Action Memorandum / Non-Time Critical Remedial Action Plan at the Naval Weapons Station, Seal Beach, California Site 7—Station Landfill

Prepared by

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Under
SWDIV Contract N62474-96-D-6115
Delivery Order #24
Project Number 171335.24.AM

10 September 2003

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Acronyms

°F	degrees Fahrenheit
µg/L	microgram(s) per liter
Ag	silver
Ag+	free silver ions (ionic silver)
$AgNO_3$	silver nitrate
AM/RAP	Action Memorandum/Remedial Action Plan
AOC	area of concern
AOPC	area of potential concern
ARAR	applicable or relevant and appropriate requirement
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	ambient water quality criteria
BAT	best available technologies
BCF	bioconcentration factor
BCT	best control technology
bgs	below ground surface
CAA	Clean Air Act
$CaCO_3$	calcium carbonate
CAP	corrective action program
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CIWMB	California Integrated Waste Management Board

COEC	chemicals of ecological concern
COPC	chemical of potential concern
CPT	cone penetrometer testing
CTR	California Toxics Rule
Cu	copper
CWA	California Water Act
CWC	California Water Code
cy	cubic yards
DDD	dichlorodiphenyl dichloroethane
DDE	dichlorodiphenyl trichloroethene
DDT	dichlorodiphenyl trichloroethane
DERP	Defense Environmental Restoration Program
DHS	Department of Health Services
DoD	Department of Defense
DON	Department of the Navy
DTSC	Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EEC	extreme effects concentration
EIA	Environmental Impact Assessment
EO	Executive Order
EPA	United States Environmental Protection Agency
ePRG	ecological preliminary remediation goal
ERA	ecological risk assessment
ESA	Endangered Species Act
FAWQC	Federal Ambient Water Quality Criteria
FR	*Federal Register*
FS	Feasibility Study
HHRA	human health risk assessment
HI	hazard index
HSC	Health and Safety Code

IAS	Initial Assessment Study
IR	Installation Restoration
kg	kilogram(s)
LDR	land disposal restriction
LOAEL	lowest observed adverse effects level
MCL	maximum contaminant level (limit)
MCLG	maximum contaminant level goal
MEC	midrange effect concentration
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
MPRSA	Marine Protection, Research, and Sanctuaries Act
NAAQS	National Ambient Air Quality Standards
NACIP	Navy Assessment and Control of Installation Pollutants
NAVSEASYSCOM	Naval Sea Systems Command
NAVWPNSTA	Naval Weapons Station
NAWQ	national ambient water quality
NCP	National Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	no further action
NFESC	Naval Facilities Engineering Service Center
Ni	nickel
NOAEL	no observed adverse effects level
NOEC	no observed effect concentration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTCRA	Non-Time Critical Removal Action
NWR	National Wildlife Refuge
O&M	operations and maintenance
OCFCC	Orange County Flood Control Channel
OU	Operable Unit

PAH	polycyclic aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzodioxins
PCDF	polychlorinated dibenzofurans
PEL	probable effect level
POA	Plan of Action
ppb	parts per billion
ppm	parts per million
PRG	preliminary remediation goal
PRP	potentially responsible party
QA/QC	quality assurance/quality control
RAB	Restoration Advisory Board
RAC	removal action contract
RAO	removal action objective
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
rPRG	residential preliminary remediation goal
RSE	Removal Site Evaluation
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SDWA	Safe Drinking Water Act
SI	Site Inspection
SIP	State Implementation Plan
SQG	sediment quality guidelines
Station	Naval Weapons Station Seal Beach

STLC	soluble threshold limit concentration
SVOC	semivolatile organic compound
SWDIV	Southwest Division, Naval Facilities Engineering Command
SWMU	solid waste management unit
SWRCB	State Water Resources Control Board
TAL	target analyte list
TBC	to be considered
TCDD	tetrachlorodibenzo-p-dioxin
TCG	target cleanup goal
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TEC	threshold effects concentration
TEL	threshold effect level
TPH-d	total petroleum hydrocarbons as diesel
TRPH	total recoverable petroleum hydrocarbon
TRV	toxicity reference value
TTLC	total threshold limit concentration
U.S.C.	United States Code
UET	upper effects threshold
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound
WET	Waste Extraction Test
WQCP	Water Quality Control Plan
WQO	water quality objective
WSCMO	Weather Service Contract Meteorological Observatory
$ZnCL_2$	zinc chloride

Naval Weapons Station Seal Beach
800 Seal Beach Boulevard
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10 September 2003

Subject: DRAFT ACTION MEMORANDUM / NON-TIME CRITICAL REMEDIAL ACTION PLAN FOR REMOVAL ACTION AT NAVAL WEAPONS STATION, SITE 7 – STATION LANDFILL, SEAL BEACH, CALIFORNIA

Site Status: Non-NPL
Category of Removal: Non-Time Critical Removal Action
CERCLIS ID: CA0170024491
Site ID: Operable Unit 2, Site 7

I. Purpose

The purpose of this Action Memorandum / Remedial Action Plan (AM / RAP) is to document, for the Administrative Record, the Department of the Navy (DON) decision to undertake a Non-Time Critical Removal Action (NTCRA) to mitigate potential impacts from prior landfilling activities at Naval Weapons Station (NAVWPNSTA) Seal Beach Installation Restoration (IR) Program Site 7, Station Landfill, and address applicable regulatory requirements. The Department of Defense (DoD) has the authority to undertake Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions, including removal actions, under 42 United States Code (U.S.C.) §9604, 10 U.S.C. §2705, and Federal Executive Order (EO) 12580.

An addendum was issued for the Final Site 7 Engineering Evaluation / Cost Analysis (EE / CA) that expanded this removal action to include two adjacent areas to Site 7, Site 4 Areas of Potential Concern (AOPCs) 1A and 2A. Therefore, references to the Site 7 removal action include the removal action for Site 4 AOPCs 1A and 2A.

The proposed NTCRA involves performing limited soil cover repairs, surficial debris removal, excavation and offsite disposal of waste and contaminated soil, and groundwater monitoring. By doing this, the proposed action will substantially eliminate the potential pathways of exposure to hazardous substances and chemicals of concern for human and ecological receptors.

The proposed removal action for this site is deemed consistent with the factors set forth within the National Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) Part 300, based on the findings of potential exposure of ecological receptors and human populations to pollutants or contaminants.

There are no nationally significant or precedent-setting issues for this site.

II. Site Conditions and Background

A. Site Description

NAVWPNSTA Seal Beach is part of the Commander Navy Region Southwest. The Station provides fleet combatants with ready-for-use ordnance. Because of its geographic location, the Station serves as a supply point for operating Navy and Marine Corps installations in Southern California. Site 7 and Site 4 AOPCs 1A and 2A are located adjacent to each other and are on the southern portion of the Station (Figure 1).

Site 7 is an approximately 33-acre site located near the southern boundary of the NAVWPNSTA Seal Beach and at the eastern boundary of the Seal Beach National Wildlife Refuge (NWR) (see Figures 1 and 2). A portion of Site 7 is located within the NWR. The landfill reportedly began operations some time between October 1955 and December 1957 and operated until about 1973, when a contract was awarded for off-Station disposal of wastes. According to interviews of long-time Station employees and a review of historical aerial photographs conducted during the 1985 Initial Assessment Study (IAS), it is reported that the landfill was developed in three stages. A different trench was used in each of these three stages. Each trench was reported to be about 80 feet wide by 300 feet long and was excavated to about the groundwater table. The total volume of the three trenches is reportedly approximately 27,000 cubic yards. However, results of the review of aerial photographs and geophysical survey conducted for the Remedial Investigation (RI) indicate that landfilling was not limited to three trenches (Southwest Division, Naval Facilities Engineering Command [SWDIV], 1993b; 1993c).

Additional field investigations of Site 7 conducted under the IR Program of the Navy confirmed the presence of multiple trenches. These trenches appear to be mostly shorter and narrower than those previously reported (SWDIV, 1995b). The material in these trenches appears to be predominantly domestic refuse, construction debris, and earthen fill material (SWDIV, 1996).

Any and all types of waste generated at the Station may have been disposed at the landfill and included full and / or empty drums and cans that may have been disposed at Site 7. The largest volume of waste reportedly included empty 1- and 5-gallon paint cans and solvent containers. Other reported waste streams include lumber, metal banding, construction debris, asbestos insulation, rags, paint, mineral spirits, alcohol, solvents, paint thinner, transformer oil filters, and petroleum products. In the 1960s, non-Station personnel were allowed to enter NAVWPNSTA Seal Beach and dispose of wastes at the landfill. The road-oiling contractor's truck was reportedly observed at the landfill during this time; however, whether the tank truck discharged to the landfill is unknown (Naval Energy and Environmental Support Activity [NEESA], 1985).

Site 4 AOPCs 1A and 2A consist of a 5,400-foot by 100-foot-wide unpaved shoulder adjacent to both Perimeter Road and Site 7 Station Landfill, along the southern boundary of NAVWPNSTA Seal Beach. Site 4 AOPC 1A is located within the NWR, and AOPC 2A is located east of the NWR.

Figure 1

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Figure 2

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Site 4 AOPCs 1A and 2A were identified as containing several potential locations where elevated lead was detected. From the mid-1960s to 1973, approximately one to three times per year, the perimeter roads of the facility were sprayed with unknown quantities of waste oil for dust control. Weeds on the unpaved roads and nearby fields were cropped and disked for fire control (NEESA, 1985). The oil was then sprayed over the area and disked into the soils for dust control. The waste oil used was generated by the facility and included Bunker C fuel oil. From 1972 through 1973, an estimated 40,000 gallons of waste oil, generated by off-facility crude oil operations and petroleum refineries and from oil spills, were sprayed by a contractor in two or three applications on approximately 12 miles of roadway. The oil was applied in dry weather to minimize the possibility of transport in surface runoff (SWDIV, 1990b). Offsite contracting of waste oil was discontinued when elevated lead content and trace amounts of other metals were found in the oils (Kearney, 1989). Since early 1974, the perimeter roads have been sprayed with quality-controlled, penetrating oil consisting of 70 percent water and 30 percent emulsified agent (NEESA, 1985).

Site conditions and background information have been collected from previous field investigation reports. Descriptions of the previous investigations are summarized below.

1. Removal Site Evaluation

NAVWPNSTA Seal Beach and the Navy have been actively engaged in the IR Program since 1985. Since 1973, Site 7 and Site 4 AOPCs 1A and 2A have been the subject of 16 environmental investigations, including:

- Environmental Impact Assessment (EIA) – Weed and Dust Control (NAVWPNSTA, 1973)
- Initial Assessment Study (IAS) of NAVWPNSTA Seal Beach (NEESA, 1985)
- Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) (A.T. Kearney, 1989)
- Seal Beach Laboratory Testing (SWDIV, 1990a)
- Plan of Action / Site Inspection (SWDIV, 1990b)
- Addendum to the Preliminary Assessment (IAS) (NEESA, 1990)
- Remedial Investigation (SWDIV, 1995a)
- Confirmation Testing for Operable Unit (OU)-6 and OU-7, Technical Memorandum (SWDIV, 1995c)
- Analytical Results for Soil Samples Collected in 1995 from IR Site 4 (AccuTek, 1995)
- Landfill Closure Plan (SWDIV, 1996)
- Ecological Risk Assessment (ERA) Phase II Validation Study (SWDIV, 1999a)
- Supplemental Groundwater Monitoring Study (SWDIV, 1999b)
- Supplemental Characterization Report (SWDIV, 1999c)
- Screening Aquatic ERA (SWDIV, 2000)

- Removal Site Evaluation (RSE) Report for Installation Restoration Program Sites 4, 5, and 6 (BNI, 2001)
- Engineering Evaluation/Cost Analysis (EE/CA) (see Attachment A)

Some of the investigations/reports may not have dealt directly with Site 4 AOPCs 1A and 2A. It was not until the RSE that AOPCs 1A and 2A were designated separately within Site 4.

Investigations and studies to date have indicated that the risk to human health and ecological receptors is marginal (SWDIV, 1995b, 1999a, and 2000; BNI, 2001). The most significant possible risks are to aquatic ecological receptors in Perimeter Pond.

The following subsections briefly summarize the results of each of the previous bulleted environmental investigations conducted at Site 7 and Site 4 AOPCs 1A and 2A.

Environmental Impact Assessment

In 1973, a plan was proposed to control weed growth on NAVWPNSTA Seal Beach property and fugitive dust emissions from base roads by applying an oil/water mixture in accordance with the Regional Water Quality Control Board (RWQCB) waste discharge requirements. This oil/water application on Perimeter Road was later identified as occurring on Site 4 and was investigated under the IR Program (NAVWPNSTA Seal Beach, 1973).

Initial Assessment Study

In 1985, the Navy conducted an IAS to investigate potentially contaminated sites at NAVWPNSTA Seal Beach (NEESA, 1985). The IAS was conducted under the Navy Assessment and Control of Installation Pollutants (NACIP) Program by NEESA. The NACIP program was the predecessor to the IR Program, and NEESA is currently known as Naval Facilities Engineering Service Center (NFESC). The IAS concluded that 9 of the 25 impacted sites identified at NAVWPNSTA Seal Beach posed a potential threat to human health or the environment and were sufficient to warrant further investigation. Site 7 was identified as one of the nine sites that potentially pose a threat, and a confirmation study was recommended to sample and monitor the site to confirm or deny the presence of contamination. Site 4 also was identified as one of the nine sites, and a confirmation study was recommended. It was not known if the oil sprayed on the perimeter roads contained polychlorinated biphenyls (PCBs) or pesticides; therefore, it was recommended that soil samples be collected at a depth of 12 inches below ground surface (bgs) (NEESA, 1985).

RCRA Facility Assessment

In 1989, A.T. Kearney, Inc., performed an RFA of NAVWPNSTA Seal Beach for the United States Environmental Protection Agency (EPA). The purpose of the RFA was to assess whether there had been, or were likely to be, releases of hazardous substances from locations where hazardous wastes or materials were or had been used, treated, stored, or disposed. Based on historical information, interviews with NAVWPNSTA Seal Beach personnel, visual inspections of the sites, and preliminary review of data available from the ongoing site investigation (SI) of the nine sites, the RFA identified 69 solid waste management units (SWMUs) and areas of concern (AOCs). Many of these SWMUs and AOCs were the same as IR Program sites identified by the 1985 IAS. Site 7 was designated SWMU No. 9 by the RFA and recommended for further investigation (Kearney, 1989). The RFA concluded that Site 4 has a high current and ongoing potential for the release of hazardous wastes or constituents to the soil or groundwater and for the generation of subsurface gases (Kearney, 1989).

Seal Beach Laboratory Testing

In January 1990, soils in agricultural outlease area where there was concern that PCB-contaminated oil may have been used for weed suppression were sampled for priority pollutants. No priority pollutants were detected at levels exceeding toxic threshold limit concentrations (TTLCs) in soils or water sampled (SWDIV, 1990a).

Plan of Action/Site Inspection

In 1987, Roy F. Weston, Inc. was contracted by NEESA to produce a Plan of Action (POA) for a verification study of hazardous waste disposal at the nine sites recommended by the IAS for further study. The POA included a comprehensive background facility review, in addition to the development of data objectives, sampling plan and procedures, quality assurance/quality control (QA/QC), and Site Safety Plan. The POA served as an SI Work Plan.

This initial SI characterized Sites 1, 2, 4, 6, 7, 8, 19, 22, and 24 as recommended by the IAS for further study. As part of the initial SI, shallow soil samples were collected to characterize the impacts of the oiling of the Perimeter Road. Of these samples, two were collected in the areas adjacent to Site 7 (coinciding with Site 4 AOPCs 1A and 2A). These two soil samples showed lead concentrations of 145 milligrams per kilogram (mg/kg) and 206 mg/kg for sample locations B19 and B20, respectively. At Site 7, the initial SI included a field survey of landfill gases, soil, surface water, and groundwater sampling. One of the Site 7 soil samples at Well W42, adjacent to Site 4, contained elevated lead concentration (2,080 mg/kg). The final SI report was released in October 1990 and recommended no further investigation for Site 4 and further study to confirm the risks, level, and extent of contamination for Site 7 (SWDIV, 1990b).

Addendum to the Preliminary Assessment

In August 1990, California Department of Toxic Substances Control (DTSC) (Department of Health Services [DHS] at that time) requested that the findings of the IAS be verified and that all 25 initial sites be considered for further investigation, plus other potential sites identified at NAVWPNSTA Seal Beach. Study was undertaken again without sample collection but with additional information provided by the RFA report, RI verification-step data, and other information found in Navy files. In addition to the original 25 sites identified in the IAS (Sites 1 through 25), 17 new sites were identified (Sites 35 through 51). Several sites recommended for no further action (NFA) in the IAS also were recommended for further study in the addendum to the preliminary assessment (NEESA, 1990).

Remedial Investigation

As a consequence of the findings of the SI report (SWDIV, 1990b), Roy F. Weston, Inc. again was contracted by NEESA to prepare an RI Work Plan for Sites 1, 2, 4, 6, 7, 8, 19, and 22. The RI Work Plan was completed in July 1990 and included recommended sampling locations and analytical parameters to delineate the nature and extent of contamination. The recommendations of the RI Work Plan were not implemented by the Navy because revisions were required to comply with CERCLA requirements. However, they served as a starting point for the 1993 RI/Feasibility Study (FS) Work Plan (SWDIV, 1993a). The RI activities were initiated in July 1993.

The final RI report for Sites 1, 7, 19, and 22 was completed in December 1995 (SWDIV, 1995b). The RI at Site 7 included review of historical aerial photographs, geophysical survey, soil gas sampling, integrated surface sampling, and ambient air sampling (including meteorological monitoring). Other field investigation activities performed at Site 7 included installation of groundwater monitoring wells and sampling (quarterly for 1 year), aquifer testing, cone penetrometer testing (CPT), direct-push groundwater sampling, and surface and subsurface soil sampling. The RI at Site 7 was developed and executed based on EPA guidance on presumptive remedies for landfills (EPA, 1991, 1992, and 1993). The EPA guidance states that a comprehensive characterization of the contents of a landfill is not necessary or appropriate. Following the EPA guidance, data were collected to characterize routes of exposure including potential pathways of migration (e.g., groundwater contamination, soil vapor, and atmospheric releases). A baseline human health risk assessment (HHRA) and a preliminary ERA were conducted using the data collected from the field investigations. The results of the risk assessments indicated that the chemical risks generated at Site 7 to human and ecological receptors are low. Therefore, the report recommended that Site 7 did not warrant remediation, and a no-action interim record of decision (ROD) was recommended.

As part of the investigations for the initial SI at Site 7 (Station Landfill), the presence of elevated lead concentrations (2,080 mg/kg) was detected in soil at a depth of 1 foot bgs at the location of Well W42 near the segment of Site 4 that is adjacent to the NWR. Additional investigation was conducted in this area (designated as the "lead hot spot") as part of the RI for OUs 1, 2, and 3. Thirty-five surface soil samples were field analyzed for chromium, lead, and zinc. In 1993, results for 23 of these soil samples indicated the presence of lead concentrations in excess of the California-modified residential preliminary remediation goal (PRG) for lead (130 mg/kg) with a maximum concentration of 5,180 mg/kg. These samples were located in a strip of land approximately 100 by 1,400 feet along Perimeter Road in the southern part of Site 7. For confirmation purposes, five surface soil samples were collected from the lead hot spot and analyzed at an offsite fixed, commercial laboratory. Analytical results indicated the presence of elevated lead concentrations with a maximum concentration of 740 mg/kg. Tetrachloroethene; benzo(a)pyrene; and 4,4'-DDT were each reported in one sample. Total petroleum hydrocarbons as diesel (TPH-d) concentrations of 40.9 and 19.8 mg/kg were reported in two samples. No chemicals of potential concern (COPCs) were identified in the groundwater samples collected from Well W42 located within the lead hot spot. The RI report concluded that the elevated lead concentrations reported in the lead hot spot probably were associated with oiling of Perimeter Road rather than Site 7 operations; therefore, the lead hot spot would be further addressed as part of Site 4 (SWDIV, 1995b).

Confirmation Testing for OU-6 and OU-7, Technical Memorandum

In February 1995, out of 35 locations included in OU-6 and OU-7, 29 locations were recommended for NFA, and 6 locations were recommended for further investigation during the SI. The six locations recommended for further investigation during the SI were AOC 4, Oil on Roads (Site 4); AOC 6, External Paint Area (Building 246); AOC 7, Railroad Supply Yard (Building 438); SWMU 11, Quenching Water Disposal Area (Building 307); SWMU 56, Hazardous Waste Drum Storage (Building 246); and SWMU 57, Paint Locker Area (Building 59). Site 4 was not sampled during this study because it was "too large for confirmation testing and potential exists for release harmful to human health and the environment" (SWDIV, 1995a). Therefore, Site 4 was recommended for the SI.

Analytical Results for Soil Samples Collected in 1995 from IR Site 4

In 1995, the DON contracted AccuTek to collect soil samples every 250 feet along Perimeter Road (426 samples) at depths of 6 and 24 inches bgs and analyze the samples for lead. Soil samples collected every 500 feet (212 samples) were analyzed for total recoverable petroleum hydrocarbons (TRPHs) and semivolatile organic compounds (SVOCs). Soil samples collected every 1,000 feet (106 samples) were analyzed for polychlorinated dibenzodioxins (dioxions)/polychlorinated dibenzofurans (furans) (PCDDs/PCDFs). Analytical results indicated that 36 out of 426 samples at the 6-inch depth had lead concentrations above the residential PRG (rPRGs) value of 130 mg/kg. The analytical results also indicate that 25 samples had PCDD/PCDF toxicity equivalency factor values above the PRG value for tetrachlorodibenzo-p-dioxin (TCDD) of 0.0038-mg/kg. Seventeen of the samples were from a depth of 6 inches bgs, and eight samples were from a depth of 24 inches bgs. The only SVOC reported above the rPRG was benz(a)anthracene, in one sample at the 6-inch depth (AccuTek, 1995).

