites are considered high priority for cleanup under the federal Superfund program. NAVSTA TI is not on the NPL.

Polycyclic Aromatic Hydrocarbon (PAH): Compounds typically associated with the incomplete combustion of fossil fuels that are found in the petroleum pitch used to make targets used at the skeet and trap range. These compounds are stable and resist common degradation processes in the environment.

Preferred remedial alternative: The remedial alternative selected by the Navy, in conjunction with the regulatory agencies, that best satisfies the RAOs based on the evaluation of remedial alternatives presented in the FS.

Proposed Plan/Draft Remedial Action Plan (RAP): A document that reviews the remedial alternatives presented in the FS, summarizes the recommended remedial action, explains the reasons for recommending the action, and solicits comments from the community. The RAP is required under California Health and Safety Code Section (HSC) Section 25356.1 for sites that are not listed on the NPL, such as Treasure Island. A Draft RAP is the California HSC equivalent of the Proposed Plan.

Remedial Action Objectives (RAOs): Statements containing specific cleanup goals for protecting human health and the environment, specifically one or more receptors from one or more chemicals in a specific medium (such as soil, sediment, groundwater, or air) at a site. RAOs are developed by evaluating ARARs and the results of remedial investigations, including human health and ecological risk assessments.

Record of Decision (ROD)/Final RAP: A decision document that identifies the remedial alternatives chosen for implementation at a CERCLA site; the ROD/Final RAP is based on information from the RI report and FS and on public comments and community concerns. A Final RAP is the California HSC equivalent of the ROD.

Remedial Investigation (RI): The first of two major studies that must be completed before a decision can be made about how to clean up a site. (The FS is the second study.) The RI is designed to evaluate the nature and extent of contamination and to estimate human health and ecological risks posed by chemicals of potential concern at a site.

Regional Water Quality Control Board (Water Board): The California water quality authority, which is part of the California Environmental Protection Agency. Its mission is to preserve, enhance, and restore California's water resources.

Screening values: These values were used as guidelines in interpreting and assessing the potential effects of concentrations of lead and PAHs detected in sediment at Site 27 on the environment. They include sediment concentrations of lead and PAHs that are associated with adverse effects on sediment-dwelling organisms (the effects-range low [ER-L] and effects-range median [ER-M]), as well as ambient concentrations of lead (43.2 milligrams per kilogram sediment [mg/kg]) and PAHs (3.39 mg/kg) in San Francisco Bay. The screening values are described in greater detail in the feasibility study.

Superfund Amendments and Reauthorization Act (SARA): SARA amended CERCLA on October 17, 1986, making several important changes and additions to the program, including new enforcement authorities and settlement tools.

U.S. Environmental Protection Agency (EPA): The federal regulatory agency responsible for administration and enforcement of CERCLA (and other federal environmental regulations).

Attn. James Sullivan
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-43101

Proposed Plan/Draft Remedial Action Plan for Installation Restoration Site 27 Clipper Cove Skeet Range

Former Naval Station Treasure Island
San Francisco, California

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FORMER NAVAL STATION TREASURE ISLAND
Installation Restoration Site 27 Clipper Cove Skeet Range

PUBLIC MEETING
June 14, 2011
6:30 – 8:30 PM
Casa de la Vista, Building 271
Treasure Island
San Francisco, CA

PROPOSED PLAN/DRAFT RAP COMMENT SHEET

The public comment period for the Proposed Plan/Draft RAP for Installation Restoration Site 27, Clipper Cove Skeet Range, at Former Naval Station Treasure Island, San Francisco, California, is from **June 2 through July 2, 2011**. You may provide verbal comments at the public meeting listed above, where all comments will be recorded by a court reporter. Alternatively, you may provide written comments in the space provided below or on your own stationery. All written comments must be postmarked no later than **July 2, 2011**. After you complete your comments and your contact information, please mail this form to the address provided on the reverse side. You may also submit this form to a Navy representative at the public meeting. Comments are also being accepted by e-mail; please address e-mail messages to james.b.sullivan2@navy.mil. Comments are also being accepted by fax: (619) 532-0983.