Landfill Closure Plan

In 1996, the Landfill Closure Plan was prepared to develop a document to comply with state landfill closure requirements with (at the time) California Code of Regulations (CCR) Title 23, Chapter 15 as the primary regulatory guidance and additional guidance from specific provisions of CCR Title 14, Chapters 3 and 5. As part of the preparation of the Landfill Closure Plan, an assessment of Site 7 and the surrounding areas was conducted in early 1996 to collect additional site-specific data to support landfill closure design. No chemical analytical data were generated for site characterization purposes as part of the development of the landfill closure plan (SWDIV, 1996).

Based on the absence of a need for remediation based on the results of IR Program investigations, the Navy began the process of closing the Site 7 landfill in accordance with state landfill closure guidelines that were in effect at that time. Elements of the assessment included:

- Archaeological and paleontological resources evaluation
- Document review and field investigation of the area east of Perimeter Pond
- Wetlands delineation
- Field evaluation of existing landfill cover soil thickness
- Groundwater level measurements
- Topographic survey
- Hydrology reconnaissance

- Sampling / analyses of onsite and stockpile soils
- Geophysical survey using seismic reflection

It was the Landfill Closure Plan that first designated distinct areas in Site 7, as shown in Figure 3. The Site 7 Landfill Closure Plan was withdrawn when the Navy decided not to close the landfill outside the IR Program.

ERA Phase II Validation Study

Previous investigations led to the first evaluation of risks to ecological receptors as part of the *Final Remedial Investigation (RI) Report for Sites 1, 7, 19, and 22* (SWDIV, 1995b). At the request of the State of California, additional evaluation of risks to ecological receptors at Sites 1 and 7 was done in accordance with the DTSC *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities* (DTSC, 1996), which was not available at the time the RI was conducted. This ERA Phase II Validation Study was conducted to obtain site-specific data on concentrations of chemicals in the tissues of food items of terrestrial ecological receptors for the re-evaluation of ecological risks and development of ecological preliminary remediation goals (ePRGs). The developed ePRGs were all near or above site maximum concentrations, so the proposed values did not alter the conclusion of the RI for no further action at Site 7. The established values were considered to be conservatively protective of the environment.

Supplemental Groundwater Monitoring Study

In 1998, CH2M HILL performed a Groundwater Monitoring Study at Sites 1 and 7, which consisted of two 3-week events of continuous monitoring of the groundwater level and two groundwater sampling events. With respect to Site 7, the objective of the continuous groundwater level monitoring was to confirm the direction of groundwater flow during the wet season. The objectives of the groundwater sampling events were to determine the source of elevated levels of gross alpha and gross beta in the groundwater at Site 7 and to assess the concentrations of metals and cyanide. Results of the groundwater monitoring indicated that the groundwater conditions at Site 7 are complex. Surface water features at or adjacent to the site (i.e., NWR tidal salt marsh, Port of Long Beach mitigation ponds, Orange County Flood Control Channel [OCFCC], drainage ditch, and seasonal ponding due to rainfall) affect the shallow groundwater flow conditions. Site 7 groundwater is affected not only by Anaheim Bay tidal fluctuations but also by the influence that rainfall and tidal fluctuations exert on these hydrologic features. It appears that groundwater flow is generally away from the NWR during periods with no rainfall (dry season) and is generally towards the NWR during periods of significant rainfall (wet season). The exact groundwater flow direction is determined by the interaction among the hydrologic features at or adjacent to Site 7.

The groundwater quality data trends at Site 7 indicated sporadic detection of few metals that exceeded their respective ambient water quality criteria (AWQC) and background concentrations. In addition, the radionuclides were found to be naturally occurring, and cyanide was not detected in the September 1998 sampling event. Overall, natural attenuation processes (e.g., dilution due to tidal “flushing”) appear to have been active over time, and no well-defined plumes exist (SWDIV, 1999b).

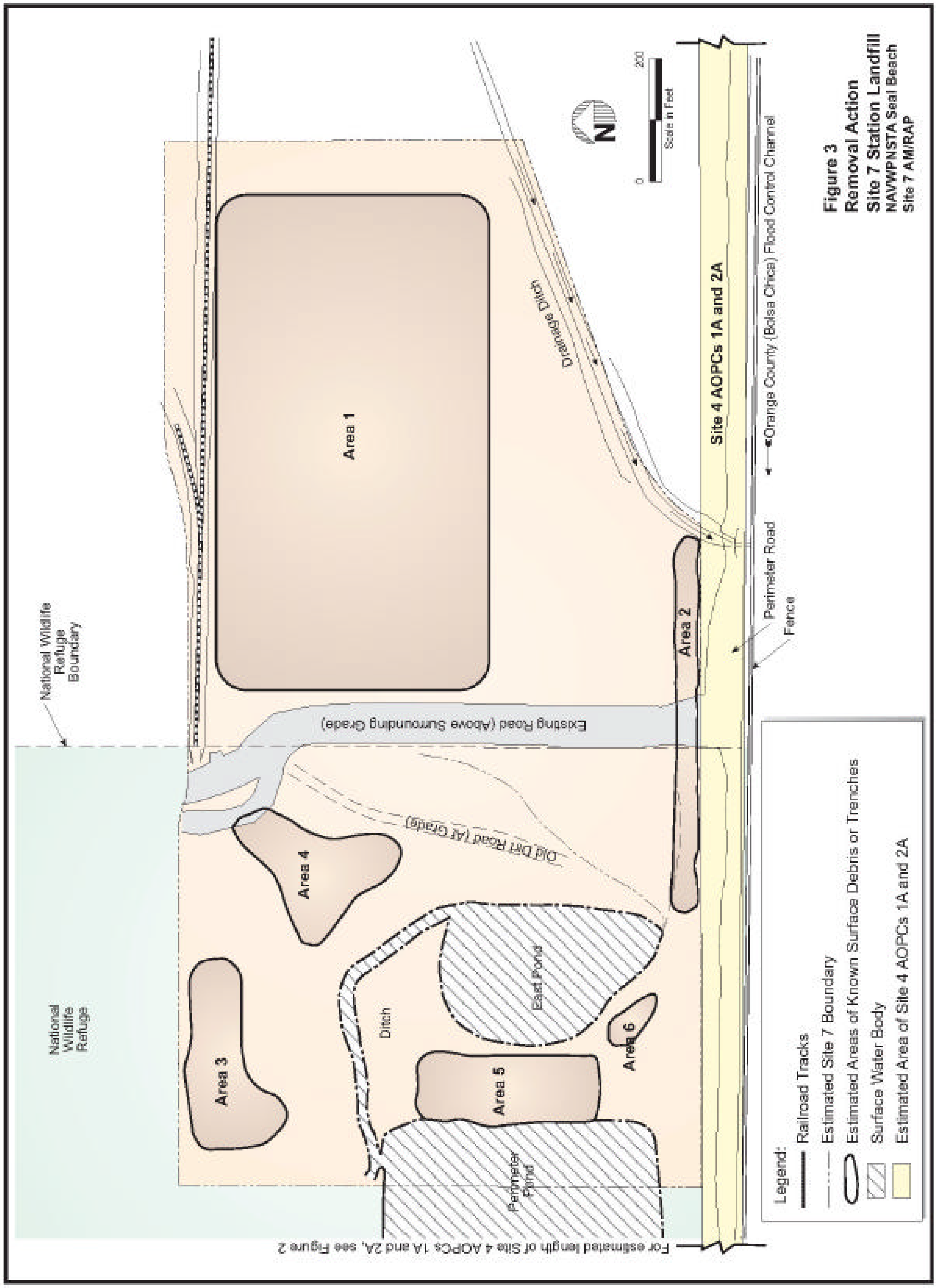

Figure 3
Removal Action
Site 7 Station Landfill
NAVWPNSTA Seal Beach
Site 7 AM/RAP

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Supplemental Characterization Report

The supplemental characterization Study of Perimeter Pond trenches was undertaken in June 1998 to provide a better estimate of the locations, dimensions, and volumes of the trenches that compose Site 7. A combination of land survey, geophysical survey, and exploratory boring and soil sampling was used to characterize the existence of buried waste. Initial estimates of the in-place waste volumes were made for Areas 1, 2, 5, and 6 (see Figure 3). The findings for Areas 3 and 4 were inconclusive with respect to the existence of a disposal trench(es) (SWDIV, 1999c).

Screening Aquatic ERA

To supplement the ERA Phase II validation study, a screening aquatic ERA was performed in December 1999 that addressed concerns of the presence of areas of discolored sediment adjacent to Perimeter Pond and discharges of water (seeps) from areas of exposed debris (SWDIV, 2000). The nature of the seeps along Perimeter Pond are somewhat dynamic. It is probable that voids in the refuse are filling with sea water during high tides and draining into the pond during falling and low tides. Sediment moving in and out of the seeps, the duration of flooding, and the rates of rise and fall of the tides probably affect the amounts of water moving in and out of the refuse. As part of the screening aquatic ERA, concentrations of chemicals in sediment, water, and mussel tissue collected from or near Perimeter Pond were compared with respective ecological screening values (sediment and water) or with statewide concentrations in mussel tissue in a screening risk assessment. Maximum values of some chemicals in some samples from all media exceeded screening risk levels but not by large amounts. Based on sediment samples collected from 10 locations along the eastern shoreline of Perimeter Pond, low risks to sessile benthic invertebrates caused by silver, dichlorodiphenyl trichloroethane (DDT) and metabolites, and Aroclor 1254 (a PCB) in sediment would occur at two locations: the southeast corner of the pond and an area near the exposed debris at the approximate center of the east shoreline (see Figure 4). (Technically, Aroclor 1254 is a combination of several PCBs.) Aquatic organisms in the immediate vicinity of water seep(s) could be exposed intermittently to elevated concentrations of copper, lead, nickel, and zinc. Ecological risks from sediment and water were detected in localized (small) areas, and risks from contaminated mussels (as a surrogate for invertebrates in general) are similar to those in nearby embayments (Anaheim Bay and Huntington Harbour).

Removal Site Evaluation for IRP Sites 4, 5, and 6

In 2001, an RSE was conducted to evaluate supplemental data obtained during previous site investigations at Sites 4, 5, and 6. It is in this RSE that Site 4 was separated into 12 AOPCs including AOPCs 1A and 2A. The sample locations for Site 4 AOPCs 1A and 2A are shown in Figure 5. The COPCs were identified for soil and groundwater, and the concentrations above the screening criteria were assessed. Fate and transport modeling was performed to check whether COPCs in soil could reach groundwater. An HHRA and an ERA were conducted.

Based on the findings and conclusions for soil at AOPCs 1A and 2A, further evaluation is recommended for lead in soil. Based on the findings and conclusions for groundwater at AOPCs 1A and 2A, groundwater is recommended for further evaluation in the form of confirmatory groundwater monitoring for arsenic, antimony, and hexavalent chromium (BNI, 2001). Groundwater monitoring for Site 4 AOPCs 1A and 2A is included in the Groundwater Monitoring Program at Installation Restoration Sites 4, 5, 6, and 7 (BNI, 2002).

Engineering Evaluation/Cost Analysis

The *Final Engineering Evaluation/Cost Analysis (EE/CA) Non-Time Critical Removal Action for Site 7, Station Landfill, Naval Weapons Station, Seal Beach, Orange County, California* (Attachment A) evaluated four types of NTCRA alternatives. These alternatives included:

- No action
- Capping and long-term monitoring
- Limited repair of existing soil cover and groundwater monitoring
- Excavation and offsite disposal

The four alternatives were evaluated for effectiveness, implementability, and cost. Based on this evaluation, the EE/CA recommends Alternative 3, which includes performing limited repairs to soil cover, removing surficial debris, excavating and disposing waste offsite, and monitoring the groundwater. Subsequent to the approval of the Final EE/CA, an addendum to the EE/CA (Appendix F of Attachment A) was prepared to expand the removal actions of Site 7 to include the adjacent areas of Site 4 AOPCs 1A and 2A. Excavation and offsite disposal of lead-contaminated soil is recommended for Site 4 AOPCs 1A and 2A. Table 1 summarizes the removal action alternatives for Site 7 and Site 4 AOPCs 1A and 2A.

2. Physical Location

As shown in Figure 1, NAVWPNSTA Seal Beach is approximately 26 miles south of the Los Angeles urban center. The Station consists of about 5,000 acres of land along the Pacific Coast within the City of Seal Beach in Orange County, California.

NAVWPNSTA Seal Beach is bordered to the southwest by Anaheim Bay, to the north by Interstate 405, to the east by Bolsa Chica Road, to the west by Seal Beach Boulevard, and southeast by the OCFCC.

The cities that surround NAVWPNSTA Seal Beach include Seal Beach, Los Alamitos, Westminster, and Huntington Beach. The predominant land use in the surrounding area is medium-density residential, commercial, industrial, or recreational development.

Agricultural outleases on NAVWPNSTA Seal Beach total 2,171 acres; consisting of approximately 1,385 acres of irrigable farm area; 760 acres of dry land farm area; and 26 acres of maintenance and storage area. Approximately 1,000 acres of NAVWPNSTA Seal Beach have been designated the Seal Beach NWR. The NWR consists of an approximately 800-acre tidal saltmarsh and 200 upland acres.
Five species, each listed as endangered by either federal or state agencies, are known to inhabit NAVWPNSTA Seal Beach, the NWR, and its associated wetlands (NEESA, 1985).

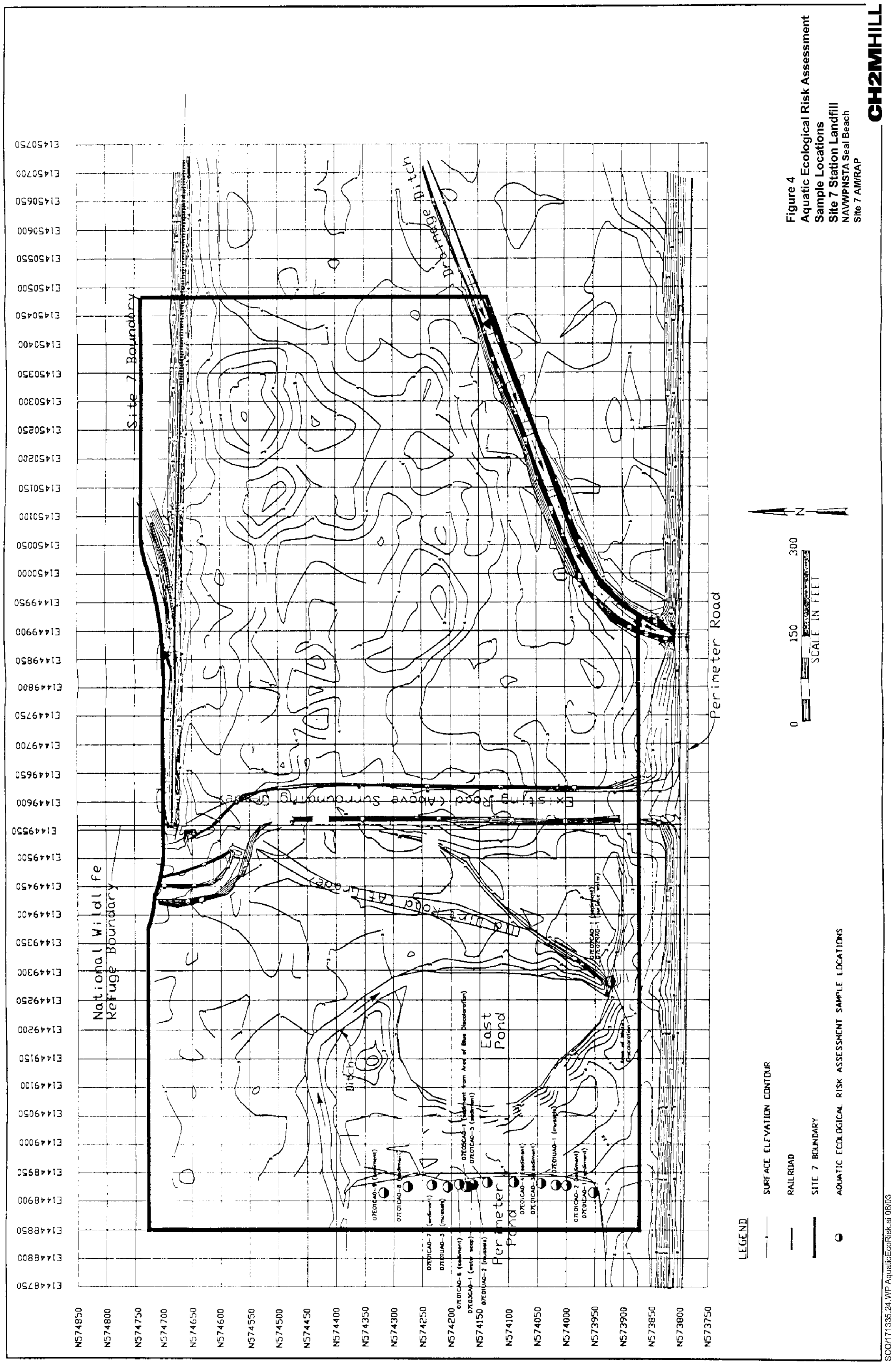

Figure 4
Aquatic Ecological Risk Assessment
Sample Locations
Site 7 Station Landfill
NAVWPNSTA Seal Beach
Site 7 AM/RAP

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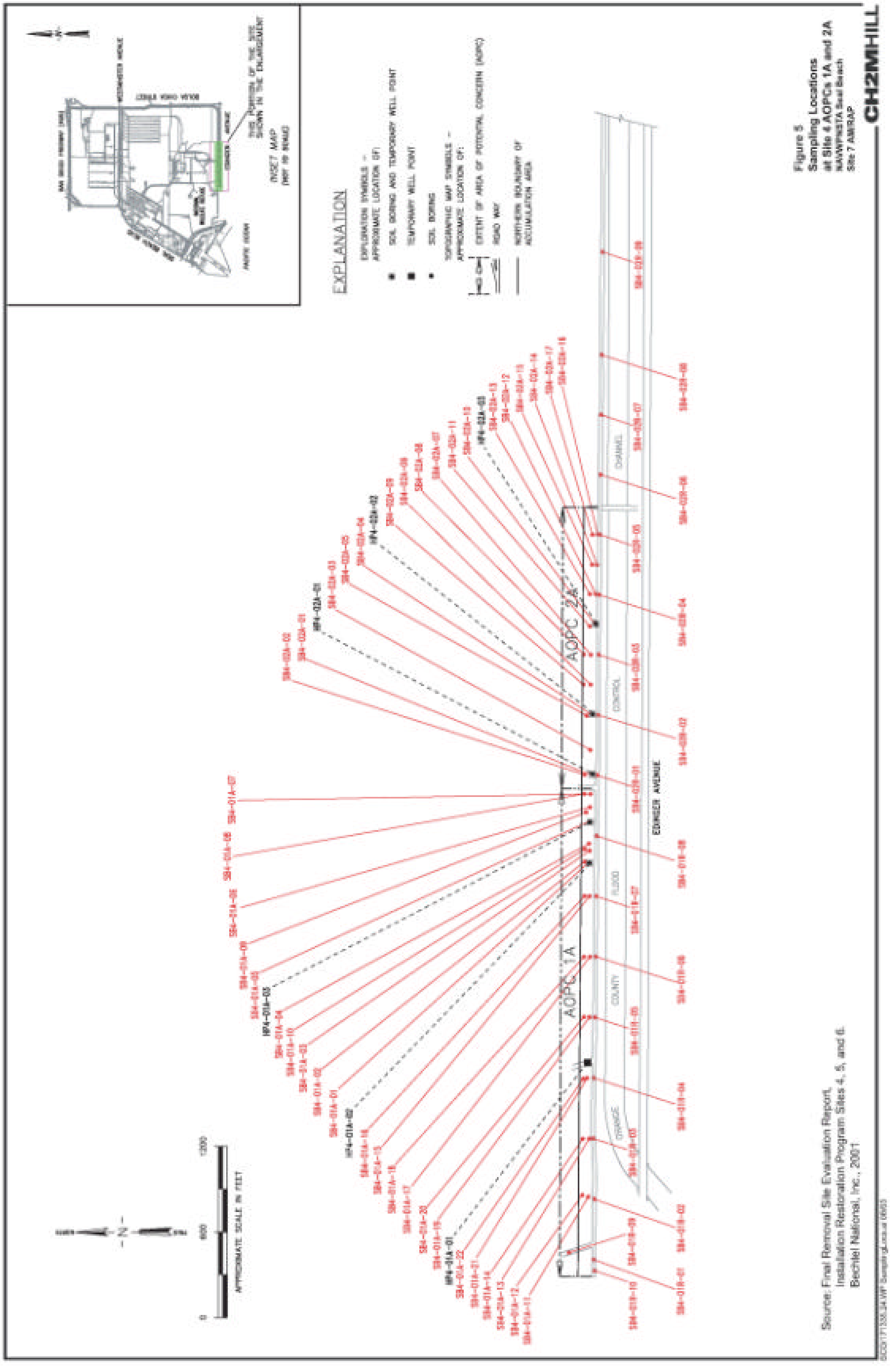

Figure 5
Sampling Locations
at Site 4 AOPCs 1A and 2A
NAVWPNSTA Seal Beach
Site 7 AM/RAP

Source: Final Removal Site Evaluation Report, Installation Restoration Program Sites 4, 5, and 6. Bechtel National, Inc., 2001

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TABLE 1
Removal Action Alternatives for Areas Within Site 7 and Site 4 AOPCs 1A and 2A
NAVWPNSTA Seal Beach, Site 7 (Station) Landfill AM/RAP

		REMOVAL ACTION ALTERNATIVES [b]			
Area Description	**Estimated Volume of Waste Material (Cubic Yards) [a]**	**Alternative 1: No Action**	**Alternative 2: Capping**	**Alternative 3: Existing Soil Cover Repair and Monitoring**	**Alternative 4: Excavation and Offsite Disposal**
Area 1 Landfill Area	34,032 cy (Buried)	No Action	Capping and Long-term Maintenance/ Monitoring	Limited Repair of Existing Soil Cover and Groundwater Monitoring	Excavation and Offsite Disposal
Area 2 Southern Perimeter Trench	3,660 cy (Buried)	No Action	Groundwater Monitoring	Groundwater Monitoring	Excavation and Offsite Disposal
Area 3	Surface Debris	No Action	Surface Debris Removal	Surface Debris Removal	Surface Debris Removal
Area 4	Surface Debris	No Action	Surface Debris Removal	Surface Debris Removal	Surface Debris Removal
Area 5 Perimeter Pond Trench	1,068 cy (Buried)	No Action	Excavation and Offsite Disposal	Excavation and Offsite Disposal	Excavation and Offsite Disposal
Area 6	Surface Debris	No Action	Surface Debris Removal	Surface Debris Removal	Surface Debris Removal
Site 4 AOPCs 1A and 2A	1,200 to 5,000 cy (Surface)	No Action	Excavation and Offsite Disposal	Excavation and Offsite Disposal	Excavation and Offsite Disposal

Notes:

[a] In-place waste volumes were obtained from the *Supplemental Characterization Report Installation Restoration Site 7* (SWDIV, 1999c) except for Site 4 AOPCs 1A and 2A which were obtained from Appendix F of the EE/CA (Attachment A).