Name: ____________________

Representing (optional): ____________________

Address (optional): ____________________

____

Phone number (optional): ____________________

Please check the appropriate box if you would like to be added to or removed from the Navy's Environmental Mailing List for Treasure Island: ☐ Add me ☐ Remove me

Comments:

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affix
postage

James Sullivan
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-43101

Fold here and seal

ATTACHMENT G
PUBLIC NOTICE, ROSTER OF PUBLIC MEETING ATTENDEES, AND PUBLIC MEETING TRANSCRIPT

San Francisco Chronicle

Affidavit of Publication

Name of Publication: **SAN FRANCISCO CHRONICLE**
Address: **901 MISSION ST.**
City, State Zip: **SAN FRANCISCO, CA 94103**
Phone #: **415-777-1111**
State of: **CALIFORNIA**
County of: **SAN FRANCISCO**

The attached legal notice ran in the San Francisco Chronicle on **Thursday, 6/2/11**.

It appeared on page: **A4**.

On June 9, 2011, before me David Jess Miller, personally appeared
Maribeth Yu Dorida,

who proved to me on the basis of satisfactory evidence to be the person~~(s)~~ whose name~~(s)~~ is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he~~/she/~~they~~ executed the same in ~~his~~/her/~~their~~ authorized capacity~~(ies)~~, and that by ~~his~~/her/~~their~~ signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

DAVID JESS MILLER
COMM. # 1889577
NOTARY PUBLIC-CALIFORNIA
CITY AND COUNTY OF SAN FRANCISCO
MY COMM. EXP. MAY 16, 2014

Notary Signature [signature]

My commission expires: May 16, 2014

Place Notary Seal Above

WORLD

LIBYA

U.N. accuses Khadafy forces of war crimes

By Frank Jordans
ASSOCIATED PRESS

GENEVA — A U.N. panel said Wednesday that Libyan government forces have committed crimes against humanity and war crimes in a conflict it estimates has killed between 10,000 and 15,000 people.

The U.N. investigators found evidence that opposition forces also committed "some acts which would constitute war crimes," the global body said.

"The commission is not of the view that the violations committed by the opposition armed forces were part of any 'widespread or systematic attack' against a civilian population such as to amount to crimes against humanity," it added.

The three-member panel based its findings on interviews with 350 people in government and rebel-held parts of Libya, as well as in refugee camps in neighboring countries.

Their 92-page report adds to evidence collected by prosecutors at the International Criminal Court in The Hague, Netherlands, who are seeking arrest warrants for Moammar Khadafy and two other senior officials. The report was commissioned in February by the U.N. Human Rights Council, which has no power to launch legal proceedings but can censure governments accused of committing abuses.

The U.N. panel said government forces committed murder, torture and sexual abuses "as part of a widespread or systematic attack against a civilian population" before and during the conflict.

"Such acts fall within the meaning of 'crimes against humanity,' " it said.

The panel also found "many serious violations of international humanitarian law committed by government forces amounting to 'war crimes.' "

"The consistent pattern of violations identified creates an inference that they were carried out as a result of policy decisions by Col. Gadhafi and members of his inner circle," it said.

The panel's report also found that rebel forces committed "some acts which would constitute war crimes."

Meanwhile, the panel said estimates of the number of people killed in the conflict since February range from 10,000 to 15,000, the government, the opposition and nongovernmental organizations.

The panel also investigated allegations that NATO air strikes in Libya have caused large numbers of civilian casualties. The alliance has conducted thousands of air strikes as part of its U.N. mandate to enforce a no-fly zone and protect civilians in Libya.

The experts said they were unable to confirm Libyan government claims that 500 civilians have died in the air strikes.

"The commission has not seen evidence to suggest that civilian areas have been intentionally targeted by NATO forces, nor that it has engaged in indiscriminate attacks on civilians," it said.

The International Criminal Court's prosecutor, Luis Moreno-Campo, has previously said he has "strong evidence" of crimes against humanity committed by Khadafy's government.

The panel was led by Cherif Bassiouni, an Egyptian who is a professor of law at DePaul University in Chicago.

Kuni Takahashi / New York Times

Rebel fighters look over cars destroyed in a blast in the parking lot of the Tibesti Hotel in Benghazi, Libya. The hotel is frequented by rebel leaders, diplomats and journalists.

PAKISTAN

Courier who led U.S. to bin Laden is identified

By Kathy Gannon
ASSOCIATED PRESS

ISLAMABAD — The courier who led U.S. intelligence to Osama bin Laden's hideout in Pakistan hailed from the Swat Valley, a one-time stronghold of militant Taliban fighters, Pakistani officials said on Wednesday.

The officials identified the courier as Ibrahim Saeed Ahmed. He and his brother Abrar were shot dead in the daring U.S. Navy SEAL raid May 2 that also killed bin Laden and two other people.

The brothers apparently lived up with bin Laden after they returned to Swat Valley from Kuwait, where their parents had immigrated.

Swat is about 70 miles north of the city of Abbottabad, where bin Laden had been hiding for about five years. The Wall Street Journal, which first reported the real names of the two brothers, said they were from the Swat village of Martung.

9/11 planner's protege

Ahmed, who is said to have been in his early 30s, was a protege of Khalid Sheikh Mohammed, the Sept. 11 mastermind, and a close associate of Faraj al-Libi, a top al-Qaida operative captured in 2005 about 12 miles (20 kilometers) from Abbottabad.

Both Mohammed and al-Libi lied about their association with Ahmed while being held in CIA secret prisons. But a top al Qaeda operative named Hassan Ghul also in CIA custody helped the agency connect the dots: Finding Ahmed, who had been identified as someone important, could lead to bin Laden.

The captives said the courier was known by the nom de guerre Abu Ahmed al-Kuwaiti, which he adopted because their parents lived in Kuwait.

Call intercepted

But U.S. intelligence found the courier only last August through a chance interception of a phone call by Ahmed. That set in motion the secret CIA search of the Abbottabad region, culminating with the May 2 raid and bin Laden's killing.

President Obama's decision to keep Pakistan in the dark about the raid infuriated the military and its intelligence agency. Relations sank to new lows.

The U.S., however, has warned it will do the same again if it has solid intelligence on the whereabouts of any of five most-wanted figures.

HONDURAS

Orlando Sierra / AFP / Getty Images

Honduran President Porfirio Lobo, surrounded by members of his Cabinet, speaks during a national broadcast in Tegucigalpa.

Hemisphere votes nation back in with president

By Frances Robles
MIAMI HERALD

MIAMI — Members of a Honduran delegation took their seats at the Organization of American States on Wednesday, two years after the Central American nation was booted from the hemispheric group.

In a 32-1 vote, the countries voted to allow Honduras to rejoin the OAS, despite the coup that ousted former President Manuel Zelaya in 2009. Only Ecuador voted against the measure.

"The significance of this cannot be understated," said Grenada ambassador Gillian Bristol, who spoke on behalf of Caribbean nations. "We somberly reflect on how our organization was fortified by being forced to apply its most stringent procedure against one of its members."

The measure came four days after Zelaya returned to his country after living two years in exile. He left Honduras in June 2009, when armed soldiers stormed his house and forced him aboard a plane in his pajamas. The country's institutions had rallied against the controversial leader, because they believed that he was trying to change the constitution to continue his rule.

International rebuke followed.

The OAS suspended Honduras and maintained the punishment despite presidential elections that were held months later.

In recent weeks, Honduran President Porfirio Lobo extended a hand to Zelaya, who remains popular among the country's poor. Charges against Zelaya were dropped.