[b] The heading of each alternative is a general descriptor for the alternative and does not imply the explicit removal action.

cy cubic yards

NAVWPNSTA Seal Beach is located along the Southern California coast. The climate of the Southern California coast is characterized as marine influenced. The climate is mild and stable because of the relatively warm water of the Pacific Ocean. The proximity of the ocean keeps the humidity high compared with that of the rest of the Los Angeles Basin. Based on surface temperatures recorded at the Long Beach Airport since 1878, the average winter (October through March) temperature in this region is 59 degrees Fahrenheit (°F) and summer temperature averages 68°F. Prevailing winds are from the west (averaging 3.8 miles per hour), but occasionally strong, dry, winds blow from the mountains to the ocean. These winds, known as the Santa Ana winds, occur in the fall, winter, and early spring. The average annual precipitation in the area is approximately 12.5 inches, with over 90 percent occurring between the months of November and April (Western Regional Climate Center, 2003).

Site 7 Station Landfill is a 33-acre waste disposal site situated at the southern boundary of NAVWPNSTA Seal Beach adjacent to Perimeter Road and the OCFCC. The site is within Sections 17 and 18 of Township 5 South, Range 11 West, of the San Bernardino Meridian. The longitude and latitude of Site 7 are 118°03′ west and 33°44′ north, respectively. A portion of Site 7 is located within the NWR (Figure 2). The NWR was established to preserve one of the largest remaining salt marshes in Southern California. It provides essential habitat for the California least tern and light-footed clapper rail and maintains quality habitat for the California brown pelican, peregrine falcon, and Belding's Savannah sparrow.

Site 7 is bounded on the north by a railroad spur and oval laydown area, and on the south by a drainage ditch and Perimeter Road. The eastern boundary is not delineated but appears in aerial photographs (from previous investigations) to extend to the southern projection of the marshalling yard. The western boundary cuts north-south along the eastern shoreline of Perimeter Road at the southeast corner of the NWR. Perimeter Road forms the southern boundary of Site 7.

Site 4 AOPCs 1A and 2A extend northward about 100 feet from Perimeter Road (Figure 5). Because Site 4 AOPCs 1A and 2A are adjacent to Site 7, the sensitive ecosystem and overall topography at Site 4 is similar to that of Site 7.

3. Site Characteristics

Site 7 and Site 4 AOPCs 1A and 2A are located within NAVWPNSTA Seal Beach on property owned and operated by the DON. Currently, no disposal activity occurs at the sites, and to date, no previous removal actions have been implemented at the sites. No regular NAVWPSTA Seal Beach activities take place at the removal action areas, except intermittent use of Perimeter Road by security military personnel or occasional access to the NWR. There are no buildings or structures present. The current and future uses of the land are open space and occupation by the NWR. NWRs are established by Congress and are considered permanent entities.

Site 7 is underlain by predominantly clay and fine-grained silty clay soil to about 25 to 30 feet bgs. The clay and silty clay are underlain by lenses of silty sand. A 2- to 5-foot-thick bed of fine-grained silt, interbedded in the upper clay interval between 10 to 15 bgs appears across most of the site (SWDIV, 1995b).

Information to identify known areas of debris associated with past landfill operations at Site 7 were obtained during the previous investigations. Site 4 AOPCs 1A and 2A are directly south and adjacent to Site 7. Because of the proximity to Site 7, Site 4 AOPCs 1A and 2A are considered extensions of Site 7. Locations of these areas were identified and designated as Areas 1 through 6 for Site 7 and Site 4 AOPCs 1A and 2A (see Figure 3). A brief summary of each area follows.

Area 1: This area lies in the northeast portion of the site. It covers approximately 8 acres. Most of the waste disposal and landfilling activities took place in Area 1 in a series of unlined trenches situated in an east-west orientation. Reportedly, the trenches were excavated to a depth of 10 feet bgs and filled with debris (NEESA, 1985). However, exploration during a supplemental characterization investigation indicated the debris burial depths vary between 5.5 and 9 feet bgs with an average depth of 6.4 feet bgs. Types of debris observed during exploratory drilling included diapers, clothing, wire, and rubber (SWDIV, 1999c).

Area 2: This area lies along the southern boundary of the site adjacent to Perimeter Road. It is probably a single, contiguous trench approximately 600 feet long by 40 feet wide (about 0.6-acre). The depths of debris range from 6 to 10 feet bgs with an average depth of 7.5 feet bgs. During exploratory drilling, building materials such as wood, metal, and concrete were observed (SWDIV, 1999c).

Area 3: This area lies in the northwest portion of Site 7. It is an irregularly shaped area that is approximately 1 acre. Site visits to Area 3 reveal surficial scattered rusted metal debris. This surficial metal debris accounts for the geophysical anomalies detected in this area during the presampling activities of the RI (SWDIV, 1995b).

Area 4: This area lies in the northwest portion of Site 7 southeast of Area 3. It is similar to Area 3 in that it is also an irregularly shaped area littered with surficial rusted metal debris and is approximately 1 acre.

Area 5: This area forms the eastern shoreline of Perimeter Pond and lies between Perimeter Pond and East Pond (see Figure 3). Two north-south oriented trenches are in this area, with a portion of the western trench exposed to Perimeter Pond. Exposed debris observed includes materials such as concrete, metal banding, and lumber. Area 5 covers about 0.7-acre and has an average debris depth of 7 feet (SWDIV, 1999c).

Area 6: This area lies to the southeast of Area 5 and is similar to Areas 3 and 4 in that the debris found in this area appears to be surficial only. Area 6 lies along an unpaved access road between Perimeter Road and the eastern shore of Perimeter Pond. The debris, mostly pieces of lumber, appears to be debris that had fallen off vehicles during the removal of portions of the exposed trench at Area 5. Area 6 is irregular in shape and occupies about 0.1-acre.

Site 4 AOPCs 1A and 2A: Based on soil borings collected for the RSE, there is indication of possible fill materials beneath portions of Site 4 AOPCs 1A and 2A.

Site 4 AOPCs 1A and 2A are located adjacent and south of Site 7. They are adjacent to each other and consist of a relatively narrow area approximately 5,400 feet long by

100 feet wide of unpaved shoulder adjacent to both Perimeter Road and Site 7 Station Landfill (see Figure 5). Site 4 AOPCs 1A and 2A were identified as containing several potential locations where elevated lead due to dust control activities was detected. Unknown quantities of waste oil were sprayed over the perimeter roads for dust control; an estimated 40,000 gallons of waste oil was applied over a 1-year period on 12 miles of road (NEESA, 1985; SWDIV, 1990b). Information from previous investigations indicates that elevated lead concentrations were detected to a depth of at least 2.5 feet (SWDIV, 1990b; BNI, 2001).

4. Release or Threatened Release to the Environment of a Hazardous Substance, Pollutant, or Contaminant

Site 7 – Station Landfill

Chemical analyses of soil samples at Site 7 detected remnants of past waste disposal operations, including low levels of volatile organic compounds (VOCs), SVOCs, PCBs, pesticides, and cyanide with no consistent pattern. Metals were detected but generally within background levels. The metals include copper, nickel, lead, and zinc. The chemicals are pollutants or contaminants as defined by Section 101(33) of CERCLA. Also, results of sampling indicate that there is no significant migration of landfill gas.

Aero Vironment, Inc. conducted the landfill assessment for Site 7 Station Landfill in 1993. Detailed descriptions of the assessment are provided in *Ambient Air and Integrated Surface Sampling at Sites 7 and 19 for Seal Beach Naval Weapon Station* (Aero Vironment, Inc., 1993a) and *Soil Gas Sampling at Sites 7 and 19 for Seal Beach Weapon Station* (Aero Vironment, Inc., 1993b).

Shallow groundwater shows low levels and infrequent detections of COPCs including VOCs, SVOCs, pesticides, metals, asbestos, and cyanide. Results of the 10 rounds of shallow groundwater sampling do not indicate a plume of significant contamination. At Site 7, shallow groundwater was encountered between 3 and 5 feet bgs. The underlying shallow groundwater is saline to hypersaline (total dissolved solids [TDS] ranging between 24,000 and 57,000 milligrams per liter [mg/L]) and reasonably cannot be regarded as a potential drinking water source. A connection between the shallow groundwater and the lower aquifer system (a deeper source of main drinking water) appears to be unlikely.

The lack of a verifiable groundwater plume and of significant gas emissions at the Station Landfill site suggests that natural attenuation processes have been taking place actively over the last 25 to 50 years since the conclusion of landfilling operations. For example, the wastes were buried in clays and silty clays, which would tend to immobilize the metals, polycyclic aromatic hydrocarbons (PAHs), pesticides, and PCBs. Most VOCs are expected to have volatilized into the atmosphere or dissolved into rainwater and infiltrated to the groundwater. Over the course of 25 to 50 years, the effects of advective transport and dispersion on soluble compounds significantly would reduce their concentrations in soil and groundwater. Historic, seasonal, and tidal fluctuations of groundwater levels at Site 7 can enhance passive aerobic biodegradation because the subsurface soil matrix is alternately saturated and unsaturated. In particular, the lack of gas emissions seems to indicate that organic matter in the landfill has entered the final phases of degradation.

As shown by the 10 major studies that have been conducted at Site 7 since 1985, the exposed debris along the eastern shoreline of Perimeter Pond (Area 5) appears to be the only area of moderate concern. The concern at Area 5 involves the possible risks to aquatic ecological receptors due to the exposure of waste and tidal water seeps discharging from refuse buried along the east shoreline of the Perimeter Pond.

Of the 10 studies, four risk assessments have been performed on Site 7 evaluating the impacts to human health and ecology. These assessments include:

- Baseline HHRA conducted as part of the RI (SWDIV, 1995a)
- Preliminary ERA conducted as part of the RI (SWDIV, 1995a)
- Phase II ERA validation study to assess risks to terrestrial ecological receptors (SWDIV, 1999a)
- Screening Aquatic ERA to assess risks to aquatic receptors in Perimeter Pond (SWDIV, 2000)

Based on the baseline HHRA, only PCBs were detected at concentrations to qualify as a COPC from a human health standpoint. PCBs were detected at a maximum concentration of 0.435-mg/kg in soils. The HHRA determined that this level corresponds to an estimated excess lifetime cancer risk of 6×10^{-6}, which is within the range of concern that can be addressed through risk management decisions (SWDIV, 1995a).

The preliminary ERA identified DDT and its metabolites (dichlorodiphenyl dichloroethane [DDD] and dichlorodiphenyl dichloroethene [DDE]) as ecological COPCs in sediments. However, the DDT and its metabolites are likely to be regional contaminants dispersed by agricultural activities in the Los Angeles area (SWDIV, 1995a). Therefore, no significant ecological risks were identified.

The Phase II ERA validation study was a site-specific ERA conducted in conformance with the DTSC 1996 guidance (DTSC, 1996). Based on the analytical results collected from collocated soil, plants, invertebrates, and small mammals, site-specific ePRGs were developed. The developed ePRGs were near or above site maximum concentrations, so the proposed values did not alter the preliminary conclusion of the ERA for no further action at the site as recommended by the RI.

The screening aquatic ERA identified possible low risks to sessile benthic invertebrates caused by concentrations of several chemicals (silver, DDT and metabolites, and Aroclor 1254) in sediment that exceed screening risk levels. Based on the 10 locations sampled in Area 5 on the eastern shoreline of Perimeter Pond, those risks would occur at 2 locations: the southeast corner of the pond and an area near the exposed debris at the approximate center of the east shoreline. Aquatic organisms in the immediate vicinity of a water seep (or other seeps, if they occur) could be exposed intermittently to elevated concentrations of copper, lead, nickel, and zinc. Risks from such exposure would be limited to a small area because the seep would be diluted rapidly upon entering the pond. No adverse effects levels (NOAELs) for pesticides in birds were exceeded by concentrations of the pesticides in mussel tissue, which the birds consume in large amounts as food from the area.

However, that risk may be regional as higher concentrations of the same pesticides are found in mussels from Anaheim Bay and Huntington Harbour.

The primary receptors that are most likely to be impacted by Site 7 under existing conditions are species inhabiting the water column and residing in or on the sediment located along the eastern shoreline of Perimeter Pond (Area 5). Aquatic ecological receptors at Site 7 include crustaceans, echinoderms, mollusks, nematodes, polychaetes, and various fishes (Bradley, 2001). A list of species potentially inhabiting Perimeter Pond is in the *Final EE/CA for Operable Unit 2, Site 7, Station Landfill* (see Attachment A).

Another possible, though less likely, exposure pathway for chemicals from wastes at Site 7 to impact the environment is through groundwater. Results of the Groundwater Monitoring Study indicated that the groundwater monitoring conditions at Site 7 are complex. Surface water features at or adjacent to the site (i.e., NWR tidal salt marsh, Port of Long Beach mitigation ponds, Orange County Flood Control Channel (OCFCC), drainage ditch, and seasonal ponding due to rainfall) affect the shallow groundwater flow conditions. Site 7 groundwater is affected not only by Anaheim Bay tidal fluctuations but also by the influence that rainfall and tidal fluctuations exert on these hydrologic features. Groundwater generally appears to flow away from the NWR (easterly direction) during periods with no rainfall (dry season) and flows generally towards the NWR (southwesterly direction) during periods of significant rainfall (wet season). The interaction among the hydrologic features at or adjacent to Site 7 determines the exact direction of groundwater flow (SWDIV, 1999b).

Human exposure to buried contaminants at Site 7 may occur if there were future disturbance of the existing soil cover. Otherwise, human exposure to Site 7 (especially the areas within the Seal Beach NWR) would be limited. Because wildlife refuges are established to protect wildlife, human presence on refuges usually is limited to United States Fish and Wildlife Service (USFWS) personnel, scientists from academic institutions, and brief visits by the general public.

Site 4 AOPCs 1A and 2A – Oil on Roads

Figure 5 shows the locations that were sampled for the Site 4 AOPCs 1A and 2A RSE investigation. Soil samples were collected and analyzed to characterize and delineate the lateral and vertical extent of the COPCs. Eight soil borings were hand-augered at each AOPC to depths from 0 to 1 foot bgs and 2 to 2.5 feet bgs. Step-out soil samples were collected as necessary to define the lateral and vertical extent of COPCs. Three groundwater samples were analyzed for the COPCs from AOPCs 1A and 2A. Soil samples were analyzed for the target analyte list (TAL) metals, PAHs, PCBs, and PCDDs/PCDFs. The groundwater samples and some soil samples also were analyzed for hexavalent chromium.

At Site 4 AOPCs 1A and 2A, shallow groundwater is estimated to range from less than 1 foot to 3 feet bgs. The specific depth to groundwater depends on a number of fluctuating conditions such as tides, seasons, and specific location within Site 4 AOPCs 1A and 2A. The underlying shallow groundwater is saline to hypersaline (TDS ranging from 29,600 to 57,800 mg/L) and cannot reasonably be regarded as a potential drinking water source. A connection between the shallow groundwater and the lower aquifer system (deeper source of main drinking water) appears to be unlikely as presented in the site discussion above (BNI, 2001). Two risk assessments have been performed using data collected from Site 4 AOPCs 1A and 2A, including:

- Human health and ecological risk assessments as part of the RSE (BNI, 2001)
- Proposed site-specific target cleanup goal for lead assessment (CH2M HILL, 2003)

In the RSE for AOPC 1A, several metals were reported at concentrations above statistical background in soil adjacent to the road. Elevated PCDD / PCDF concentrations were reported in soil adjacent to the road. No human health risk assessment was performed for AOPC 1A because it is located within the NWR. Also, there would not be any development on AOPC 1A due to its proximity to the Station Landfill and its location within the explosive arc at NAVWPNSTA Seal Beach.

Further evaluation was recommended for AOPC 1A for soil and confirmatory groundwater monitoring for antimony and hexavalent chromium. The ERA in the RSE suggested that the concentrations of the COPCs in soil were not ecologically significant when compared to background conditions and the range of toxicity reference values (TRVs). However, DTSC would not concur with the NFA for the soil due to the presence of elevated lead concentrations at a few locations. Groundwater chemical concentrations are not expected to adversely affect marine life, so only confirmatory monitoring was recommended.

In the RSE for AOPC 2A, metals, PCDD / PCDF, and Aroclor 1254 concentrations were reported in soil adjacent to the road. A human health risk assessment was performed for AOPC 2A. The incremental cancer risk was estimated at 3.7×10^{-5}, which is within the NCP generally acceptable range of 10^{-6} to 10^{-4} for risk management. The systemic toxicity was evaluated to be unlikely due to a hazard index (HI) less than 1.0. There are potential adverse health effects from exposure to lead; however, this is not of a concern since residential use of AOPC 2A is unlikely due to its proximity to the Station Landfill and the NWR, and its location within the explosive arc at NAVWPNSTA Seal Beach. Additionally, human presence usually is limited to brief visits by USFWS personnel and Navy security personnel due to its location next to the NWR.

Further evaluation was recommended for AOPC 2A for soil and confirmatory groundwater monitoring for antimony, arsenic, and hexavalent chromium. The ERA in the RSE suggested that the PCDD / PCDF concentrations in soil were of minor ecological significance and the COPC concentrations in soil were not ecologically significant when compared to background conditions and the range of TRVs. However, DTSC would not concur with the NFA for the soil due to the presence of elevated lead concentrations at a few locations. Groundwater chemical concentrations are not expected to adversely affect marine life, so only confirmatory monitoring was recommended.

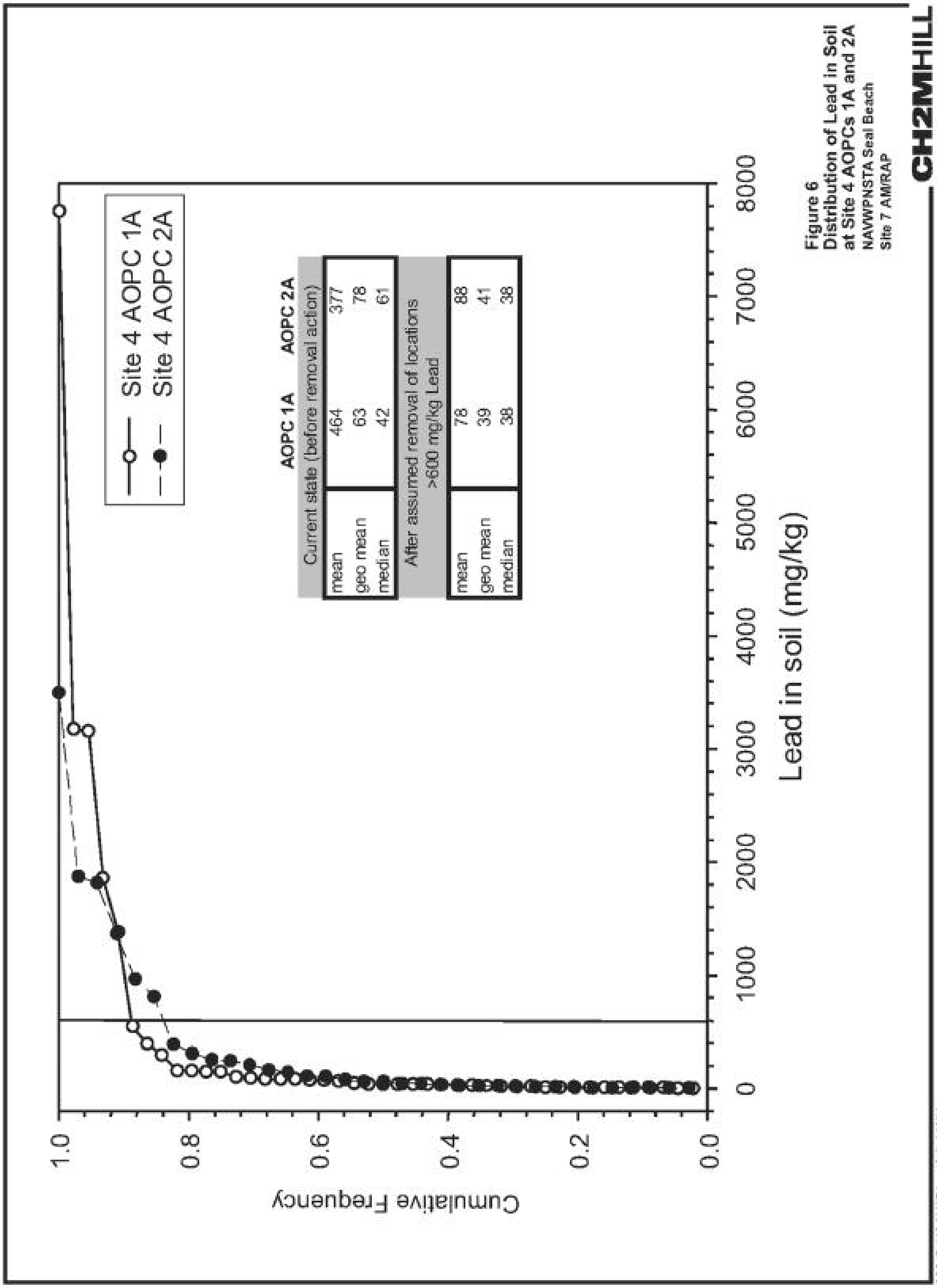
A specific ecological assessment for lead was performed to determine the site-specific target cleanup goal (TCG) for Site 4 AOPCs 1A and 2A. The range of lowest observed adverse effects level (LOAEL)-equivalent soil concentrations was compared to the full distribution of lead measured in soils at Site 4 AOPCs 1A and 2A (Figure 6). Evaluation of the distribution of lead concentrations in Site 4 AOPCs 1A and 2A indicates that the data are highly skewed and dominated by relatively few samples with high concentrations (i.e., hot spots). These hot spots were identified in a narrow strip along Perimeter Road with lead concentrations that ranged from about 900 mg/kg to over 7,500 mg/kg in soils. Despite these high concentrations, these values represent only 11 of 64 samples collected from these two AOPCs combined. Moreover, the median lead concentrations were 42 and 61 mg/kg for Site 4 AOPCs 1A and 2A, respectively (Figure 6) indicating that the hot spots concentrations were heavily influencing the mean concentration. Based on a visual evaluation of the observed lead distribution in Site 4 AOPCs 1A and 2A and in light of the calculated LOAEL-equivalent soil concentrations, a site-specific TCG of 600 mg/kg for lead is proposed. This is in addition to an areawide arithmetic average TCG of less than 100 mg/kg for lead in both Site 4 AOPCs 1A and 2A. This level represents a clear break point in the distribution of lead concentrations at the two AOPCs (Figure 6) and represents a concentration that would eliminate the majority of risk to wildlife receptors.

There are no documented impacts due to exposure to chemicals in soil at Site 4 AOPCs 1A and 2A. The primary receptors that are most likely to be impacted by Site 4 AOPCs 1A and 2A under existing conditions are ecological receptors that nest in Site 7, which is located directly north of Site 4 AOPCs 1A and 2A.

Site 4 AOPCs 1A and 2A have vegetative and wildlife receptors. If Site 4 COPCs have migrated to the adjacent habitat, potentially complete pathways are present for exposure of representative organisms to COPCs in the soil in the cropland, non-native grassland, southern willow scrub, and coastal salt marsh (BNI, 2001).

Another possible exposure pathway, though less likely, for chemicals from Site 4 AOPCs 1A and 2A to impact the environment is through groundwater. Groundwater appears to flow predominantly away from the NWR and the coast towards the north and northeast (SWDIV, 1995a). However, during periods of significant rainfall (wet weather conditions), the groundwater at Site 4 may flow towards the NWR. The exact direction of the groundwater flow is determined by the interaction among hydrologic features at or adjacent to Site 4, including the NWR tidal marsh and the OCFCC (SWDIV, 1999b).

Human exposure to Site 4 AOPCs 1A and 2A (especially the areas within the Seal Beach NWR) would be limited. Because wildlife refuges are established to protect wildlife, human presence usually is limited to brief visits by USFWS personnel and Navy security personnel. Additionally, there would not be any development on Site 4 AOPCs 1A and 2A due to its location adjacent to Station Landfill, proximity to the NWR, and its location within the explosive arc at NAVWPNSTA Seal Beach.



	AOPC 1A	AOPC 2A
Current state (before removal action)		
mean	464	377
geo mean	63	78
median	42	61
After assumed removal of locations >600 mg/kg Lead		
mean	78	88
geo mean	39	41
median	38	38

Figure 6
Distribution of Lead in Soil at Site 4 AOPCs 1A and 2A
NAVWPNSTA Seal Beach
Site 7 AM/RAP

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5. National Priorities List Status

The National Priorities List (NPL) is a list developed by EPA of hazardous waste sites nationwide that pose the greatest risks to public health and, thus, warrant priority responses under CERCLA. NAVWPNSTA Seal Beach is not on the NPL, nor is it proposed to be added to the NPL. Site 7 and Site 4 AOPCs 1A and 2A are included in the DoD IR Program at NAVWPNSTA Seal Beach and was investigated along with other NAVWPNST Seal Beach sites in accordance with CERCLA and other relevant state, federal, or local regulations. The IR Program forms the basis for investigation and cleanup of DoD installations. It is designed to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills.

The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for NAVWPNSTA Seal Beach is CA0170024491.

6. Maps, Pictures, and Other Graphic Representations

This AM/RAP includes:

- Figure 1, Location and Vicinity Map
- Figure 2, Site Location
- Figure 3, Disposal Areas
- Figure 4, Aquatic ERA Sample Locations
- Figure 5, Sampling Locations at Site 4 AOPCs 1A and 2A
- Figure 6, Distribution of Lead in Soil at Site 4 AOPCs 1A and 2A

B. Other Actions to Date

1. Previous Actions

Previous actions taken at the removal action areas were presented in Section II.A.1.

2. Current Actions

No actions currently are being conducted at the removal action areas.

C. State and Local Authority Roles

1. State and Local Actions to Date

Federal EO 12580 delegates to the DoD, the President's authority to undertake CERCLA response actions. Congress further outlined this authority in its Defense Environmental Restoration Program (DERP) Amendments, which can be found at 10 U.S.C. §2701-2705. Both CERCLA §120(f) and 10 U.S.C. §2705 require DON facilities to ensure that state and local officials be given the timely opportunity to review and comment on DON response actions. CERCLA §120 further requires the DON to apply state removal and remedial action law requirements at its non-NPL facilities.

Accordingly, the California Environmental Protection Agency, DTSC, and the California RWQCB Santa Ana Region have provided technical advice and oversight during the IAS, SI, RI, and removal phases of the IR Program. The DTSC will be preparing a California Environmental Quality Act document that will state the Site 7 NTCRA impact on the environment. Preparation of this document will include a 30-day public comment period to satisfy the requirements as set forth in the California Health and Safety Code (HSC) for remedial action plans.

The DON, with state regulatory oversight, is the lead agency for the removal action. As such, DON has final approval authority over the recommended alternative and all public participation activities with state concurrence. SWDIV is the regional manager of the DON IR Program and, therefore, is providing technical expertise to NAVWPNSTA Seal Beach to conduct activities specific to the execution of the recommended alternative.

As the lead federal agency, the DON has initiated the following local community relations activities at NAVWPNSTA Seal Beach.

- Public meetings and technical workshops
- Development of a restoration advisory board
- Preparation of fact sheets and brochures describing the IR process
- Maintenance of information repositories accessible to the public

To gain a more thorough understanding of the activities associated with this removal action, the public is encouraged to review documents contained in the information repositories, which are located at NAVWPNSTA Seal Beach, Building 110, and at the Seal Beach Public Library, Mary Wilson Branch, 707 Electric Avenue, Seal Beach, California 90740, (562) 431-3584. The library hours of operation (as of April 2002) are:

Monday and Tuesday – 12 p.m. to 8 p.m.
Wednesday and Thursday – 10 a.m. to 6 p.m.
Saturday – 10 a.m. to 5 p.m.
Friday and Sunday – closed

The complete Administrative Record is located at 1220 Pacific Highway, San Diego, California, and is maintained by Ms. Diane Silva, Southwest Division Naval Facilities Engineering Command Administrative Record Coordinator, (619) 532-3676. Attachment B contains a portion of the Administrative Record Index and lists documents relevant to Site 7 and Site 4 AOPCs 1A and 2A.

Public notices to inform the public of removal action documents available for review and a fact sheet that describes the proposed removal action are included as Attachment C.

2. Potential for Continued State and Local Response

DTSC and RWQCB Santa Ana Region currently provide technical oversight to the IR Program, participate at monthly program management meetings for NAVWPNSTA Seal Beach, and review documents produced under the IR Program for this removal action. It is anticipated that technical oversight will continue throughout the IR process and that the DON DERP account funds will continue to be the exclusive source of funding for this program.

III. Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities

In accordance with the 1990 NCP, the following threats must be considered in determining the appropriateness of a removal action (40 CFR §300.415[b][2]):

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- Hazardous substances, pollutants, or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release
- High levels of hazardous substances, pollutants, or contaminants in soils largely at or near the surface that may migrate
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or to be released
- Threat of fire or explosion
- Availability of other appropriate federal or state response mechanisms to respond to the release
- Other situations or factors that may pose threats to public health or welfare or the environment

A. Threats to Public Health or Welfare

None of the above threats apply to the conditions at the removal action areas for public health or welfare. There are no documented impacts due to exposure to chemicals in soil, groundwater, or sediment at Site 7 or at Site 4 AOPCs 1A and 2A. The primary receptors that are most likely to be impacted by existing conditions at Site 7 and Site 4 AOPCs 1A and 2A are aquatic and marine life inhabiting the water column and residing in or on the sediment located along the eastern shoreline of Perimeter Pond and ecological receptors that nest nearby.

B. Threats to the Environment

Two of the above-listed threats apply to conditions at the removal action areas for the environment.

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems

Potential biotic exposure to actual and potential releases of silver, DDT, DDD, and Aroclor 1254 in sediment, and copper, lead, and zinc in water were identified in the screening aquatic ERA. The RSE ERA recommended further evaluation for lead in soil for Site 4 AOPCs 1A and 2A (SWDIV, 2000).

General effects to ecological receptors are described below. A more detailed discussion is presented in the *Final Engineering Evaluation/Cost Analysis, Non-Time Critical Removal Action for Site 7, Station Landfill, Naval Weapons Station, Seal Beach, Orange County, California* (Attachment A), Section 2.5, Risk Evaluation.

1. Copper

As with most other heavy metals, copper (Cu) exposure can result in several toxic effects to a wide variety of plant and animal life. Cu exposure may cause reduced biochemical response in microbial communities (e.g., respiration and mineralization) and growth effects in plants. In the aquatic environment, copper toxicity is a function of water pH and hardness. Toxicity to aquatic life is related primarily to the dissolved cupric ion. Copper exposure may produce growth, reproductive, and lethal effects in fish, benthic macroinvertebrates, and amphibians.

Fish and Aquatic Invertebrates (and Benthos). Copper is toxic to many fish and aquatic organisms. The gill is the primary organ for concentration of, and exposure to, copper in aquatic organisms. In general, early life stages are most susceptible to copper toxicity. Toxicity to aquatic life is related primarily to the dissolved cupric ion. The cupric ion is the most readily available and toxic inorganic species of copper in fresh water, seawater, and sediment interstitial waters. In solution, copper interacts with numerous inorganic and organic compounds resulting in altered bioavailability and toxicity (Eisler, 1998a). Copper toxicity is dependent on water hardness, decreasing as hardness increases. Increased temperature has the effect of decreasing the toxicity of copper (Mance, 1990).

Exposure to copper has been shown to affect caddisfly (*Clistoronia magnifica*) life cycles (Nebeker et al., 1984). The no observed effect concentration (NOEC) of copper was 0.0083-mg/L. Exposure to 0.013-mg/L copper resulted in significant reductions in adult emergence. Exposure to 0.017-mg/L and greater resulted in 60 and 40 percent larvae surviving to pupae and swimming pupae, respectively. Furthermore, no adults emerged following exposure to greater than 0.0035-mg/L copper.

In a review of copper hazards to fish, wildlife, and invertebrates, Eisler found that many species of freshwater plants and animals die within 96 hours at concentrations from 5.0 to 9.8 micrograms per liter (µg/L) Cu. Sensitive species of freshwater mollusks, crustaceans, and fishes die at concentrations from 0.23- to 0.91-µg/L Cu. The most sensitive species of marine mollusks, crustaceans, and fishes have an LC50 (96-hour) ranging from 28 to 39 µg/L Cu (Eisler, 1998a). Significant sublethal effects to estuarine algae, mollusks, and arthropods can occur at 1 to 10 µg/L Cu. Toxic effect levels (48- to 96-hour LC50 or EC50) for fresh water range from 10 to 900; 700 to 10,000; and 20 to 2,000 for species of Salmonidae, Centrarchidae, and Cyprinidae, respectively (Rand and Petrocelli, 1985). The acute toxicity data indicate a considerable range of toxic effect values both within and among invertebrate taxa. Crustaceans appear to be most susceptible, with 3-day LC50s of 0.024-mg/L for *Dapnia pulex* and 0.019- to 0.022-mg/L for *Gammarus pseudolimnaeus*. Mollusks are less susceptible, with 4-day LC50s ranging from 0.037- to 2 mg/L depending on the species tested. Four-day LC50s for oligochaetes, rotifers, and chironomid larvae range from 0.1- to 1.7 mg/L (Mance, 1990).

Pipe and Coles (1995) found that the immune systems of marine mussels (*Mytilus* spp.) were compromised following exposure to copper with an increase in the rate of infection to *Vibrio tubiashi*. Copper also has been shown to compromise immune responses in rainbow trout (*Oncorhynchus mykiss*) (Carballo et al., 1995).

In California, the acute ambient water quality values for copper, based on the dissolved fraction, are 13 µg/L at a water hardness of 100 mg/L calcium carbonate ($CaCO_3$) in fresh water and 4.8 µg /L in salt water (65 FR 31682). The chronic criteria are 9 µg/L and 3.1 µg/L, respectively. For screening purposes, the threshold effects level (TEL) for copper in freshwater sediments is 35.7 mg/kg, and the TEL in marine sediments is 18.7 mg/kg (Buchman, 1999).

Bioavailability and Bioaccumulation. Bioavailability of copper in soil can depend on its interactions with other metals such as zinc, iron, cadmium, and chromium (Bodek et al., 1988). Bioavailability and toxicity of copper to aquatic organisms are dependent on the total concentration of copper and its chemical form. Both bioavailability and toxicity are significantly reduced by increases in suspended solids, water hardness, and the presence of natural organic chelators (Eisler, 1998a). Copper is not known to be appreciably bioaccumulated by fish, but some algae and bivalve mollusks do bioconcentrate or bioaccumulate copper by factors of over 1,000 (EPA, 1985a). Bioconcentration factors (BCFs) reported for several marine invertebrate species range from 90 for the mussel (*Mytilus edulis*) in a 14-day study to 3,300 for the clam (*Mya arenaria*) in a 35-day study (Boening, 1998). BCFs in fresh water ranged from 0 in the bluegill (*Lepomis macrochirus*) to 2,000 in algae (Boening, 1998). Polychaete worms had a BCF of 2,550 in salt water. The highest saltwater BCFs were for bivalve mollusks, ranging from 85 to 28,200 (Eisler, 1998a). There is little evidence that copper will biomagnify in food chains (Ontario MOE, 1993; ATSDR, 1990a). Eisler reported that maximum concentrations in tissues of fishes, elasmobranchs, birds, and marine mammals from collection sites are lower when compared to more primitive organisms (Eisler, 1998). It generally is assumed that copper does not significantly biomagnify in food chains (Boening, 1998).

2. Lead

Lead (Pb) can be extremely toxic to a wide variety of organisms. Plants exposed to high concentrations of lead in soils usually exhibit decreases in transpiration rate, weight (e.g., leaves, root, and shoot), and growth (e.g., elongation and biomass). Similarly, lead concentrations in soil can reduce the rate of decomposition by microflora, inhibit soil respiration and other biochemical processes, and reduce the efficiency of nitrogen and carbon mineralization. In general, invertebrates are more sensitive to lead than fish, but the severity of toxicity is species dependent. For terrestrial invertebrates, such as earthworms, significant amounts of lead exposure may cause impairment to cocoon production, reduced reproductive success (e.g., reduced hatches per cocoon or percent hatches), and decreases in overall growth. For aquatic invertebrates and fish, acute and chronic lead toxicity increases as water hardness decreases and can readily cause mortality. The effects of lead on amphibians and reptiles are not well known due to lack of research to date. However, it is believed that elevated body burdens of lead in amphibians and reptiles may result in physiological and reproductive effects. Research with mice in the laboratory has implicated lead as a potential carcinogen and an agent for adverse reproductive effects (e.g., reduced offspring weight) (Eisler, 1988).

Fish and Aquatic Invertebrates. Eisler conducted a review and found that several trends are evident concerning lead toxicity in aquatic organisms (Eisler, 1988):

- Dissolved waterborne Pb was more toxic than total lead Pb
- Organic lead compounds were more toxic than inorganic forms
- Effects were most pronounced at elevated water temperatures and reduced pH after long exposures
- Younger life stages had more pronounced effects

Within invertebrates, crustaceans appear to be the most sensitive to lead (Mance, 1990). The LC50/EC50 for various lead compounds to *Daphnia magna* ranged from 450 to 1,910 parts per million (ppm) and increased with water hardness (EPA, 1980a). Reproductive impairment in daphnids was significant with exposure to 10 parts per billion (ppb) lead (Eisler, 1988). Rotifers exposed to lead chloride in relatively soft water had an LC50/EC50 value of 40,800 ppb (EPA, 1980a). Snails exhibit significant mortality rates when exposed to lead at 19 ppb over their lifetime (Eisler, 1988).

Chronic lead exposure to fishes can lead to spinal curvature, anemia, darkening of the tail, caudal fin degeneration, reduced swimming ability, enzyme inhibition in various organs, muscular atrophy, paralysis, reduced growth, delay in maturation, and death (Eisler, 1988). One sign of acute toxicity in fishes is increased mucous formation. The excess coagulates over the entire body, particularly the gills, and can result in death from suffocation (Aronson, 1971; NRCC, 1973). Rand and Petrocelli found that toxic effect levels (48- to 96-hour LC50 or EC50) ranged from 1,000 to 500,000; 20,000 to 400,000; and 2,000 to 500,000 ppb for species of Salmonidae, Centrarchidae, and Cyprinidae, respectively (Rand and Petrocelli, 1985). An LC50 value of 40 mg/L lead was reported for a 96-hour static toxicity test with goldfish (*Carassius auratus*) (Bolognani et al., 1992). LC50 values for rainbow trout (*Oncorhynchus mykiss*) exposed to lead under the static conditions were 471 and 542 mg/L (total) and 1.47 and 1.32 mg/L (dissolved), while the LC50 under flow-through conditions was only 1.17 mg/L (Goettl and Davies, 1976).

In California, the acute ambient water quality values for lead, based on the dissolved fraction, are 65 µg/L at a water hardness of 100 mg/L $CaCO_3$ in fresh water and 210 µg/L in salt water (65 *Federal Register* [FR] 31682). The chronic criteria are 2.5 µg/L and 8.1 µg/L, respectively. For screening purposes, the TEL for lead in freshwater sediments is 35.0 mg/kg, and the TEL in marine sediments is 30.2 mg/kg (Buchman, 1999). The probable effects levels (PELs) are 91.3 mg/kg and 112.2 mg/kg for freshwater and marine sediments, respectively. The acute and chronic national ambient water quality (NAWQ) criteria for lead are 0.082- and 0.0032-mg/L at a hardness of 100 mg/L $CaCO_3$ (EPA, 1985b).

Bioavailability and Bioaccumulation. Due to strong absorption of lead to soil organic matter, the bioavailability of the lead is limited. Organic compounds of lead are more bioavailable than inorganic lead. Compared to lead carbonate, lead sulfate is relatively soluble and likely to be more bioavailable.

Lead can be bioaccumulated by plants and animals. The primary route of lead exposure to plants is through root uptake; however, translocation to shoots is limited (Wallace et al., 1977). In aquatic organisms, the highest lead concentrations are seen usually in benthic organisms and algae, whereas the lowest concentrations tend to be evident in upper trophic level predators like carnivorous fish (Eisler, 1988; ATSDR, 1993). Lead is known to bioconcentrate in aquatic biota. Invertebrates exposed to 32 ppb lead had BCFs of 1,000 to 9,000 over a 28-day period. Median BCF values in aquatic biota exposed to various concentrations of Pb^{2+} varied from about 42 in fish to 2,570 in mussels (EPA, 1985b); however, available evidence does not support the occurrence of lead biomagnification through the aquatic food chain (Eisler, 1988). In vertebrates, lead tends to concentrate in bone matter instead of soft tissue, minimizing movement to higher trophic levels and uptake of lead by predators, especially raptors that regurgitate undigestible material (Stansley and Roscoe, 1996).

3. Nickel

Nickel (Ni) also can be extremely toxic to a wide variety of organisms. Nickel toxicity reduces photosynthesis, growth, and nitrogenase activity of algae. Similarly, nickel concentrations in soil can reduce the metabolism of soil bacteria, and mycelial growth, spore germination, and sporulation of fungi (Babich and Stotzky, 1982). Excess nickel has produced adverse effects in yeasts, higher plants, protozoans, mollusks, crustaceans, insects, annelids, echinoderms, fishes, amphibians, birds, and mammals (EPA, 1975). Nickel interacts with numerous inorganic and organic compounds (Schroeder et al., 1974; Nielsen, 1980; EPA, 1980b, 1985c; and U.S. Public Health Service, 1993). These interactions are complex and may be additive or synergistic in producing adverse effects; some interactions are antagonistic (Eisler, 1998b).

Fish and Aquatic Invertebrates. In 1998, Eisler conducted a review and found that aquatic organisms vary widely in their tolerance to nickel. Sensitive species were killed by ionic nickel at concentrations from 11 to 113 µg/L. Mortality occurred in rainbow trout embryos at concentrations of 11 to 90 µg/L, and in largemouth bass at 113 µg/L. Embryos of channel catfish and the narrow-mouthed toad were intermediate in sensitivity, with mortality occurring at 38 µg/L and 50 µg/L, respectively. Mortality in dapnids occurred at 13 µg/L. Less sensitive species included mysid shrimp, freshwater snails, clam embryos, and salamander embryos, which died at 150, 237, 310, and 410 µg/L, respectively (Eisler, 1998b). Aquatic bacteria and yeasts are comparatively tolerant to nickel; sensitive species of freshwater eubacteria show reduced growth at 5 mg/L, and in marine eubacteria, growth inhibition begins at 10 to 20 mg/L (Babich and Stotzky, 1982).

In California, the acute ambient water quality values for nickel, based on the dissolved fraction, are 470 µg/L at a water hardness of 100 mg/L $CaCO_3$ in fresh water and 74 µg/L in salt water (65 FR 31682). The chronic criteria are 52 µg/L and

8.2 µg/L, respectively. For screening purposes, the TEL for nickel in freshwater sediments is 18.0 mg/kg, and the TEL in marine sediments is 15.9 mg/kg (Buchman, 1999). The PELs are 35.9 mg/kg and 42.8 mg/kg for freshwater and marine sediments, respectively.

Bioavailability and Bioaccumulation. The chemical and physical forms of nickel and its salts influence bioavailability and toxicity. Insoluble, inorganic nickel is usually unavailable in water and soils, but acid rain can mobilize nickel and make it more bioavailable for uptake by plants and animals. The bioaccumulation of nickel in the environment varies greatly among groups. Reported BCFs for aquatic macrophytes range from 6 in pristine areas to 690 near a nickel smelter; BCFs for crustaceans range from 10 to 39, and 2 to 191 and 2 to 52 for mollusks and fish, respectively (Sigel and Sigel, 1988). Under laboratory conditions, BCFs for nickel are around 10 for algae, 100 for cladocerans, 61 for fathead minnows, and range from 299 to 414 for marine mussels and oysters (EPA, 1980b). Nickel can bioaccumulate, but there is little evidence of significant biomagnification along food chains (NRCC, 1981; Sigel and Sigel, 1988; and WHO, 1991).