Ecuador's ambassador to the OAS, Maria Isabel Salvador, said Honduras still does not meet the requirements to join the organization: democracy, rule of law and respect to human rights.

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PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN

FOR SITE 27, FORMER CLIPPER COVE SKEET RANGE

FORMER NAVAL STATION TREASURE ISLAND

SAN FRANCISCO, CALIFORNIA

REPORTER'S TRANSCRIPT OF PUBLIC MEETING

JUNE 14, 2011

Casa de la Vista, Building 271
Avenue of the Palms, Treasure Island
San Francisco, California

Reported by Christine M. Niccoli, RPR, C.S.R. No. 4569

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NICCOLI REPORTING

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(650) 573-9339
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A T T E N D E E S

OPENING STATEMENT:

JAMES B. SULLIVAN - Department of the Navy (Navy)

PRESENTERS:

RADHIKA MAJHAIL - Department of Toxic Substances Control (DTSC)

LORA BATTAGLIA - Navy

---oOo---

CONSULTANTS, REGULATORS, NAVY:

MICHAEL ANDERSON - St. George Chadux Corporation

DAVID CLARK - Navy

KATIE HENRY - Tetra Tech EM Inc.

REMEDIOS V. SUNGA - DTSC

TOMMIE JEAN VALMASSY - Tetra Tech EM Inc.

---oOo---

PUBLIC AUDIENCE:

JULIE - Yerba Buena resident

KATIE CHAMBERLAIN - Anchor QEA

MIKE GOMEZ - Treasure Island resident

CHRISTOPHER JONES - Treasure Island resident

CHRISTIN MINNOTTE - Treasure Island resident

SRI MUTHU - Yerba Buena resident

ALICE PILRAM - Treasure Island resident

K. ZAUCHARYENICH - Treasure Island resident

---oOo---

TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA

TUESDAY, JUNE 14, 2011, 6:41 P.M.

---oOo---

MR. JAMES SULLIVAN: Okay. Welcome. My name is Jim Sullivan, and I'm from the U.S. Navy, and this is a joint meeting from the U.S. Navy and the California Department of Toxic Substances Control on the subject of the proposed cleanup plan for Site 27, the former Clipper Cove skeet range located within Clipper Cove.

So I wanted to briefly go over the agenda for tonight. We'll have a overview of the cleanup process or the CERCLA process followed by an overview of the CEQA, or the California Environmental Quality Act, process as it relates to this project and then a discussion of the Proposed Plan. It's a Navy Proposed Plan. It's both a Navy Proposed Plan and a state Draft Remedial Action Plan.

So then following that presentation, we will open it up to public comment, and that will be on the record here.

And then following public comment, we'll have an open house, and you can walk up -- walk through the poster stations. We'll have people there to address questions that you might have, and then we'll also still have -- there will be -- also be still an opportunity to make comments on the record during the poster session.

And so we'll conclude at 8:30 tonight.

So just a few logistics. We have coffee and drinks and cookies on the back table. The restrooms are in the back. And if it gets too hot or too cold during the course of the meeting, just let us know. And if it gets too hard to see this, see the screen, let us know that, and we can maybe move it around a little bit.

So at this point, I'll turn it over to Radhika Majhail from the Department of Toxic Substances Control.

MS. MAJHAIL: Thank you, Jim.

Good evening, everybody. I'm Radhika Majhail. I work for the Department of Toxic Substances Control, and I'm the public participation specialist for Treasure Island.

We're here today to discuss the site cleanup and to discuss the Draft RAP for Clipper Cove. But before we get into the details of the cleanup plan, I want you to know the DTSC site cleanup process, how does DTSC -- what is the process that we follow.

So the first step in the site cleanup plan is the site discovery. This is the first stage when the Department becomes aware of a site. And this -- after this -- This is the stage when we come to determine we need to do cleanup or not.

Then we move up into the second stage, which is called preliminary assessment study or -- and in this case, we actually do collect a study and decide is the cleanup necessary. Do we really need to clean it up? What is the risk?