4. Silver

As with most other heavy metals, silver exposure can result in several toxic effects to a wide variety of plant and animal life. Free silver ions (Ag+) are strongly fungicidal, algicidal, and bactericidal. In solution, ionic silver is highly toxic to aquatic plants and animals. Silver may cause growth and germination effects in terrestrial plants. Bioavailability and toxicity of silver in sediments depend strongly on complex sediment properties (Rodgers et al., 1995). Toxic effects in freshwater sediments are modified by pH, organic carbon, cation exchange capacity, and the amounts of silt and clay (Ratte, 1999). In the aquatic environment, silver toxicity is a function of chemical form, water pH, and hardness. Silver exposure may produce growth, reproductive, and lethal effects in fish, benthic macroinvertebrates, and amphibians. In toxicity tests with fish and amphibian species for a variety of metals and metalloids, silver was the most toxic element tested as judged by the acute LC50 values (Birge and Zuiderveen, 1995).

Fish and Aquatic Invertebrates. In solution, ionic silver is highly toxic to aquatic animals where water concentrations of 1.2 to 4.9 µg/L killed sensitive species, including insects, daphnids, amphipods, trout, flounders, sticklebacks, guppies, and dace (Eisler, 1996). At nominal water concentrations of 0.5- to 4.5 µg/L, most species of exposed organisms exhibited high accumulation with adverse effects on growth (Eisler, 1996). Ag^{+} is the most toxic chemical form of silver to fishes. Silver ion is 300 times more toxic than silver chloride; 15,000 times more toxic than silver sulfide; and 17,500 times more toxic than silver thiosulfate complex to fathead minnows (LeBlanc et al., 1984).

Several acute toxicity values (depending on the chemical compound) for various freshwater aquatic organisms are available (Ratte, 1999). These range from 0.0005-mg/L silver nitrate for *Daphnia pulex* (water flea) to less than 1,000 mg/L silver sulfide for several species. Early developmental stages appear to be more susceptible than adults to the effects of silver compounds. Tests with marine vertebrates have been performed exclusively with fish. Silver toxicity for marine fish is expected to be lower than for freshwater fish due to the moderating action of increasing chloride concentration (Ratte, 1999). Anadromous rainbow trout (*Oncorhynchus mykiss*) adapter to brackish water showed markedly lower sensitivity to silver than they did in fresh water (Ferguson and Hogstrand, 1998). For most species tested, silver seems to be less toxic to juvenile and adult fish in seawater than in fresh water (Ratte, 1999).

In California, the acute ambient water quality values for silver, based on the dissolved fraction, is 3.4 µg/L at a water hardness of 100 mg/L $CaCO_3$ in fresh water and 1.9 µg/L in salt water (65 FR 31682).

Benthos. Bioavailability and toxicity of silver in sediments depend strongly on complex sediment properties (Rodgers et al., 1995). Toxic effects in freshwater sediments are modified by pH, organic carbon, cation exchange capacity, and the amounts of silt and clay (Ratte, 1999). These factors affect the concentration of ionic silver in pore water and overlying water immediately above the sediments, which is the main exposure route for benthic epifauna and infauna. The toxicity of silver to sediment organisms differs with species, chemical compound, and test method used (Ratte, 1999). As in the water column, the relative toxicity of silver compounds depends largely on the solubility and formation of free silver ions.

Juvenile bivalves are particularly sensitive to ionic silver, with toxicity ranging from less than 1 to 14 µg/L in the water (Ratte, 1999). Other examples of toxicity to marine invertebrates have been reported; for example, 400 µg/L killed 90 percent of tested barnacles (*Balanus balanoides*) within 48 hours, and 10 to 100 µg/L $AgNO_3$ caused abnormal or delayed development in eggs of sea urchin (*Paracentrotus* sp.) (Ratte, 1999). The effect threshold for development of sea urchin (*Arbaceia* sp.) was 0.5-µg/L.

In California, the acute ambient water quality values for silver, based on the dissolved fraction, are 3.4 µg/L at a water hardness of 100 mg/L $CaCO_3$ in fresh water and 1.9 µg/L in saltwater (65 FR 31682). For screening purposes, the upper effects threshold (UET) for silver in freshwater sediments is 4.5 mg/kg, and TEL in marine sediments is 0.73 mg/kg (Buchman, 1999).

Bioavailability and Bioaccumulation. Silver (Ag) can bioconcentrate in aquatic biota and bioaccumulate in plants and animals (Luoma and Jenne, 1977). Lower solubility of a silver compound leads to lower bioavailability and bioaccumulation (Ewell et al., 1993). The ability to accumulate dissolved silver from the medium ranges widely among species. Reported BCFs (mg Ag per kg freshwater organism/mg Ag per liter of medium) range from 210 in diatoms to 18,700 in oysters (EPA, 1980d). Filter-feeding marine zooplankton have weight-related concentration factors averaging 5×10^3 (Fisher and Reinfelder, 1995). Silver is the most strongly accumulated of all trace metals by marine bivalve mollusks (Luoma, 1994). The major pathway for silver accumulation in oysters and other bivalves was from dissolved silver; there was negligible intake from silver adsorbed to suspended sediments or algal cells. Oysters eliminate adsorbed silver in the feces (Abbe and Sanders, 1990; and Sanders et al., 1990). Several species of benthic invertebrates have exhibited elevated tissue concentrations compared to their substrate (Ratte, 1999). Bioaccumulation of silver by carnivorous organisms has not been well studied;

however, observed concentrations in fish do not support a substantial accumulation of silver (Ratte, 1999). Biomagnification of silver in aquatic food chains is unlikely at silver concentrations normally encountered in the environment (Connell et al., 1991).

5. Zinc

Zinc exposure can result in several toxic effects to a wide variety of animal life. Zinc exposure may produce growth, reproductive, and lethal effects for fish, benthic macroinvertebrates, and amphibians. Zinc interacts with numerous chemicals, and the patterns of accumulation, metabolism, and toxicity from these interactions sometimes differs greatly from those produced by zinc alone (Eisler, 1993).

Fish and Aquatic Invertebrates (and Benthos). Effects of zinc on invertebrates include increased mortality and reduced growth and reproductive capability. Several toxicological endpoints for invertebrates, fish, and avian receptors are summarized in *The Effects of Zinc on Select Endangered Invertebrates, Fish, and Avian Receptors* (Straub and Boening, 1998). In another review of zinc hazards to fish, wildlife, and invertebrates, arthropods were found to be the most sensitive group of tested invertebrates to zinc (Eisler, 1993). Toxicity was usually greatest to marine crustaceans (Eisler, 1981) and larvae (Eisler, 1980). Similar to other invertebrates, elevated temperatures, extended exposures, soft water, and increasing salinity increased the toxic effects (Eisler, 1993).

The effects of zinc on the reproductive capabilities of *Biomphalaria glabrata* (Say) were investigated. The effects of 500 to 2,000 µg/L zinc chloride ($ZnCl_2$) were tested at water hardnesses of 61 to 68.5 mg/L. Zinc contamination significantly reduced the fecundity of the mollusks. Growth rate was significantly reduced in test groups exposed to 500 and 1,500 µg/L Zinc. Maturity was delayed at the lower concentration, and no mollusks achieved maturity at 1,500 µg/L. Hatch rates were reduced with zinc exposure (Munzinger and Guarducci, 1988). In a study of reproductive effects of zinc on the snail *Ancylus fluviatilis*, there was no effect on growth, behavioral adaptations, or reproduction at a concentration of 320 µg/L zinc (Willis, 1988). However, concentrations of 100 µg/L were lethal to newly hatched organisms exposed for 30 days. The effects of zinc on embryonic development of the mud snail *Ilynassa obsoleta* were examined, and the NOAEL was found to be 6.54 µg/L to 65.4 µg/L (Conrad, 1988).

A review found that several trends are evident concerning zinc toxicity in fish (Eisler, 1993).

- Freshwater fish are more sensitive than marine fish.
- Embryos and larvae are the most sensitive developmental stages.
- Effects are lethal or sublethal for most species in the range of 50 to 235 µg/L zinc.
- Behavioral modifications occur at concentrations as low as 5.6 µg/L zinc.

Several other toxicological endpoints for fish are summarized *in The Effects of Zinc on Select Endangered Invertebrates, Fish, and Avian Receptors* (Straub and Boening, 1998).

In California, the acute ambient water quality values for zinc, based on the dissolved fraction, are 120 µg/L at a water hardness of 100 mg/L $CaCO_3$ in fresh water and

90 µg/L in salt water (65 FR 31682). The chronic criteria are 120 µg/L and 81 µg/L, respectively. For screening purposes, the TEL for zinc in freshwater sediments is 123.1 mg/kg and the TEL in marine sediments is 124 mg/kg (Buchman, 1999).

Bioavailability and Bioaccumulation. The amount of bioavailable zinc is determined by the amount of zinc present and in what form it exists (e.g., soluble or insoluble). Zinc is more bioavailable under acidic soil conditions, particularly at pH less than 5 (Duquette and Hendershot, 1990). Zinc availability decreases in cool soil temperatures (Killorn, 1984; Rehm and Schmitt, 1997; Mahler et al., 1981). In aquatic systems, low alkalinity, low hardness, and high pH promote the formation of bioavailable species of zinc (Paulauskis and Winner, 1988; Everall et al., 1989; Schubauer-Berigan et al., 1993). Zinc bioavailability and toxicity to aquatic organisms are highest under these conditions (Weatherly et al., 1980). Water hardness is the principal modifier of acute zinc toxicity.

Because zinc is an essential trace element to both plants and animals, its uptake is a common occurrence, and most species accumulate more than they need for normal metabolism. Bioconcentration is organism dependent; BCFs reported *in Ambient Water Quality Criteria for Zinc* ranged from 51 in Atlantic salmon (*Salmo salar*) to 1,130 for the mayfly (*Ephemerella grandis*) (EPA, 1987). There is little evidence of successive biomagnification of zinc in tissues of fish and avian receptors. Mollusks accumulated more zinc than the fish that fed off the mollusks (Elder and Collins, 1991).

6. DDT, DDE, and DDD

The toxicity and accumulation of DDT in fish are correlated with age, fat content, and body length of the fish. Signs of toxicity are similar to those exhibited by insects (Ellgaard et al., 1977). Exposure to lethal concentrations of DDT results in increasing levels of irritability or excitability followed by muscular spasms, complete loss of equilibrium, convulsions, and eventual death. Although a significant number of aquatic DDD, DDE, and DDT toxicity studies have been conducted with invertebrates, only a few studies have investigated their toxicity to plants, fish, reptiles, and amphibians. Because DDT can accumulate in fatty tissues, birds and mammals in higher trophic levels have the potential to become exposed to and bioaccumulate significant quantities of DDT and its metabolites. DDT has significant effects on the reproduction of birds through eggshell thinning and other reproductive impairment. The effects of DDT on mammals primarily have been demonstrated in laboratory studies, although bats appear to be very sensitive.

Fish and Aquatic Invertebrates (and Benthos). More than 40 acute toxicity values for various aquatic organisms were available (EPA, 1999). These ranged from 0.00036-mg/L for water flea (*Daphnia pulex*) to 1.23 mg/L for the planarian, *Polycellis felina*. Early developmental stages appear to be more susceptible than adults to the effects of DDT (EPA, 1989). Some effects appear to be reversible, and some aquatic invertebrates have demonstrated resistance (Johnson and Finley, 1980).

One study reported 96-hour LC50 values for several fish species ranging from 1.5 (largemouth bass) to 56 µg/L (guppy) (Johnson and Finley, 1980). Species with similar 96-hour LC50 values included coho salmon (*Oncorhynchus kisutch*), rainbow trout (*Oncorhynchus mykiss*), northern pike (*Esox lucicus*), black bullhead (*Ameirurus melas*), bluegill sunfish (*Lepomis macrochirus*), walleye (*Stizostedion vitreum*), fathead minnow (*Pimephales promelas*), and channel catfish (*Ictalurus punctatus*). Toxicity to chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon was greater in smaller fish than larger fish (WHO, 1989).

Black bullhead was exposed to DDT for a 96-hour period (Markling, 1966). The LC50 values ranged from 0.017- to 0.042-mg/L. Compared to other fish species, the black bullhead seems to be relatively sensitive to DDT. A similar 96-hour black bullhead study reported the LC50 value of 0.005-mg/L (Macek and McAllister, 1970).

The screening ecological benchmarks for DDD, DDE, and DDT in surface waters are 0.000011-, 0.0105-, and 0.000001-mg/L, respectively (TNRCC, 2000). In California, the acute ambient water quality values for 4,4'-DDT are 1.1 µg/L in fresh water and 0.13-µg/L in saltwater (65 FR 31682). For screening purposes, the TEL for DDT (total) in freshwater sediments is 0.00698-mg/kg, and the TEL in marine sediments is 0.00389-mg/kg (Buchman, 1999).

Bioavailability and Bioaccumulation. Plants can bioaccumulate significant amounts of DDT, DDD, and DDE, all of which have been noted in the roots of some grain, maize, and rice plants (EPA, 1989). In wildlife, bioaccumulation is a significant exposure pathway for higher trophic-level organisms that prey on fish and other aquatic organisms. Some aquatic organisms bioaccumulate DDT and its metabolites at concentrations from 1,000 to 1,000,000 times that measured in surrounding media (EPA, 1989). Concentrations of DDT and its metabolites have been measured in fat and brain cells at levels up to several hundred times that measured in blood. Because DDT can accumulate in fatty tissues, birds and mammals in higher trophic levels have the potential to become exposed to and bioaccumulate significant quantities of DDT and its metabolites.

7. PCBs

PCBs are structurally specific toxicants that require an interaction with, or stimulation of, specific biochemical receptors to initiate the expression of toxicity response (Hansen, 1994).

In general, PCB toxicity increases with increasing chlorination and with increasing exposure. In addition, PCBs tend to be most toxic to the early life stages of most invertebrate species (Johnson and Finley, 1980).

In vertebrates (i.e., mammals, birds, and fish), PCBs elicit a variety of biologic and toxic effects, including liver damage, tumors, and a wasting syndrome (Eisler, 1986). Other symptoms related to PCBs include decreased developmental and reproductive activity, endocrine and hepatotoxic effects, and carcinogenesis (Safe, 1993). Mutagenic, carcinogenic, and teratogenic properties of PCBs have been documented. In general, mutagenic activity tends to decrease with increasing chlorination (EPA, 1980c). The carcinogenic effects of PCBs have been established in mice and rats with various Aroclor and Kanechlor PCBs, which may enhance the carcinogenicity of other chemicals (EPA, 1980c).

Fish and Aquatic Invertebrates (Benthos). Decreased growth of aquatic organisms during exposure to PCBs is well documented. Concentrations as low as 0.1-µg/L of Aroclor 1254 produced growth reductions in marine diatoms and a freshwater alga (*Scenedesmus quadricauda*) and altered the population structure of phytoplankton communities (EPA, 1980c). Decreased shell growth of oysters was reported in acute testes with Aroclor 1016, 1248, and 1254 in concentrations ranging from 10.1 to 17.0 µg/L (EPA, 1980c). In addition, reproductive toxicity caused by PCB exposure is reported for Baltic flounder (*Platichthys flesus*) when ovaries exceeded 0.12-mg/kg fresh weight and for cyprinid minnows (*Phoxinus phoxinus*) when gonads contained more than 24 mg/kg fresh weight (Ernst, 1984). Trout and salmon exposed to PCBs exhibit reproductive effects that include increased prehatch mortality, posthatch deformities, low survival post hatch, and complete reproductive failure (EPA, 1980c). Acute LC50 values for Aroclor 1242 (4 days) was 10 µg/L for scud (*Gammarus pseudolimnaeus*) (NAS, 1979), 400 µg/L for damselfly (*Ischnura verticalis*) (Johnson and Finley, 1980), and 800 µg/L for dragonfly (*Macromia* spp.) (USFWS, 1986).

Various sediment quality guidelines (SQGs) have been proposed to predict the likelihood that effects from various sediment contaminants will occur to benthic organisms and their communities. Consensus-based SQGs for total PCBs in freshwater sediments have been proposed in the past (MacDonald et al., 2000). For total PCBs, the threshold effects concentration (TEC), midrange effect concentration (MEC), and extreme effect concentration (EEC) are 0.040, 0.40, and 1.7 mg/kg, respectively (MacDonald et al., 2000). Chronic screening values for Aroclors (PCB mixtures) have been proposed in the past as well (Smith et al., 1996). The chronic screening values, or TEC, for Aroclor 1254 and Aroclor 1260 are 0.06- and 0.005-mg/kg, respectively (Smith et al., 1996). For surface water, the screening ecological benchmark used for total PCBs and aroclors is 0.000014-mg/L (TNRCC, 2000). In California, the ambient water quality values (chronic) for PCBs, based on total aroclors, are 0.014 µg/L in fresh water and 0.03 µg/L in salt water (65 FR 31682).

Bioavailability and Bioaccumulation. Increased sorption includes the tendency to bind strongly to soil, bioaccumulate in lipids (e.g., of invertebrates, fish, birds, mammals, and humans), and biomagnify up the food chain. The bioavailability of organic contaminants, such as PCBs, to the benthic community is highly dependent on the amount of organic matter in sediments (Gunnarsson et al., 1999). As the percentage of organic content of the contaminated media increases, the bioavailability decreases. PCBs have a strong sorption affinity for organic matter. It has been suggested that the primary route of PCB exposure and subsequent bioaccumulation, is probably through ingestion (Lamoureux and Brownawell, 1999). PCB transfer through aquatic ecosystems has been reported in the Great Lakes using a sediment-lake trout model (Jensen, 1984).

It has also been shown that rats, mice, and monkeys absorb between 75 and 90 percent of orally administered doses of PCBs (ATSDR, 1995). It depends on the animal species, but PCBs are usually metabolized (via the microsomal monooxygenase system catalyzed by cytochrome P-450) to polar metabolites that can undergo conjugation with glutathoine and glucuronic acid (ATSDR, 1995).

IV. Endangerment Determination

A. Site 7 – Station Landfill

Risk was calculated in the baseline HHRA and the preliminary ERA conducted as part of the RI (SWDIV, 1995b). Additionally, the Phase II ERA validation study (SWDIV, 1999a) assessed risks to terrestrial ecological receptors, and the screening aquatic ERA (SWDIV, 2000) assessed risks to aquatic ecological receptors in Perimeter Pond. These calculations and assessments demonstrate that current conditions at Site 7 present minimal potential risks to public health, welfare, or the environment.

The baseline HHRA detected PCBs but determined the risk was within the range of concern that can be addressed by risk management decisions. The preliminary ERA concluded that no significant ecological risks were identified. The Phase II ERA agreed with the preliminary ERA conclusion for no further action at the site. The screening aquatic ERA detected possible low risks to sessile benthic invertebrates by pesticides.

Based on the 10 locations sampled, those risks would occur at 2 locations: the southeast corner of the pond and an area near the exposed debris at the approximate center of the east shoreline. Aquatic organisms in the immediate vicinity of the seep (or other seeps if they occur) could be exposed intermittently to elevated concentrations of copper, silver, zinc, and some pesticides. Risks from such exposure would be limited to a very small area because the seep would be rapidly diluted upon entering the pond.

Concentrations of pesticides in mussel tissue exceed NOAELs for those pesticides in birds and indicate possible risks to birds consuming large amounts of food from the area. However, that risk may be regional as higher concentrations of the same pesticides are found in mussels from Anaheim Bay and Huntington Harbour. The general effects and numerical risks to aquatic ecological receptors were previously discussed in Section III.B.

B. Site 4 AOPCs 1A and 2A – Oil on Roads

Risk calculations from the ERA conducted as part of the Site 4 AOPCs 1A and 2A RSE and the specific ecological assessment for lead conducted as part of the EE/CA (Appendix F of Attachment A) demonstrate that current conditions at Site 4 AOPCs 1A and 2A present a minimal potential risk to the environment.

Although further evaluation for soil and groundwater was recommended for Site 4 AOPCs 1A and 2A. The ERA in the RSE suggested that the concentrations of the COPCs in soil were of minor ecological significance or not ecologically significant when compared to background conditions and the range of TRVs. However, DTSC would not concur with NFA for the soil due to the presence of elevated lead concentrations at a few locations. Chemical concentrations in groundwater are not expected to adversely affect marine life, so only confirmatory monitoring was recommended.

No human health risk assessment was performed for AOPC 1A because it is located within the NWR. Additionally, there would not be any development on AOPC 1A due to its proximity to Station Landfill and its location within the explosive arc at NAVWPNSTA Seal Beach. A human health risk assessment was performed for AOPC 2A. The incremental cancer risk was estimated at 3.7 x 10^{-5}, which is within the NCP generally acceptable range of 10^{-6} to 10^{-4} for risk management. The systemic toxicity was evaluated to be unlikely due to a hazard index less than 1.0. There are potential adverse health effects from exposure to lead; however, this is not of concern since residential use of AOPC 2A is unlikely due to its proximity to Station Landfill and the NWR and its location within the explosive arc at NAVWPNSTA Seal Beach. Additionally, human presence usually is limited to brief visits by USFWS personnel and Navy security personnel because of its location next to the NWR.

To guide soil removal action activities at Site 4 AOPCs 1A and 2A, a site-specific TCG for lead was developed. The site-specific TCG was derived based on a comparison of the back-calculated LOAEL-equivalent soil concentrations for each of four bird and mammal receptors (harvest mouse, ground squirrel, skunk, and robin) against the distribution of lead in the soil at Site 4 AOPCs 1A and 2A. Based on a visual evaluation of the observed lead distribution in Site 4 AOPCs 1A and 2A and in light of the calculated LOAEL-equivalent soil concentrations, a site-specific TCG of 600 mg/kg for lead is proposed. Remediation to a maximum TCG of 600 mg/kg for lead with an areawide arithmetic average TCG of less than 100 mg/kg for lead is expected to virtually eliminate risks from lead to wildlife in Site 4. This TCG was not developed to be protective of human health because human access to Site 4 AOPCs 1A and 2A is limited. Because of the NWR, human presence usually is limited to brief visits by USFWS personnel and Navy security personnel. Additionally, there would not be any development on Site 4 AOPCs 1A and 2A due to its location next to Station Landfill, proximity to the NWR, and its location within the explosive arc at NAVWPNSTA Seal Beach. This site-specific TCG is below the industrial PRG for lead, which is 750 mg/kg (EPA, 2002).