So if we decide that cleanup needs to be done, then we move on to the other process. By the time when we move on from this step to this study right here, we site by site conduct the public -- the public participation process as well.

The first step in the process is to come up with a public participation plan and usually a site itself. So for Treasure Island, the community relations plan was done for the entire Treasure Island and not just for this site.

So -- and that plan involves the community. It tells us the issues, the concerns about the community, the issues regarding any cleanup, and what would be our steps, what will we be using, what would be our activities for that cleanup.

After that we then send up -- we do -- this is the fact sheet and public meeting where in this stage is -- is not typically done for all the sites. It's kind of on a site-by-site basis. It's not typically done over here.

We actually move in this stage we just called the Remedial Investigation and Feasibility Study, or RI/FS. And in this it's a comprehensive study. We do find out what are the issues, how do we need to clean up, what are the screening levels, how -- So all the details are actually collected and done into the RI/FS.

So after the RI/FS is done, after we decide on the cleanup, then we move on in developing the -- writing the plan, the work plan, which is Proposed Plan or the Draft Remedial Action Plan, or the Draft RAP. And this is the stage we are here in today. We are doing the public meeting for that Draft RAP. Draft RAP is actually an equivalent of -- state equivalent of the Proposed Plan, which is federal term.

So this is a public meeting. This is an open meeting for all public, and it's on record. So we are here to take your comments if any you have for the -- for this cleanup tonight.

After this meeting, we will take the comments, and the Department will respond to all the comments into a Response to Comments document, and that document is usually mailed out to anybody who has responded to us with a valid address. So it is also mailed in to them. Plus, it is also available online at the Navy's Web site and is also available on DTSC Web site as well.

So once the comments are done, we -- the Response to Comments document is finalized, and the draft is approved by the Department. Then it becomes the Final RAP.

And the Final RAP is -- again, it's a state equivalent of the ROD. So this is the final work plan that will be utilized for the cleanup.

The next step is remedial design. This is the stage when we actually design; we start working on the details of the cleanup, how the cleanup is done, where it will be -- I mean, all the designing of the process starts here.

After that we move on to the implementation. Once we have done it on paper, now it's time to put it to the site. So we start working on the site in the implementation phase.

Once the implementation is done or it's actually begin -- is working out, the public participation branch sends out work notice to the public or the community and around the site, around the work site, and notify them about the work that's going on, the times of, you know, the work will start, the time of the work will end, and also what you expect. So the work notice will be sent out once we start the implementation phase.

After the work has been done, the Department again looks at the site and tries to see -- evaluates the site, evaluates the cleanup; and that's when we decide on whether we need to have operation and maintenance or we need to have -- we need to have long-term maintenance plans.

Once that's been set up, then we can -- the Department goes hea- -- goes ahead and certifies the site, and then it moves on to site closure. So we certify the site as clean site.

Let me tell you a little bit about the CEQA as well. CEQA is California legislature -- it passed CEQA Act in 1970. CEQA is also called California Environmental Quality Act.

And what it does is that all the lead agency actually has to do a environment study. So anytime we plan on doing a cleanup, we have to do environment study to see what impacts that -- that would have on the environment.

So we did one for this site as well, which is called as the initial study. The initial study actually enables the agency to see if there was a significant impact or yes or no. In this case, there was no significant impact of the cleanup on the environment. So we came up with a Negative Declaration, or it's also called a Neg. Dec. Most of the time we use the word "Neg. Dec."

So the Draft Negative Declaration is also being review -- will be revi- -- will be open for public review during this comment period. So this comment period we have two documents for review: One is the Draft RAP, and the other one is the Neg. Dec.

Now let me just explain a little bit about what actually is the Draft RAP. I know I told you, but this is why we are here because we are presenting the Draft RAP to you guys. Well, what does this mean? What is a Draft RAP?

Draft RAP is actually a cleanup plan that the Department comes up with. And in the Draft RAP, the main idea of the Draft RAP is that we have the cleanup alternatives.