V. Proposed Actions and Estimated Cost

A. Proposed Action

1. Description of Proposed Action

The Final EE/CA (see Attachment A) proposed four alternatives for evaluation and comparison. Section V.A.4 describes the EE/CA in detail. Based on the EE/CA, the DON proposed Alternative 3 as the recommended removal action. Alternative 3 involves groundwater monitoring, repair of existing soil cover, and excavation and offsite disposal. An addendum to extend Site 7 removal actions to include the adjacent areas of Site 4 AOPCs 1A and 2A also recommended excavation and offsite disposal for these areas. The breakdown of the removal actions for the different areas (see Figures 3 and 5) identified at and adjacent to Site 7 are:

- Area 1: Limited repair of existing soil cover and groundwater monitoring
- Area 2: Groundwater monitoring

- Areas 3, 4, and 6: Surface debris removal
- Area 5 and Site 4 AOPCs 1A and 2A: Excavation followed by offsite disposal and imported clean backfill

Areas 1 and 2: Limited Repair of Existing Soil Cover and Groundwater Monitoring

At Area 1, additional soils would be placed on areas with deficient soil cover to provide for a minimum 2-foot cap thickness that would reduce direct contact with buried onsite waste, but avoid destruction of wetlands and sensitive habitat. The soil cover is expected to be effective in preventing direct contact by receptors, as well as eliminating the migration of potential surface contamination through windblown dust or surface runoff. The main objective of a cover in the recommended removal action (Alternative 3) is to protect humans and habitat from contact with or exposure to surface trash and debris. The site conditions prohibit the need to provide additional groundwater protection due to the presence of a high groundwater table at the site. Based on the previous investigations (see Section II.A.1 of this document) of the existing site conditions (shallow groundwater, tidal fluctuations, generally poor groundwater quality, and minimal ecological risk), minimizing infiltration to reduce the production of leachate and gas is not necessary.

Groundwater monitoring, involving a total of eight wells, is proposed at Areas 1 and 2 based on the minimal risks to receptors identified at the site. In Area 1, a network of four existing groundwater monitoring wells (W41, W42, W43, and W45) is proposed to be used to collect groundwater samples and monitor for trends in chemical concentrations in groundwater. In Area 2, three additional monitoring wells are proposed to monitor groundwater concentrations south of Area 2 between the buried wastes and the nearest surface body of water. One existing monitoring well north of Area 2 (Well 07M01) also would be included in the monitoring program. The groundwater would be monitored for potential trends or offsite migration of chemicals from Area 2. The purpose of this groundwater monitoring program is to serve as a sentinel well network to monitor the potential for migration of groundwater contamination from Site 7. These wells are located strategically between buried wastes at Site 7 and the nearest potential aquatic receptors. Thus, these groundwater monitoring wells would serve as an “early detection system.” This program would be consistent with the recommendations of the groundwater monitoring study performed at Site 7.

Areas 3, 4, and 6: Removal of Surface Debris Followed by Geophysical Survey to Confirm Removal Effectiveness

Based on previous geophysical surveys and site visits, only surface debris is known to exist within Areas 3, 4, and 6; therefore, selective removal of debris from the top few feet of soil at the site is proposed in these areas. Successful removal would be confirmed by nonintrusive geophysical techniques. The debris material would be hauled offsite and disposed at an approved landfill or recycled. Prior to commencement of debris removal activities, a survey of the affected vegetation habitat would be identified, relocated, and protected. After completion of the removal action activities, replanting would restore the vegetation habitat.

Area 5: Excavation and Offsite Disposal Followed by Backfill with Imported Soil

Based on long-term risks to aquatic receptors in the Perimeter Pond, the removal action would involve excavation of wastes and waste residuals (approximately

1,068 cubic yards [cy] in-place volume [SWDIV, 1999c]) below approximately 2 feet of overburden soil in Area 5. Excavation will occur to the extent that waste (such as debris and discolored soils) can no longer be identified by visual observation. The excavation volume, however, may vary significantly based on conditions encountered during excavation. It is anticipated that in-place excavation volumes (including waste and contaminated soils) at Area 5 could range from as low as 1,600 cy to as high as 14,700 cy. The wastes then would be transported offsite and disposed in an approved landfill. Imported clean fill consisting of fine-grained soils would be used to backfill the excavation. The surface of the reconstructed shoreline would be armored with riprap and geotextile for erosion protection.

Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal Followed by Backfill with Imported Soil

Based on long-term risks to ecological receptors, the removal action would involve excavation of lead-contaminated surface soil to the extent that elevated concentrations (above the maximum TCG of 600 mg/kg for lead coupled with an area wide arithmetic average TCG of less than 100 kg/mg for lead) are no longer detected. The excavation volume, however, may vary significantly based on lead concentrations detected during excavation. It is anticipated that excavation volumes could range from as low as 1,200 cy to as high as 5,000 cy. The soil then would be transported offsite and disposed in an approved landfill. Imported clean fill consisting of fine-grained soils would be used to backfill the excavation.

2. Contribution to Remedial Performance

Based on CERCLA, the NCP, the evaluation of applicable or relevant and appropriate requirements (ARARs), and the human health and ecological risk assessments, the removal action objectives (RAOs) for Site 7 are as follows.

- Reduce the potential for exposure of ecological receptors to landfill waste and potentially contaminated soil by increasing separation and/or eliminating exposure pathways (e.g., water seeps) of wastes to human and ecological receptors
- Restore habitat that is compatible with the Seal Beach NWR habitat
- Minimize impact to wetlands and improve conditions of remaining wetlands, to the extent practicable
- Control surface-water runoff and reduce the potential for erosion of the landfill surface
- Comply with chemical-specific ARARs where exceedances have occurred due to waste releases
- Minimize further migration of lead in surface soil at adjacent Site 4 AOPCs 1A and 2A
- Reduce risk to ecological receptors from lead-contaminated soil to acceptable levels at adjacent Site 4 AOPCs 1A and 2A

These RAOs are designed to protect humans and habitat from contact or exposure of surface trash and debris. To help achieve these RAOs, TCGs were established for the areas where excavations would occur requiring confirmation sampling. Ecological risk-based TCGs were developed using the DTSC ecological risk assessment guidance (DTSC, 1996) after identifying the primary risks. For Areas 1 and 2, TCGs were developed based on the risks to representative site-specific terrestrial receptors, which include ground squirrel, kestrel, and sandpiper (SWDIV, 1999a). For Site 4 AOPCs 1A and 2A, a TCG was developed based on the risks to representative site-specific ecological receptors, which include harvest mouse, ground squirrel, skunk, and robin (CH2M HILL, 2003).

Another primary risk identified at Site 7 involves the risks to aquatic ecological species due to the exposure of debris and tidal water seeps discharging from debris buried along the eastern shoreline of the Perimeter Pond (Area 5). Removal of the buried waste and shoreline sediments from the two moderately contaminated areas is proposed, but the primary RAO is to eliminate the tidal seeps emanating from the exposed debris in Area 5.

As part of the removal action, groundwater monitoring would be performed where buried wastes are left in place (Areas 1 and 2) to determine the long-term effectiveness of the removal action. A groundwater monitoring work plan would be prepared to establish sampling and analytical protocols for monitoring groundwater quality at Site 7. The purpose of this groundwater monitoring program is to provide a sentinel network of wells to monitor potential migration of groundwater contaminant at Site 7. The wells would be located strategically between buried wastes at Site 7 and the nearest potential aquatic receptors. Thus, these groundwater monitoring wells would serve as an "early detection system."

The recommended removal action is expected to meet the RAOs. Alternative 3 (the recommended removal action) includes an engineered alternative cover design to the prescriptive cover design, as described in CCR Title 27, Sections 20080 (b) and (c). Although the regulations require measures to protect groundwater quality, the intent of the recommended removal action is neither to protect water quality by minimizing infiltration through the cover nor to minimize precipitation from infiltrating the cap. The objective of this cover design is to prevent direct contact with receptors, to eliminate the migration of potential surface contamination through windblown dust or surface runoff, and/or to prevent ponding of surface water runoff. The existing site conditions preclude measures to significantly reduce infiltration of precipitation at the site because of the following factors.

- Shallow groundwater depth at the site is less than 5 feet bgs.
- The base of the buried refuse was determined to vary between 5 and 12 feet bgs; therefore, the majority of the waste is below the water table.
- Groundwater quality at the site is generally poor due to natural conditions.
- Natural attenuation by tidal fluctuations appears to have been active over time; therefore, no well-defined plumes have been identified.

An engineered alternative cover design consisting of the repair of the existing soil cover is proposed at Area 1 to reduce potential long-term risks to ecological receptors by providing adequate separation between the buried material and the receptors. The waste would be left in place but would be isolated to prevent exposure and future migration. The additional soils would be placed on areas with deficient soil cover to provide an effective cap thickness that would reduce direct contact with buried onsite waste, but avoid destruction of wetlands and sensitive habitat. In addition, groundwater would be monitored for potential trends and offsite migration of chemicals. The excavation of buried material at Area 5 and Site 4 AOPCs 1A and 2A and removal of surface debris at Areas 3, 4, and 6 also would reduce the long-term risks to receptors at the site. These removal action NTCRA activities afford an appropriate reduction in long-term risks to ecological receptors from waste materials at the site.

3. Description of Alternative Technologies

Several alternative technologies were evaluated for the removal action as described below.

- **Alternative 1:** No Action
- **Alternative 2:** Capping and Long-term Maintenance/Monitoring
  Primary removal action activities involve capping Area 1 with a Title 27-compliant cap; removal of surficial debris in Areas 3, 4, and 6; excavation and offsite disposal of waste and contaminated soil in Area 5 and Site 4 AOPCs 1A and 2A; and long-term monitoring/maintenance.
- **Alternative 3:** Limited Repair of Existing Soil Cover and Groundwater Monitoring. Primary removal action activities involve performing limited soil cover repairs of Area 1; surficial debris removal in Areas 3, 4, and 6; excavation and offsite disposal of waste and contaminated soil in Area 5 and Site 4 AOPCs 1A and 2A; and groundwater monitoring.
- **Alternative 4:** Excavation and Offsite Disposal
  Primary removal action activities for the Site 7 removal action involve excavation and offsite disposal of wastes and contaminated soil for Areas 1, 2, and 5 and Site 4 AOPCs 1A and 2A ,and surficial debris removal in Areas 3, 4, and 6.

Removal action activities for Areas 3, 4, 5, and 6 are common for Alternatives 2, 3, and 4 (see Table 1). These actions were discussed previously in Section V.A.1 of this document.

The four alternatives analyzed were compared against each other to evaluate the relative performance of each alternative in relation to each criterion for effectiveness, implementability, and cost.

The effectiveness of each alternative was evaluated based on the overall protection of human health and the environment; long-term effectiveness and permanence; compliance with ARARs; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. The comparative analysis of the criteria is summarized in Table 2.

4. Engineering Evaluation/Cost Analysis

An EE/CA has been developed for this NTCRA and is provided in Attachment A. The EE/CA identified and compared four alternatives for the Station landfill as listed above.

The Draft EE/CA was released for review by the Restoration Advisory Board (RAB) members and regulatory agencies for comment between 29 October 2001 and 06 February 2002. Subsequently, a Draft EE/CA Addendum to the EE/CA was released for review by the RAB members and regulatory agencies for comment between 21 May 2003 and 21 June 2003. The RAB member and regulatory agency period on this draft AM/RAP is from 10 September to 10 October 2003.

The Final EE/CA recommended Alternative 3 as the preferred removal action for Site 7 based on implementability, cost, and effectiveness. Section V.A.2 of this document provides detail on the selection of Alternative 3. Also, an Administrative Record was developed to allow the public to review the Site 7 EE/CA, AM/RAP, and other related documents.

5. Applicable or Relevant and Appropriate Requirements

This section lists the potential ARARs for the removal action at Site 7. Section 300.415(i) of the NCP provides that removal actions must attain ARARs to the extent practicable, considering the exigencies of the situation.

Section 300.5 of the NCP defines *applicable requirements* as cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, removal action, location, or other circumstance at a CERCLA site.

Section 300.5 of the NCP further defines *relevant and appropriate requirements* as cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws. While not applicable to a hazardous substance, pollutant, or contaminant, removal action, location, or other circumstances at a CERCLA site, these laws address problems or situations sufficiently similar to those encountered at a CERCLA site and are well suited to the particular site.

Because CERCLA 121 (e)(1) exempts onsite response actions from federal, state, and local permitting requirements only federal and state substantive environmental or facility siting requirements will be incorporated through the ARARs process. Administrative requirements such as approval of or consultation with administrative bodies, issuance of permits, documentation, reporting, record keeping, and enforcement are not ARARs for CERCLA actions confined to the site.

TABLE 2
Comparative Analysis of Removal Action Alternatives
NAVWPNSTA Seal Beach, Site 7 (Station Landfill), AM/RAP

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Existing Soil Cover Repair and Monitoring	Alternative 4: Excavation and Offsite Disposal
	Area 1 through Area 6 and Site 4 AOPCs 1A and 2A: No Action	Area 1: Capping and Long-term Maintenance/Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Limited Repair of Existing Soil Cover and Groundwater Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Excavation and Offsite Disposal Area 2: Excavation and Offsite Disposal Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal
Effectiveness				
• Overall Protection of Human Health and the Environment	Alternative 1 would not meet RAOs, and it provides the least overall protection of the environment compared to the alternatives considered. Surface debris and areas with inadequate soil cover would allow no or very little separation between wastes and humans and sensitive ecological receptors. A previous soil cover investigation indicates that the soil cover over Areas 1 and 2 ranges between 0 and 2 feet. Areas 3 through 6 and Site 4 AOPCs 1A and 2A have surface debris and lead-contaminated soil exposed that allow immediate exposure as well as indirect exposure through stormwater runoff and/or wind erosion.	Alternative 2 would meet RAOs. At Areas 1 and 2, long-term risks to human and terrestrial ecological receptors are reduced by isolating the direct exposure pathway with the addition of soil cover over the entire surface area. Surface drainage improvements would be provided with adequate slopes. For Areas 3, 4, and 6, risks are reduced through removal of surface debris. At Area 5, risks are reduced through excavation of buried waste materials, offsite disposal of the waste at an approved facility, and backfilling with clean soils. For Site 4 AOPCs 1A and 2A, the magnitude of residual risk is reduced because lead-contaminated soil above the TCG is excavated and disposed offsite at an approved facility. Periodic maintenance and monitoring of the Area 1 proposed landfill cap would maintain overall protection of human health and the environment, including: • Monolithic soil cover and vegetation • Drainage and erosion controls • Site access control • Groundwater monitoring • Stormwater monitoring	Alternative 3 would meet RAOs. The majority of the existing soil cover at Areas 1 and 2 should be adequate to reduce long-term risks to terrestrial receptors. However, areas with inadequate soil cover would be repaired to provide adequate separation between waste and humans and/or ecological receptors. The potential for long-term risks to humans and terrestrial ecological receptors is also provided by performing periodic groundwater monitoring. For Areas 3, 4, and 6, risks are reduced through removal of exposed surface debris. At Area 5, risks are reduced through excavation of buried waste materials, offsite disposal of the waste at an approved facility, and backfilling with clean soils. For Site 4 AOPCs 1A and 2A, the magnitude of residual risk is reduced because lead-contaminated soil above the TCG is excavated and disposed offsite at an approved facility.	Alternative 4 would meet RAOs. For Areas 1, 2 and 5, risks are reduced through excavation of buried waste materials and offsite disposal of the waste at an approved facility. For Site 4 AOPCs 1A and 2A, the risk is reduced because lead-contaminated soil above the TCG is excavated and disposed offsite at an approved facility. For Areas 3, 4, and 6, risks are reduced through removal of exposed surface debris. This affords the maximum long-term protection to the environment. However, short-term risks during implementation are potentially high. Alternative 4 affords the greatest protection of the environment. Materials at Site 7 and lead-contaminated soil with concentrations exceeding background levels or TCGs at Site 4 AOPCs 1A and 2A would be excavated and disposed offsite. Imported clean fill materials would be used to backfill the excavations.

TABLE 2
Comparative Analysis of Removal Action Alternatives
NAVWPNSTA Seal Beach, Site 7 (Station Landfill), AM/RAP

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Existing Soil Cover Repair and Monitoring	Alternative 4: Excavation and Offsite Disposal
	Area 1 through Area 6 and Site 4 AOPCs 1A and 2A: No Action	Area 1: Capping and Long-term Maintenance/Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Limited Repair of Existing Soil Cover and Groundwater Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Excavation and Offsite Disposal Area 2: Excavation and Offsite Disposal Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal
• Compliance with ARARs	Alternative 1 would not comply with ARARs.	Alternative 2 would comply with ARARs, specifically CCR Title 27 for landfill closure and maintenance and monitoring. In a semiarid environment such as that at Site 7, an alternative cover consisting of at least a 24-inch-thick monolithic soil cover should satisfy ARARs. The design of the alternative cover is an engineered alternative that would meet the performance of the prescriptive standards, including: • Provide adequate thickness to minimize infiltration through the cover • Construction of minimum 3 percent slope on the top deck and maximum 3 to 1 (horizontal to vertical) slopes on the sideslopes • Providing adequate drainage and erosion control • Re-establishing vegetation • Performing routine monitoring of the landfill cap and its features • Periodically monitoring the environmental controls, such as groundwater, stormwater, and, if necessary, landfill gas	Alternative 3 would comply with ARARs to the extent that protection of humans and the environment would be provided. • Provide adequate protection by separation between waste and humans and ecological receptors • Provide adequate protection and minimize disturbance to the existing wetlands and ecological environment Extensive provisions to protect or improve existing water quality conditions are not required because of the existing hydrological conditions.	Alternative 4 would comply with ARARs for clean closure at Site 7(CCR Title 27 and LEA Advisory No. 16). Clean closure for Site 7 would consist of the following: • Complete removal of waste and waste residuals, including contaminated soils • Waste materials and residuals would be removed to a point where remaining contaminant concentrations are at or below background levels or TCGs Alternative 4 would comply with ARARs for Site 4 AOPCs 1A and 2A to the extent that protection of human health and the environment would be provided. • Lead-contaminated soil and residuals would be removed to a point where remaining lead concentrations are at or below the TCG. • Extensive provisions to protect or improve existing water quality conditions are not required because of the existing hydrological conditions.

TABLE 2
Comparative Analysis of Removal Action Alternatives
NAVWPNSTA Seal Beach, Site 7 (Station Landfill), AM/RAP

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Existing Soil Cover Repair and Monitoring	Alternative 4: Excavation and Offsite Disposal
	Area 1 through Area 6 and Site 4 AOPCs 1A and 2A: No Action	Area 1: Capping and Long-term Maintenance/Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Limited Repair of Existing Soil Cover and Groundwater Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Excavation and Offsite Disposal Area 2: Excavation and Offsite Disposal Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal
Long-Term Effectiveness and Permanence				
• Magnitude of Residual Risk	Under No Action, the magnitude of residual risk would remain unchanged and be the highest among the four alternatives.	Under Alternative 2, the residual risk existing at Areas 1 and 2 is not reduced. However, the source of residual risks would be further isolated under the new vegetated soil cap and existing landfill cover at Area 1. For Areas 3 through 6, the magnitude of residual risk is reduced because buried waste materials and/or surface debris are excavated and disposed offsite at an approved facility. For Site 4 AOPCs 1A and 2A, the magnitude of residual risk is reduced because lead-contaminated soil above the TCG is excavated and disposed offsite at an approved facility.	Under Alternative 3, the magnitude of residual risk at Areas 1 and 2 would remain the same as the baseline risk. However, the source of residual risks would be isolated under the existing landfill cover and repaired landfill cover. For Areas 3 through 6, the magnitude of residual risk is reduced because buried waste materials and/or surface debris are excavated and disposed offsite at an approved facility. For Site 4 AOPCs 1A and 2A, the magnitude of residual risk is reduced because lead-contaminated soil above the TCG is excavated and disposed offsite at an approved facility.	Under Alternative 4, the magnitude of residual risk would be relatively low because buried waste materials and/or surface debris at Areas 1 through 6 and lead-contaminated soil above the TCG at Site 4 AOPCs 1A and 2A are excavated and disposed offsite at an approved facility.
• Adequacy and Reliability of Controls	Alternative 1 would not provide adequate and reliable controls. The buried waste is currently beneath soil cover of variable thickness (estimated to be 0 to 2 feet). The surface debris would remain scattered throughout the site. The lead-contaminated soil would remain in place.	Alternative 2 would provide adequate and reliable controls with the proposed capping design and ancillary structures. The monolithic soil cover design at Area 1 would be effective in deterring ecological receptors from burrowing to reach buried waste materials. For Area 2, the existing soil cover would be adequate in deterring ecological receptors from burrowing to reach buried waste materials. For Areas 3 through 6, the need for controls is eliminated by removal and offsite disposal of the buried waste and surface debris. For Site 4 AOPCs 1A and 2A, Alternative 2 eliminates the need for controls by removal and offsite disposal of the lead-contaminated soil above the TCG.	Alternative 3 would provide adequate and reliable controls to monitor chemicals in groundwater from the main disposal trenches to the nearest receptors. Patching the existing cover to maintain adequate thickness of the soil cover would eliminate direct contact with ecological receptors. For Area 2, the existing soil cover would be adequate in deterring ecological receptors from burrowing to reach buried waste materials. For Areas 3 through 6, Alternative 2 eliminates the need for controls by removal and offsite disposal of the buried waste and surface debris. For Site 4 AOPCs 1A and 2A, Alternative 2 eliminates the need for controls by removal and offsite disposal of the lead-contaminated soil above the TCG.	Alternative 4 would not require any controls because buried waste materials and/or surface debris at Site 7 and lead-contaminated soil above the TCG at Site 4 AOPCs 1A and 2A are excavated and disposed offsite at an approved facility.