So before coming -- before proposing or recommending -- before recommending a particular alternative, the Department actually goes through a list of alternatives. So we have many alternatives.

And we have nine criteria that we follow to study all these different alternatives and come up with the best suitable for the site. And all that information is actually in this document that we are pr- -- we are putting out for public comment here.

I have the project manager from Navy, Lora Battaglia, who actually goes over in details of the Draft RAP. So right after this I'll hand over the stage to Lora.

And just a quick reminder that we are in a 30-day comment period which started on July [sic] 2nd, and the Depa- -- and it is the time for you to comment on the Neg. Dec. as well as the Draft RAP.

So if you have any comments, you can say them; and we can accept verbal comments today at the meeting, or you can also send in your written comments to Jim Sullivan, and we'll have this add- -- we'll have that address later in the -- at the presentation.

So now moving on I will have Lora to come to the stage and tell you more about the site and draft plan.

MS. BATTAGLIA: Thank you.

Hi. My name is Lora Battaglia. I'm the project manager for Site 27, the Clipper Cove Skeet Range.

I'll give you a little overview of what this part of the presentation entails. I'll go over the site background, the previous investigations that were conducted at this site. I'll give you a summary of the risks. I'll discuss the remedial alternatives that were evaluated and discuss our preferred alternative; and then at the end, we'll have an opportunity for public comment period on the record.

For the background, the naval skeet range operated until 1989. Clay targets, or what are called skeet, were launched from the shoreline; and lead shot were fired over the water, which resulted in a fan-shaped shot zone area. Over the water you can see the dark green area is where the shot is at the highest density. The extent of the lead shot was determined to be no more than 750 feet away from the shoreline.

In our previous investigations, our offshore sampling began in 1993. As part of the Phase I remedial investigation, sediment and storm water samples were collected and analyzed for metals, pesticides, polychlorinated biphenyls, or PCBs, and polycyclic aromatic hydrocarbons, or PAHs, as we call them.

None of the samples that were collected within the Site 27 boundary contain concentrations of the lead or PAHs above the screening values.

However, in 1996 we conducted additional offshore investigation to further comply with the Water Board order, and we collected sediment and bay water samples to define the vertical and horizontal extent of lead, lead shot, and analyzed for total lead and PAHs, but neither was detected. There was lead shot detected in all but one sample within the sediment.

In 1997 during the Phase II remedial investigation for offshore sediments, we focused on further characterizing the cove both within and outside of the Site 27 boundary.

In 2005 we conducted a bathymetric survey to map the floor of the cove so that we could see what the bottom looked like. And as part of this investigation, it was determined that the top 2 feet of sediment contained lead shot where there could be a potential risk to diving ducks. The investigation concluded that lead shot was a contaminant of concern but that lead itself was not a contaminant of concern.

Our Poster Board No. 2 contains the outline and a little bit more information about the previous investigations conducted.

For the risks, diving ducks, such as the surf scoter, can penetrate the sediment surface from depths ranging from the length of their head, which is about 5, 6 1/2 inches, to the length of their entire body, which is 17 to 21 inches, while they forage for food in waters as deep as 40 feet.

So the risk here is that there may be incidental ingestion of lead shot by those diving ducks who -- and that's the primary receptor pathway in the nearshore area. Diving ducks have been observed in the Site 27 area, and there is food for them within the sediments there.

It was determined that there's no human health risk because there is no pathway for exposure to humans.

Our remedial action objectives, or RAOs, are specific goals for protecting either human health or the environment, and they are provided for helping us develop the remedial alternatives.

So we have two remedial action objectives for this particular site. The first one is to prevent or minimize the ingestion of lead shot by diving ducks within 75 feet of the shoreline where there's a complete exposure pathway under the current conditions.