TABLE 2
Comparative Analysis of Removal Action Alternatives
NAVWPNSTA Seal Beach, Site 7 (Station Landfill), AM/RAP

Evaluation Criteria	Alternative 1: No Action Area 1 through Area 6 and Site 4 AOPCs 1A and 2A: No Action	Alternative 2: Capping Area 1: Capping and Long-term Maintenance/Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Alternative 3: Existing Soil Cover Repair and Monitoring Area 1: Limited Repair of Existing Soil Cover and Groundwater Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Alternative 4: Excavation and Offsite Disposal Area 1: Excavation and Offsite Disposal Area 2: Excavation and Offsite Disposal Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal
Reduction of Toxicity, Mobility, and Volume Through Treatment				
• Treatment Processes Used and Materials Treated • Amount of Hazardous Materials Destroyed or Treated • Expected Reductions in Toxicity, Mobility, and Volume • Irreversibility of Treatment • Type and Quantity of Treatment Residual	Alternative 1 would not reduce toxicity, mobility, or volume of contaminants through treatment.	Alternative 2 does not propose removal actions that involve treatment; therefore, Alternative 2 would not reduce toxicity, mobility, or volume of contaminants through treatment.	Alternative 3 does not propose removal actions that involve treatment; therefore, Alternative 3 would not reduce toxicity, mobility, or volume of contaminants through treatment.	Alternative 4 does not propose removal actions that involve treatment; therefore, Alternative 4 would not reduce toxicity, mobility, or volume of contaminants through treatment.
Short-Term Effectiveness				
• Protection of Community During Remedial Action • Protection of Workers During Removal Action • Environmental Impacts	Under No Action, unlike the other three active alternatives, there would not be any temporary risks posed to the community, workers, or the environment. However, risks from ongoing water-seep discharges to the Perimeter Pond at Site 7 or groundwater at Site 4 AOPCs 1A and 2A continue to exist.	Under Alternative 2, excavation of Area 5 and Site 4 AOPCs 1A and 2A temporarily would pose high short-term risks to the workers and the environment (ecological receptors at the site). The short-term risk is mainly due to excavation activities occurring adjacent to a pond. The capping activity at Area 1 is likely to present low to moderate risks to the workers operating heavy equipment. In general, there would be a moderate disturbance to the community during construction due to increased traffic and dust. Significant disturbance to the existing onsite environmental habitat would occur with elimination of wetlands because of construction activities during soil placement and grading requirements for Area 1.	Under Alternative 3, excavation of Area 5 and Site 4 AOPCs 1A and 2A would temporarily pose high short-term risks to the workers and the environment (ecological receptors at the site). The short-term risk is mainly from construction activities occurring adjacent to a pond. However, the long-term groundwater monitoring action at Area 1 does not pose risks to the community, workers, or the environment during construction.	Alternative 4 would temporarily pose the greatest short-term risks to the workers and the environment (ecological receptors at the site) among the alternatives considered. In general, there would be a significant disturbance to the community during construction due to increased traffic.
• Time Until RAOs are Achieved	Alternative 1 would not achieve the RAOs; therefore, the time taken would be indefinite.	It would take approximately 0.5-year to complete the removal action under Alternative 2. However, the RAOs would be achieved only after a minimum of 5 years of periodic monitoring at Area 2.	It would take approximately 0.5 year to complete the removal actions at Areas 3 through 6 under Alternative 3. However, the RAOs would be achieved only after a minimum of 5 years of periodic monitoring at Areas 1 and 2.	It would take approximately 1.5 years to complete the removal action under Alternative 4. The RAOs would be achieved upon completion of the excavation and backfilling activities.

TABLE 2
Comparative Analysis of Removal Action Alternatives
NAVWPNSTA Seal Beach, Site 7 (Station Landfill), AM/RAP

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Existing Soil Cover Repair and Monitoring	Alternative 4: Excavation and Offsite Disposal
	Area 1 through Area 6 and Site 4 AOPCs 1A and 2A: No Action	Area 1: Capping and Long-term Maintenance/Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Limited Repair of Existing Soil Cover and Groundwater Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Excavation and Offsite Disposal Area 2: Excavation and Offsite Disposal Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal
Implementability				
• Technical Feasibility • Availability of Services and Materials	Alternative 1 would not have any technical implementability concerns because no action is being taken.	Under Alternative 2, the capping at Area 1 employs proven and demonstrated technologies and is feasible to implement. However, the excavation activity at Area 5 and Site 4 AOPCs 1A and 2A may require specialized equipment for excavation adjacent to a pond. Specialized excavation, sheetpiling, dewatering, and waste handling contractors are required; however, the required equipment and experienced contractors are widely available in Southern California.	Under Alternative 3, the long-term monitoring at Area 1 does not have any technical implementability concerns. However, the excavation activity at Area 5 and Site 4 AOPCs 1A and 2A may require specialized equipment for excavation adjacent to a pond. Specialized excavation, sheetpiling, dewatering, and waste handling contractors are required; however, the required equipment and experienced contractors are widely available in Southern California.	The excavation activity at Areas 1, 2, 5, and Site 4 AOPCs 1A and 2A require specialized equipment for excavation. Due to the large area of excavation, dewatering, backfill quantities, and waste disposal become significant issues. Specialized excavation, sheetpiling, dewatering, and waste handling contractors are required; however, the required equipment and experienced contractors are widely available in Southern California.
• Administrative Feasibility	Alternative 1 would not require any additional administration because no action is being taken.	Alternative 2 would require procedures to administer land use restrictions and regulatory approval for capping, excavation, and offsite disposal. Because the removal action involves excavation and offsite disposal of buried wastes and surface debris within the NWR, the DON would need to coordinate with the DTSC, the RWQCB, the South Coast Air Quality Management District (SCAQMD), the USFWS, the United States Army Corps of Engineers (USACE), and the California Department of Fish and Game (CDFG) during the removal action.	Alternative 3 would require procedures to administer land use restrictions, and regulatory approvals for excavation and offsite disposal. Because the removal action involves excavation and offsite disposal of buried and surface debris within the NWR, DON would need to coordinate with DTSC, RWQCB, SCAQMD, USFWS, ACOE, and CDFG during the removal action.	Alternative 4 affords clean-closure of Site 7; therefore, there would be no land use restrictions for Site 7. There may be land-use restrictions for Site 4 AOPCs 1A and 2A due to the levels of lead remaining in the soil after excavation. However, there would be extensive regulatory coordination issues for excavation and offsite disposal. Because the removal action involves excavation and offsite disposal of buried wastes, surface debris, and contaminated soil within the NWR and adjacent wetland areas, DON would need to coordinate with DTSC, RWQCB, SCAQMD, USFWS, ACOE, and CDFG during the removal action.

TABLE 2
Comparative Analysis of Removal Action Alternatives
NAVWPNSTA Seal Beach, Site 7 (Station Landfill), AM/RAP

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Existing Soil Cover Repair and Monitoring	Alternative 4: Excavation and Offsite Disposal
	Area 1 through Area 6 and Site 4 AOPCs 1A and 2A: No Action	Area 1: Capping and Long-term Maintenance/Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Limited Repair of Existing Soil Cover Groundwater Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Excavation and Offsite Disposal Area 2: Excavation and Offsite Disposal Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal
• State (or Other Support Agency) Acceptance	It is anticipated that Alternative 1 would not be acceptable to the regulatory agencies (i.e., DTSC, RWQCB, California Integrated Waste Management Board [CIWMB], USFWS, USACE, and CDFG).	It is anticipated that DTSC, RWQCB, CIWMB, USFWS, and CDFG would accept Alternative 2. However, the construction disturbance and site restoration may cause major concern. The capping at Area 1 reduces the potential risks to human and ecological receptors through direct contact. The results of the long-term monitoring at Areas 1 and 2 are expected to confirm past investigations at Site 7, that the wastes pose minimal risks to human and ecological receptors. In addition, at Areas 3 through 6, the excavation of waste material and surface debris removal would reduce risks to receptors within NWR. For Site 4 AOPCs 1A and 2A, the excavation of lead-contaminated soil above the TCG would reduce risks to receptors within NWR.	It is anticipated that DTSC, RWQCB, CIWMB, USFWS, USACE, and CDFG would accept Alternative 3. The results of the long-term monitoring at Areas 1 and 2 are expected to confirm past investigations at Site 7, that the wastes pose minimal risks to human and ecological receptors. At Areas 3 through 6, the excavation of waste material and surface debris removal would reduce risks to receptors within NWR. For Site 4 AOPCs 1A and 2A, the excavation of lead-contaminated soil above the TCG would reduce risks to receptors within NWR. Site construction activities would cause less impact than Alternatives 2 and 4. In addition, site restoration would only impact those areas disturbed during construction.	It is anticipated that DTSC, RWQCB, CIWMB, USFWS, USACE, and CDFG would accept Alternative 4. However, the construction disturbance and site restoration may cause major concern. The excavation of buried wastes and surface debris at Site 7 provides clean closure and excavation of lead-contaminated soil at Site 4 AOPCs 1A and 2A provides adequate protection of human health and the environment; therefore, this alternative would likely be the most favored alternative for regulators.
• Community Acceptance	It is anticipated that Alternative 1 may not be acceptable to the community.	The community's issues and concerns for Alternative 2 would be addressed based on public comments on the EE/CA. However, it is anticipated that the community likely would consider this alternative favorably because of the further isolation of buried wastes. One issue may be the increase in offsite traffic, noise, and dust because of the need to transport and dispose waste materials offsite. The collection of sufficient evidence to demonstrate minimal long-term risks within Area 2 also may be required. Use of railroad transport for transport of offsite waste hauling and onsite backfill would be a mitigating measure that would make traffic and noises issues less significant.	The community's issues and concerns for Alternative 3 would be addressed based on public comments on the EE/CA. However, it is anticipated that the community likely would consider this alternative favorably because of the minimal intrusive activities involved. Collection of sufficient evidence to demonstrate minimal long-term risks within Areas 1 and 2 may be required. The other issue may be the increase in offsite traffic, noise, and dust because of the need to transport and dispose waste materials offsite, although Alternative 3 involves the least amount of intrusive construction activities of the three alternatives considered. Use of railroad transport for transport of offsite waste hauling and onsite backfill would be a mitigating measure which would make traffic and noises issues less significant.	The community's issues and concerns for Alternative 4 would be addressed based on public comments on the EE/CA. However, it is anticipated that the community would likely consider this alternative favorably because it involves removal of wastes at Site 7 and lead-contaminated soil above the TCG at Site 4 AOPCs 1A and 2A. One issue may be the increase in offsite traffic, noise, and dust because of the need to transport and dispose waste materials offsite. Use of railroad transport for transport of offsite waste hauling and onsite backfill would be a mitigating measure which would make traffic and noises issues less significant.

TABLE 2
Comparative Analysis of Removal Action Alternatives
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	Area 1 through Area 6 and Site 4 AOPCs 1A and 2A: No Action	Area 1: Capping and Long-term Maintenance/Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Limited Repair of Existing Soil Cover Groundwater Monitoring Area 2: Groundwater Monitoring Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal	Area 1: Excavation and Offsite Disposal Area 2: Excavation and Offsite Disposal Area 3: Surface Debris Removal Area 4: Surface Debris Removal Area 5: Excavation and Offsite Disposal Area 6: Surface Debris Removal Site 4 AOPCs 1A and 2A: Excavation and Offsite Disposal
Cost				
Estimated Capital Costs ($ range)	$0	$4.8 million to $8.4 million	$2.1 million to $5.7 million	$17.0 million to $41.5 million
Estimated Annual Operation and Maintenance (O&M) Costs	$0	$190,000 to 226,000	$176,000 to 209,000	$38,000 to 44,000
Estimated Present Worth ($ range)	$0	**$5.0 million to $8.7 million**	**$2.3 million to $5.9 million**	**$17.1 million to $41.6 million**

Notes:

ARARs	applicable or relevant and appropriate requirements
CDFG	California Department of Fish and Game
CIWMB	California Integrated Waste Management Board
DON	Department of the Navy
DTSC	Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
NWR	National Wildlife Refuge
O&M	Operation and Maintenance
RAOs	Removal Action Objectives
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
TCGs	target cleanup goals
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

Only those state standards that are identified by the state in a timely manner and are more stringent than federal requirements may be applicable or relevant and appropriate.

There are three types of ARARs. The first includes chemical-specific requirements. This type of ARAR sets limits on the concentration of specific hazardous substances, contaminants, and pollutants in the environment. Examples of this type of ARAR are ambient water quality criteria and drinking water standards. The second type of ARAR includes location-specific requirements that restrict certain types of activity based on site characteristics. These include restrictions on activity in wetlands, floodplains, and historic sites. The third type of ARAR includes action-specific requirements. These are technology-based restrictions that are triggered by the type of action under consideration. Examples of action-specific ARARs are RCRA regulations for waste treatment, storage, and disposal.

ARARs must be identified on a site-specific basis from information about specific chemicals at the site, specific features of the site location, and actions that are being considered as removal actions.

As the lead federal agency, the DON has the primary responsibility for the identification of federal ARARs at Site 7. As the lead state agency, DTSC has the responsibility for identifying state ARARs. Requirements of ARARs and requirements that are identified by the state as "to be considered" (TBCs) are generally divided into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific, location-specific, and action-specific ARARs affecting the development of RAOs are discussed in the following section. A detailed discussion of all of the ARARs considered for this AM/RAP can be found in the Final EE/CA included as Attachment A to this document.

The DON has evaluated and concluded that no ARARs were identified for Site 4 AOPCs 1A and 2A beyond those ARARs already identified in the Site 7 EE/CA (SWDIV, 2002). The development and evaluation of the Site 7 ARARs are described in Section 3.4 of the Site 7 EE/CA (SWDIV, 2002). DTSC reviewed the DON ARAR evaluation and concurred with its conclusions; the concurrence letter can be found in Attachment A (DTSC, 2003a). ARARs previously were requested from the state for Site 7. Because the Site 4 removal action for AOPCs 1A and 2A is being conducted concurrently with the Site 7 removal action, these same ARARs will be used for Site 4 AOPCs 1A and 2A as appropriate.

Groundwater, surface water, soil, sediment, and air are the environmental media potentially affected by this removal action. The conclusions for ARARs pertaining to soil and sediment are presented in Section V.A.5., Hazardous Waste Management. Air requirements are discussed in Section V.A.5., Air Standards. Groundwater and surface water requirements are discussed in Section V.A.5., Water Quality Protection.

Hazardous Waste Management—Soil and Sediment ARARs

Analyses of representative soil and sediment samples from Site 7 have been conducted. Analytical results indicate that the soil and sediment have the potential to exceed ecological risk-based TCGs. Federal and state chemical-specific soil ARARs consist of the federally authorized RCRA and non-RCRA hazardous waste.

Federal Chemical-Specific ARARs (Soil)

California has received federal approval for its RCRA hazardous waste management program. State components that are a component of a federally authorized or delegated state program generally are considered federal requirements and potential federal ARARs for the purposes of ARARs analysis. Thus, federal and state requirements for characterizing wastes generated during the removal action will be applicable.

It is not anticipated that any wastes generated during this removal action will be "placed" onsite. Therefore, land disposal restrictions (LDRs) will not apply. LDRs will, however, be applicable in instances where wastes are placed at an offsite treatment or disposal facility.

Soil excavation is included as a potential component of this removal action. Historical information indicates the possibility of RCRA hazardous waste being disposed at Site 7, Station Landfill. Previous analytical results indicate that chemical levels in soils are well below the chemical criteria of RCRA hazardous waste; hazardous waste determination will be made at the time of excavation. The substantive provisions of the following requirements are the most stringent of the potential federal and state chemical-specific ARARs for soil at Site 7 (see Attachment A, Table A2-2 of Appendix A).

- RCRA definition of hazardous waste in CCR Title 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100
- RCRA definition of waste characterized as toxic in 40 CFR § 261.24(a) and in CCR Title 22, § 66261.24(a)(1)(B)
- RCRA groundwater protection standards in CCR Title 22, § 66264.94 except 66264.94(a)(2) and 66264.94(b)
- Definitions of designated waste, nonhazardous waste, and inert waste, CCR Title 27, § 20210, 20220, and 20230
- Waste characteristics for discharge of waste to land, CCR Title 27, Division 2, Subdivision 1 (includes CCR Title 27, Division 2, Chapter 3)

State Chemical-Specific ARARs (Soil)

Prior to disposal, a non-RCRA hazardous waste determination is needed for any contaminated soil generated by remedial actions. Under the California RCRA program, waste can be classified as non-RCRA state-only hazardous waste if it meets the following conditions, as defined in 22 CCR 66261.101 if it:

- Is not defined as an RCRA hazardous waste
- Exhibits any of the characteristics of corrosivity identified in Sections 66261.22(a)(3) and 66261.22(a)(4)
- Exhibits any of the characteristics of toxicity identified in Sections 66261.22(a)(2) through 66261.22(a)(8)

TTLC and soluble threshold limit concentration (STLC) criteria listed in Section 66261.24(a)(2) are used to determine whether contaminated soil or waste would be classified as a non-RCRA hazardous waste. A waste containing a total concentration of a constituent exceeding the concentration of the TTLC for that constituent is considered a non-RCRA hazardous waste. However, if the concentration is below the TTLC, the waste still could be considered as non-RCRA hazardous waste.

The STLC is obtained using the Waste Extraction Test (WET). Where WET data are not available, a screening approach can be used to determine whether the waste material or soil could be considered hazardous based on toxicity. Because the WET method involves a tenfold dilution of the sample, the total soil or waste concentration can be compared to 10 times the STLC, making the assumption that all of the contaminant is leachable from 1 kg of the solid to 10 kg of the liquid. If soil or waste concentrations are less than 10 times their respective STLC, then the material could not be a non-RCRA hazardous waste under these criteria. If the soil or waste concentrations are greater than 10 times their respective STLC limits, then either the material would need to be classified as a non-RCRA hazardous waste or WET testing would need to be conducted to confirm whether the concentrations are below the STLC.

Special Waste. In accordance with 22 CCR 66261.122, a generator can have a waste classified as "special" by the California DTSC if it is not a RCRA-listed or characteristic hazardous waste, if it exceeds the TTLC or STLC thresholds for inorganic constituents, and if its STLC concentration does not exceed the TTLC threshold. Waste from Site 7 may be classifiable as special, and such petition will be made to the California DTSC should analytical results indicate. Special wastes may be disposed at California Class II or Class III disposal facilities with the permission of the RWQCB responsible for those facilities.

Federal and State Chemical-Specific ARARs (Sediment)

Sediment excavation is included as a potential component of the removal action for Site 7. Historical information indicates the possibility of RCRA-listed hazardous waste being disposed at Site 7, Station Landfill. Previous analytical results indicate that chemical levels in sediments are well below the chemical criteria of RCRA-listed hazardous waste; hazardous waste determination will be made at the time of excavation. No site-specific data indicate that sediment is impacting the surface water quality. The substantive provisions of the following requirements are the most stringent of the potential federal and state chemical-specific ARARs for groundwater at Site 7 (see Table A2-2 in Appendix A of Attachment A).

- RCRA definition of hazardous waste in CCR Title 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100
- RCRA definition of waste characterized as toxic in 40 CFR § 261.24(a) and in CCR Title 22, § 66261.24(a)(1)(B)
- Definitions of designated waste, nonhazardous waste, and inert waste, CCR Title 27, § 20210, 20220, and 20230

- Waste characteristics for discharge of waste to land, CCR Title 27, Division 2, Subdivision 1 (includes CCR Title 27, Division 2, Chapter 3)

A threshold question for sediment ARARs is whether or not the sediment either in situ or excavated would be classified as RCRA hazardous waste or as non-RCRA, state-regulated, hazardous waste. Contaminated sediments that are subject to a permit that has been issued under Section 404 of the Clean Water Act (CWA) or under Section 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA, also known as the Ocean Dumping Act) are excluded from the definition of federal hazardous waste under the Dredged Material Exclusion of 40 CFR § 261.4(g). Permits under either law will govern management of sediments destined for offsite discharge into waters of the United States. Any discharge of contaminated sediments that occurs in upland areas that have no return flow to waters of the United States is not subject to the exclusion of 40 CFR § 261.4(g). (See 63 CFR § 65874 for further details.) If these sediments are determined to be hazardous waste, the appropriate RCRA requirements will apply.

RCRA Hazardous Waste and Land Disposal Restriction Requirements

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

The determination of whether a waste is RCRA hazardous waste can be made by comparing the site waste to the definition of RCRA hazardous waste. The RCRA requirements at CCR Title 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100 are potential ARARs because they define RCRA hazardous waste. A waste can meet the definition of hazardous waste if it has the toxicity characteristic of hazardous waste. This determination is made by using the toxicity characteristic leaching procedure (TCLP). The maximum concentrations allowable for the TCLP listed in CCR Title 22, § 66261.24(a)(1)(B) are potential federal ARARs for determining whether the site has hazardous waste. If the site waste has concentrations exceeding these values, it is determined to be a characteristic RCRA hazardous waste. See Attachment A Section A1.4.1 for a more complete discussion of hazardous waste determination.

RCRA LDRs at CCR Title 22, § 66268.1(f) are potential federal ARARs for discharging waste to land. This section prohibits the disposal of hazardous waste to land unless:

- It is treated in accordance with the treatment standards of CCR Title 22, § 66268.40 and the underlying hazardous constituents meet the Universal Treatment Standards at CCR Title 22, § 66268.48
- It is treated to meet the alternative soil treatment standards of CCR Title 22, § 66268.49
- A treatability variance is obtained under CCR Title 22, § 66268.44

These are potentially applicable federal ARARs because they are part of the state-approved RCRA program. RCRA treatment standards for non-RCRA, state-regulated waste are not potentially applicable federal ARARs, but they may be relevant and appropriate state ARARs.

Air Standards

Previous air monitoring conducted as part of the RI at Site 7 (i.e., soil gas, integrated surface sampling, and ambient air sampling) indicated the presence of a few VOCs (including methane) detected at concentrations significantly below those found at typical Southern California landfills. The results of migration gas sampling indicate that there is no significant migration of landfill gas. The landfill gas assessment and field procedures were performed in accordance with the State of California Air Resources Board (CARB) Testing Guidelines for Active Solid Waste Disposal Sites, as required by California HSC Section 41805.5. The California HSC requires all active disposal sites to conduct tests and measurements to determine the composition of landfill gases, the presence of specified air contaminants in the ambient air, and whether offsite subsurface migration of landfill gas is occurring.