Our second remedial action objective is to prevent or minimize the ingestion of lead shot by diving ducks sitewide where there might be a potentially complete exposure pathway in the future where the lead shot, which is currently buried below 2 feet of sediment, would become closer to the sediment surface as a result of dredging or disturbance.

So our alternatives that were evaluated are these three alternatives here, Alternative 1 being a requirement that we use no action as a baseline.

Alternative 2 is focused dredging and backfill, institutional controls, and sediment monitoring.

Alternative 3 would involve sitewide dredging. Both of these alternatives have an "a" and "b" option, "a" being landfill disposal of the sediment once it's dredged, and Option "b" being beneficial reuse of sediment. That involves the dredged sediment being transported by barge to an upland beneficial reuse site where the sediment's being reused to create a restored wetland. It will create the base of a wetland so it won't be an exposure situation to any diving ducks.

This slide shows you the areas of Alternative 2 being a limited dredge area and Alternative 3 being the sitewide dredge area.

As Radhika mentioned, there's nine criteria that we use to evaluate our alternatives. These are also located on Poster 6 'cause I realize it's hard to read here.

To be eligible for selecting a criteria, they have to meet the first top two threshold criteria, which are overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements. The last two criteria are state acceptance and community acceptance, and those will be addressed through the public comment and regulatory review period.

A ranking analysis of the remedial alternatives was conducted to provide a comparison of the alternatives against those criteria that are outlined in the NCP. To conduct the ranking analysis, a score of 1 to 5 was assigned for each of the alternatives. These two are outlined, I believe, on Poster No. 4.

And you can see that up at the top, we have our two alternatives with the "a" and "b" disposal options; and here are the criteria that were compared and the number ranking and the score assigned to each alternative, 5 being the best and 1 being the least satisfactory.

The preferred alternative is Alternative 2b. That involves the focused dredging and backfill, off-site disposal of sediment at the beneficial reuse site, institutional controls, and sediment monitoring.

Alternative 2b would be implemented by removing the contaminated sediments to a depth of at least 2 1/2 feet in the nearshore area where there's current complete exposure pathway.

Dredge sediment would be transported by barge to the upland beneficial reuse site. After dredging, the area would be backfilled with clean fill to prevent exposure to diving ducks, and we would implement institutional controls throughout the rest of the site to restrict the activities that might disturb the sediment.

The reasons for selecting Alternative 2b are because it provides the overall protection of the environment by removing the complete current exposure pathway for the diving ducks, and it ensures the pathway will remain incomplete for the remainder of the site.

It's also the most effective in the store term and has the least effect on the community, the workers, and the environment because of the limited dredge area. It also has a relatively shorter performance period.

The third reason is because it would be implemented very quickly. Periodic costs would, however, include voluntary monitoring to ensure that we're meeting our objectives. It also meets the federal and state requirements and is the most cost effective to implement.

So what's next? The public comments on the Proposed Plan/Draft Remedial Action Plan must be received or postmarked by July 2nd. That's the completion of our public comment period.

As we have mentioned, the Record of Decision and Final RAP are planned for the spring of 2012, and that's where all the comments will be formally responded to and addressed in the responsiveness summary portion.

You may provide comments verbally or in writing after this presentation and throughout the evening. You may also mail, E-mail, or fax comments to James Sullivan, the Navy BRAC PMO West office at 1455 Frazee Road, Suite 900, in San Diego, California 92108, phone number 619-532-0966, fax 619-532-0983, or E-mail james.b.sullivan2@navy.mil.

Or you may also mail, fax, or E-mail comments to Remedios Sunga at DTSC at 700 Heinz Avenue, Berkeley, California 94710, phone number 510-540-3840, fax 510-540-3819, and E-mail rsunga@dtsc.ca.gov.

And so I'd like to turn it over to the DTSC to ask for any public comments.

MS. MAJHAIL: Thank you.

Let's open the floor for public comment. If you have any public comment or impression or concern, you may present it right now.

MS. CHAMBERLAIN: I have one. My name is Katie Chamberlain with Anchor QEA.

What is the anticipated upland dredge material on the beneficial reuse site?

MS. BATTAGLIA: It's the Montezuma wetlands in Sonoma?

MS. HENRY: Solano County.

MS. BATTAGLIA: Oh. Solano County.

MS. HENRY: It's a -- It's discussed in the Feasibility Study, and tonight we actually have copies of that if you haven't seen it on the table in the corner. So take a look for more information there as well.

And they are -- basically, the premise is to use it, as Lora said, as a base so it wouldn't be on the top layer . . . [inaudible].

THE COURT REPORTER: Can you speak up, please?

MS. HENRY: Oh, I'm sorry.

THE COURT REPORTER: So it wouldn't be used what?

MS. HENRY: It would be used as a base layer with cleaner sediment placed on top of it.

MS. MAJHAIL: Okay. Any more questions, concerns, or comments?

Yes.

MS. PILRAM: I am Alice Pilram. I'm a member of the RAB, and I live here on the island. I have a question about the future of Clipper Cove.

So if just the area along the shoreline is taken care of, remediated, what happens in the future when they need to dredge the cove? because it is filling up with sediment, and there is going to be a marina there. Whose responsibility will that be, then? because there is shot out there and definitely will be disturbed if the cove is dredged.

MS. BATTAGLIA: Jim?

MR. SULLIVAN: Right now the marina developer didn't have any plans to dredge the portion of -- Clipper Cove for Site 27 is located back there. Their plans for potential deep dredging were outside the footprint of Site 27.

But in the event that they did need to dredge in the future, there would be a -- what is referred to as a land-use control or institutional control or covenant that would be in the deed when the property is transferred from the Navy to the Treasure Island Development Authority that would require any -- any future owner or the developer to manage that shot material in the event that they do need to dredge into it.

So the location of the shot material would all be documented in this control.

MS. SUNGA: I just want to add something to that. If that will happen --

THE COURT REPORTER: Wait. Wait, wait, wait, wait. Please wait. I have to identify you.

MS. MAJHAIL: Remedios Sunga.

MS. SUNGA: Remedios Sunga.

MS. MAJHAIL: DTSC.

THE COURT REPORTER: Okay.

MS. SUNGA: Yeah.

In the event that the developer wants to go back and disturb the shots in the sediments, they have to go back to the DTSC because the land-use control or the deed requires that they have to work with us. They have to submit a plan for us to approve in how they want to disturb it and how they want to restore it back to where the diving ducks will not be exposed.

MS. MAJHAIL: They will have to refer it again to DTSC. Thank you for your question.

Any other questions?

Since there are no more questions or comments at this time, I can ask you to take the meeting off the record, and we can complete the meeting part of it, but we'll move it to the open house.

MS. BATTAGLIA: Yeah.

MS. MAJHAIL: Yeah, and then you're free to go to the -- to these posters and have any questions. We're still here to answer any questions even after the meeting.

MR. SULLIVAN: And also we'll still be here to take any --

MS. MAJHAIL: -- take formal comments.

MR. SULLIVAN: -- any -- any formal comment that you would --

MS. MAJHAIL: Yes.

MR. SULLIVAN: -- like to make during the course of the rest of the open house.

MS. BATTAGLIA: Yeah. You may write that on the papers on the table at the front, or you may actually just speak to Christine here at the front as well.

MS. MAJHAIL: Thank you very much for attending the meeting tonight.

(Whereupon, at 7:08 p.m. open house commences until 8:30 p.m. during which time no public comments were stated for the record.)

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CERTIFICATE OF REPORTER

I, CHRISTINE M. NICCOLI, Certified Shorthand Reporter of the State of California, do hereby certify that this 23-page transcript of the foregoing meeting was reported by me stenographically to the best of my ability at the time and place aforementioned.

IN WITNESS WHEREOF, I have hereunto set my hand this 25th day of October, 2011.

CHRISTINE M. NICCOLI, C.S.R. NO. 4569