Air quality monitoring will be conducted as part of the removal action. Removal action activities involving excavation will implement standard dust control measures to minimize fugitive dust emissions and will have odor control foams as a precaution.

Federal Chemical-Specific ARARs

The Clean Air Act (CAA) establishes the National Ambient Air Quality Standards (NAAQS) in 40 CFR § 50.4-50.12. NAAQS are not enforceable in and of themselves; they are translated into source-specific emissions limitations by the state EPA. Substantive requirements of the South Coast Air Quality Management District (SCAQMD) rules that have been approved by EPA as part of the State Implementation Plan (SIP) under the CAA are potential federal ARARs for air emissions (CAA Section 110). The SIP includes rules for emission restrictions on particulates, organic compounds, and hazardous air pollutants and standards of performance for new sources. No federal air ARARs have been identified for this removal action.

State Chemical-Specific ARARs

RCRA requirements for non-RCRA, state-regulated hazardous wastes and SCAQMD rules are described below.

State RCRA requirements included within the EPA-authorized RCRA program for California are considered to be potential federal ARARs. When state regulations are broader in scope than their federal counterparts, they are considered potential state ARARs. State requirements such as the non-RCRA, state-regulated hazardous waste requirements may be potential state ARARs because they are not within the scope of the federal ARARs (57 CFR 32726[1992]).

SCAQMD Rules 401, 403, 404, 405, 407, 408, 431.1, 431.2, and 431.3 in Regulation IV, and Rule 1150 in Regulation XI were identified by the state as ARARs for the potential air emissions at Site 7. These are not potential federal ARARs because they are not included in the SIP.

The DON considers these rules applicable to this removal action at Site 7. Fugitive dust controls will be implemented during the removal action to comply with these rules.

Water Quality Protection—Groundwater

At Site 7, shallow groundwater shows low levels and infrequent detections of COPCs, including VOCs, SVOCs, pesticides, metals, asbestos, and cyanide; therefore, no chemicals of concern were identified for groundwater. However, ARARs were still identified for groundwater at Site 7 because they could be potentially applicable or relevant and appropriate if higher levels of COPCs are detected. Historical information indicates the possibility of RCRA hazardous waste being disposed at Site 7, Station Landfill.

The substantive provisions of the following requirements are the most stringent of the potential federal and state chemical-specific ARARs for groundwater at Site 7 (see Attachment A, Appendix A, Tables A2-2 and A2-3):

- RCRA definition of hazardous waste in CCR Title 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100
- RCRA definition of waste characterized as toxic in 40 CFR § 261.24(a) and in CCR Title 22, § 66261.24(a)(1)(B)
- RCRA groundwater protection standards in CCR Title 22, § 66264.94 except 66264.94(a)(2) and 66264.94(b)
- Water Quality Control Plan (WQCP) for the Santa Ana Region (RWQCB, 1995): (establishes water quality objectives [WQOs], beneficial uses, waste discharge limitations), Chapters 4 and 5
- State Water Resources Control Board (SWRCB) Resolution (Res.) 68-16, Res. 88-63, and Res. 89-42
- Porter-Cologne Water Quality Control Act, California Water Code (CWC) §§ 13241, 13243, 13263(a), 13269, and 13360
- Waste characteristics for discharge of waste to land, CCR Title 27, Division 2, Subdivision 1 (includes CCR Title 27, Division 2, Chapter 3)

Federal Chemical-Specific ARARs

One of the significant issues in identifying ARARs for groundwater under the Safe Drinking Water Act (SDWA) and RCRA is whether the groundwater at the site can be classified as a source of drinking water. EPA groundwater policy is set forth in the preamble to the NCP (55 CFR 8666, 8752–8756 [1990]). This policy uses the groundwater classification system set forth in the draft *EPA Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy* (EPA, 1986). Under this policy, groundwater is classified in one of three categories (Class I, II, or III), based on ecological importance, replaceability, and vulnerability considerations. Irreplaceable groundwater that currently is used by a substantial population or groundwater that supports a vital habitat is considered to be Class I. Class II consists of groundwater that currently is being used or that might be used as a source of drinking water in the future. Groundwater that cannot be used for drinking water due to insufficient quality (e.g., high salinity or widespread, naturally occurring contamination) or quantity is considered to be Class III. The EPA guidelines define Class III groundwater as groundwater with TDS concentrations over 10,000 mg/L and a yield of less than 150 gallons per day (EPA, 1986). Class III groundwater also can be classified based on economic or technological treatability tests as well as quality or quantity (both criteria are not needed, just one or the other).

For aquifers with Class III characteristics, maximum contaminant limits (MCLs) are neither applicable nor relevant, are not RCRA Hazardous Waste appropriate, and are not used to determine preliminary response action goals (EPA, 1986; 55 CFR 8666, 8750–8754 [1990]).

The aquifer underlying Site 7 at NAVWPNSTA Seal Beach (Santa Ana Pressure Sub-basin) is classified by EPA as a Class III aquifer and is designated by RWQCB Santa Ana Region as water that cannot be used for drinking water due to the fact that underlying shallow groundwater is saline to hypersaline and yield is less than 150 gallons per day.

According to the Water Quality Control Plan for the Santa Ana River Basin, the Santa Ana Pressure Sub-basin is designated as having the following beneficial uses: Municipal and domestic supply, agricultural supply, and industrial service and process supply. These beneficial-use designations are assigned to all areas of the sub-basin. The RWQCB Santa Ana Region recognizes, however, that the uppermost groundwater zone in this area is unlikely to be used as a source of drinking water because of its poor mineral quality and low yield.

State Chemical-Specific ARARs

The state has identified the following ARARs for groundwater cleanup at the site:

- California Water Code §§ 13260-13274 (Division 7, Chapter 4, Article 4)
- Porter-Cologne Water Quality Control Act, CWC §§ 13241, 13243, 13263(a), 13269, and 13360 (identified as an action-specific ARAR, but included here for convenience)
- *Comprehensive Water Quality Plan for the Santa Ana Basin*, Chapters 4 and 5 (RWQCB, 1995)
- SWRCB Res. 68-16 and Res. 92-49
- SWRCB Res. 88-63 and Res. 89-42 (identified as location-specific ARAR, but included here for convenience)

- County of Orange, Public Facilities and Resources Department, California RWQCB, Santa Ana Region, Order No. R8-2002-0007, National Pollutant Discharge Elimination System (NPDES) Permit No. CAG918001, for the discharge of treated groundwater and SWRCB Water Quality No. 97-03-DWG, NPDES General Permit No. CAS000001 for discharge of stormwater associated with industrial activities
- CCR Title 27, Division 2, Chapter 3
- CCR Title 27, Division 2, Subdivision 1

Water Quality Protection—Surface Water

Discharge to surface water is included as an element of a potential response action for Site 7. Potential federal and state ARARs for surface water are detailed in the following subsections.

Federal Chemical-Specific ARARs

Safe Drinking Water Act

There are no surface waters at or near Site 7 that are potential sources of drinking water.

Water Quality Standards

On 22 December 1992, EPA promulgated federal water quality standards under the authority of the federal CWA Section 303(c)(4)(B), 33 U.S.C., Chapter 26, § 1313, in order to establish water quality standards required by the CWA where the state of California and other states had failed to do so (57 CFR 60848 [1992]). These standards have been amended over the years in the *Federal Register* including the amendments of the National Toxics Rule (60 CFR 22228 [1995]). The water quality standards, as amended, are codified at 40 CFR § 131.36. The water quality standards contained in 40 CFR § 141.36(a) are potential applicable federal ARARs for discharge to or cleanup of surface water. Additional and revised water quality standards for salinity for the San Francisco Bay / Sacramento-San Joaquin Delta Estuary were codified in 40 CFR § 131.37.

EPA promulgated a rule on 18 May 2000 to fill a gap in California water quality standards that was created in 1994 when a state court overturned the state's water quality control plans that contained water quality criteria for priority toxic pollutants. The rule is commonly called the California Toxics Rule (CTR) and is codified at 40 CFR § 131.38. These federal criteria are legally applicable in the state of California for inland surface waters and enclosed bays and estuaries for all purposes and programs under the CWA. They are also potential applicable requirements for groundwater that discharges to surface waters (see Attachment A, Appendix A, Section A2.2.1.1).

These standards of the CTR apply to the state's designated uses and supersede any criteria adopted by the state, except when state regulations contain criteria that are more stringent for a particular use in which case the state's criteria will continue to apply.

Other CWA Requirements

CWA 301(b) requires that all direct dischargers meet technology-based requirements including the best control technology (BCT) and the best available technology (BAT) economically achievable. These requirements are made on a case-by-case basis using best professional judgment.

Federal Ambient Water Quality Criteria

Section 304(a)(1) of the CWA (33 U.S.C. § 1314[a][1]) directs EPA to publish and to periodically update ambient water quality criteria. The FAWQC are updated in the *Federal Register.* The latest list of the National Water Quality Criteria through June 2000 was published in the *Federal Register* on 10 December 1998 with amendments in 64 CFR 19781 (1999). If criteria are not listed for a pollutant, EPA does not have any national recommended water quality criteria.

These criteria are to reflect the latest scientific knowledge on the identifiable effects of pollutants on public health and welfare, aquatic life, and recreation. These criteria serve as guidance to states in adopting water quality standards under Section 303(c) of the CWA that will protect human life and aquatic life from acute and chronic effects.

FAWQC may be potentially relevant and appropriate for surface water depending on the designated use and whether the criteria are intended to be protective of that use. FAWQC may be used to establish cleanup goals for surface water that is considered a potential source of drinking water only in the absence of promulgated MCLs or maximum contaminant level goal (MCLGs). However, if the designated beneficial use of the surface water requires protection of aquatic life, the FAWQC may be more stringent than the MCL, MCLG, or other cleanup standard for sources of nondrinking water. The more stringent standard would be the controlling ARAR.

FAWQC are not ARARs; no groundwater discharges to surface water will occur during the removal action. Although water seeps have been observed in Area 5 of Site 7, eliminating the source of these water seeps (i.e., excavating and backfilling the trenches in Area 5) will discontinue further groundwater discharge to surface water.

State Chemical-Specific ARARs

Comprehensive Water Quality Control Plan for Santa Ana Basin (Basin Plan)

The substantive provisions of the Basin Plan for the Santa Ana Region (RWQCB, 1995) at Chapters 4 and 5 are potential state ARARs for cleanup of or discharges to surface water.

SWRCB Res. 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California

SWRCB Res. 68-16 is not an ARAR for cleanup of already impacted surface water. This policy may be a potential state ARAR for discharges to surface waters that result from the removal action.

SWRCB Res. 92-49, Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under CWC § 13304

The DON has determined that the substantive provisions of this policy are no more stringent than federal ARARs at CCR Title 22, § 66264.94. See Attachment A,

Appendix A, Section A2.2.1.2 for further discussion that applies to surface water as well.

SWRCB Res. 88-63, Sources of Drinking Water

SWRCB Res. 88-63 states that sources of water that contain TDS exceeding 3,000 mg/L (or having electrical conductivity of greater than 5,000 micromhos per centimeter) or a yield of less than 200 gallons per day are not reasonably expected by the RWQCBs to supply a public water system. The substantive provisions of SWRCB Res. 88-63 are potential state ARARs for surface water that is a source of drinking water.

NPDES Permit Requirements

The SWRCB and RWQCB can issue general permits in accordance with the CWA for discharges to surface water. CERCLA response actions are not subject to permit requirements as provided under CERCLA § 121(e) (42 U.S.C. § 9621[e]).

The DON will comply with substantive effluent limitations of RWQCB, Santa Ana Region, Order No. 96-31, NPDES Permit No. CAS618030 as a means of demonstrating compliance with other state water quality ARARs identified in this document. Therefore, the substantive provisions of RWQCB, Santa Ana Region, Order No. 96-31, NPDES Permit No. CAS618030, page 7, item 23 are TBCs for this removal action.

Location-Specific ARARs

Potential federal and state location-specific ARARs are identified and discussed in the following sections. The discussions are presented based upon various attributes of the site location.

Federal Location-Specific ARARs

Pertinent and substantive provisions of the following potential ARARs were reviewed to determine whether they were potential federal ARARs for this removal action.

- 40 CFR Part 6, 6.302 and Attachment A (excluding Sections 6[a][2], 6[a][4], and 6[a][6]) (EO 11988 Protection of Floodplains and EO 11990 Protection of Wetlands)
- 36 CFR Part 65 (National Archaeological and Historical Preservation Act)
- 36 CFR Part 800 (National Historic Preservation Act, Section 106)
- 16 U.S.C. Section 1536(a) (Endangered Species Act of 1973)
- 40 CFR 230.10, 231, 231.1, 231.2, 231.7, and 231.8 (CWA Section 404)
- 50 CFR Section 35.1 et seq. (Wilderness Act)
- 50 CFR Part 27 (National Wildlife Refuge System)
- 16 U.S.C. Section 662 (Fish and Wildlife Coordination Act)
- 16 U.S.C. 1271 et seq. and Section 7(a) (Wild and Scenic Rivers Act)
- 16 U.S.C. Section 307(c) and Section 1456(c); 15 CFR Part 930 and Section 723.45 (Coastal Zone Management Act)

- 16 U.S.C. 3504 (Coastal Barrier Resource System)
- 16 U.S.C. 461-467 (Historic Site, Buildings, and Antiquities Act)
- 33 U.S.C. 403 (Rivers and Harbors Act of 1890)
- 16 U.S.C. Section 703 (Migratory Bird Treaty Act of 1972)
- 16 U.S.C. Section 1372(2) (Marine Mammal Protection Act)
- 16 U.S.C. Section 1801 et seq. (Magnuson Fishery Conservation and Management Act)

Determinations of status for location-specific ARARs were generally based upon consultation of maps or lists included in the regulation or prepared by the administering agency. Specific issues concerning some of the requirements are discussed in the following sections. The ARARs identified as applicable are discussed below.

Protection of Wetlands, EO No. 11990

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

Portions of Site 7 and the adjacent Site 4 AOPCs 1A and 2A meet the definition of "wetland." The remediation contractor will include the substantive requirements of typical USACE 404 permits in their construction activities to prevent degradation or damage to the adjacent wetland areas.

Floodplain Management, EO No. 11988

Under 40 CFR § 6.302(b), federal agencies are required to evaluate the potential effects of action they may take in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain.

The areas in Site 7 and the adjacent Site 4 AOPCs 1A and 2A are within a potential floodplain; however, this removal action will not adversely impact the floodplain because the site will be restored following the removal action.

Clean Water Act (33 U.S.C. § 1344)

The areas in Site 7 and the adjacent Site 4 AOPCs 1A and 2A are within a potential floodplain; however, this removal action will not adversely impact the location. A portion of the site is located within a wetland; therefore, the remediation contractor will include the substantive requirements of typical USACE 404 permits in their construction activities to prevent degradation or damage to the adjacent wetland areas. Section 404 of the CWA governs the discharge of dredged and fill material into waters of the United States, including adjacent wetlands. Wetlands are areas that are inundated by water frequently enough to support vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mudflats, natural ponds, and similar areas. Both EPA and the USACE have jurisdiction over wetlands. EPA Section 404 guidelines are promulgated in 40 CFR § 230, and the USACE guidelines are promulgated in 33 CFR § 320.

Discharge of dredged or fill material to a wetland is not planned as part of this removal action.

Endangered Species Act of 1973

The Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531–1543) provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction. The ESA defines an endangered species and provides for the designation of critical habitats. Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. Under Section 7(a) of the ESA, federal agencies must carry out conservation programs for listed species. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented. Consultation regulations at 50 CFR § 402 are administrative in nature and, therefore, are not ARARs. However, they may be TBCs to comply with the substantive provisions of the ESA.

Table A3-1 in Appendix A of Attachment A lists federal requirements for the protection of threatened and endangered species that are potential ARARs for CERCLA actions at NAVWPNSTA Seal Beach. The rare, threatened and endangered species, and species of special concern are reported in Section 2.5.4 of the Final EE/CA report for this removal action (see Attachment A).

Seven species of birds known to be residents or migrants at NAVWPNSTA Seal Beach are listed by either federal or state agencies, or both, as threatened or endangered. They include the California brown pelican (*Pelicanus occidentalis californicus*), Swainson's hawk (*Buteo swainsoni*), peregrine falcon (*Falco peregrinus anatum*), Aleutian Canada goose (*Branta canadensis leucopareia*), western snowy plover (*Charadrius alexandrinus nivosus*), California least tern (*Sterna antillarum browni*), and Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) (Recon, 1997). Because of the rapidly disappearing habitat on the coast of Southern California, two species of federally listed endangered birds, the California least tern and the light-footed clapper rail, rely on the Seal Beach NWR tidal salt marsh habitat for their nesting grounds.

The results of past ecological assessments indicate that there is a potential threat to aquatic ecological receptors along the eastern shoreline of Perimeter Pond adjacent to Site 7. Surface soil samples collected from Site 4 AOPCs 1A and 2A along the southern extent of Site 7 show elevated lead concentrations at certain locations that may pose a potential threat to terrestrial wildlife. However, federally listed endangered species probably use Site 7 and adjacent areas to some extent; the DON will coordinate with USFWS during the planning and implementation of the removal action. The removal action is expected to mitigate potential threats to endangered species.

Migratory Bird Treaty Act of 1972

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

Migratory birds have been observed at NAVWPNSTA Seal Beach, but the removal action is not expected to impact the migratory bird. The breeding season at the NWR is typically between 31 March and 15 September; the removal action is expected to be implemented outside of the breeding season. The removal action is expected to mitigate potential threats from Site 7 to wildlife. Dust will be controlled during implementation of the removal action.

National Wildlife Refuge System Administration Act of 1966

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

The NWR System Administration Act contains the following substantive requirements that are potential ARARs. The act prohibits any person from disturbing, injuring, cutting, burning, removing, destroying, or possessing any property within any area of a wildlife refuge. The act also prohibits the taking or possessing of any fish, bird, mammal or other wild vertebrate or invertebrate animals, or nest or eggs within any refuge area or otherwise occupying any such area unless such activities are done with a permit or permitted by express provision of law. The act also regulates the use of audio equipment as well as motorized vehicles, aircraft, and boats in wildlife refuges. It prohibits construction activities, disposal of waste, and the introduction of plants and animals into any wildlife refuge. The prohibitions under the act are codified at 50 CFR § 27.

A portion of Site 7 extends approximately 700 feet into the Seal Beach NWR and Site 4 AOPC 1A is located within the NWR. Following the removal action, the excavation will be restored to surrounding grade using clean backfill material and will be revegetated with native plant species. The removal action potentially could disturb breeding Belding's savannah sparrows and light-footed Clapper rails that nest in the area. Both species' breeding seasons are from about March through August at NAVWPNSTA Seal Beach. Timing the removal action to coincide with nonbreeding periods (i.e., September through February) will eliminate the potential for harming these endangered species.

State Location-Specific ARARs

The following are potential state location-specific ARARs for this removal action.

- Title 22 CCR 66264.18 (a), (b), and (c) (Hazardous Waste Control Act)
- California Water Code §§ 13260-13274 (Division 7, Chapter 4, Article 4)
- SWRCB Res. 68-16 and Res. 92-49
- SWRCB Res. 88-63 and Res. 89-42

- CCR Title 27, §§ 20950, 22207(a), 22212(a), and 22222
- CCR Title 27, §§ 20385-20435
- CCR Title 27, § 21090
- CCR Title 27, §§ 20385, 20390, and 20395
- CCR Title 27, Division 2, Chapter 3
- CCR Title 27, Division 2, Subdivision 1
- County of Orange, Public Facilities and Resources Department, OCC Sections 6-1-122, 6-3-41, and 6-4-377

Several of these were not determined to be ARARs for this removal action: SWRCB Res. 92-49 is not more stringent than a federal ARAR; only specific sections of CWC §§ 13260-13274 (Division 7, Chapter 4, Article 4) were determined to be ARARs; only specific sections of CCR §§ 20385-20435 were determined to be ARARs; and County of Orange, Public Facilities and Resources Department, OCC Sections 6-1-122, 6-3-41, and 6-4-377.

California Endangered Species Act

The list of plants and animals of California declared to be endangered are found in CCR Title 14, §§ 670.2 and 670.5. These requirements are not a "cleanup standard, standard of control," or "other substantive requirement, criteria, or limitation" (CERCLA § 121, 42 U.S.C. § 9621). Therefore, CCR Title 14, §§ 670.2 and 670.5 are not potential ARARs. The lists are incorporated by reference into other potential state ARARs (e.g., California Fish and Game Code § 2080).

The state identified §§ 2090-2096 as TBC. These sections are not effective after January 1994, but will be evaluated as TBC.

California Fish and Game Code

The state identified the following sections as potential ARARs: §§ 1600; 1601; 1603; 2014; 2080; 5650(a), (b), and (f); 3005; and the Commission Wetlands Policy. Sections 1600, 1601, 1603, and the Commission Wetlands Policy were determined not to be ARARs; Section 1600 and the Commission Wetlands Policy as TBCs (see Table A3-2 in Appendix A of Attachment A). The other four sections were determined to be potentially relevant and appropriate for the protection of aquatic and wildlife species/habitats.

Action-Specific ARARs

Action-specific ARARs are technology-based restrictions that are triggered by the type of action under consideration, in this case the capping of areas, excavation, and offsite disposal of inert debris at Site 7 and excavation and offsite disposal of lead-contaminated soil at Site 4 AOPCs 1A and 2A.

Federal Action-Specific ARARs

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

RCRA

Site 7 would not be classified as a hazardous waste landfill because there is no record of RCRA hazardous waste disposal. However, because some of the wastes in these landfills may contain hazardous constituents, certain provisions of RCRA may be relevant and appropriate for landfill closure.

The RCRA landfill closure requirements (CCR Title 22, § 66264.111 and 66264.310) are general performance standards that eliminate the need for further maintenance and control and eliminate postclosure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. The grading conducted for the capping / cover options at Site 7 does not constitute placement or disposal under RCRA. Therefore, the generator requirements for hazardous waste determinations contained in CCR Title 22, § 66262.10(a) and 66262.111 are not triggered.

Criteria for Municipal Waste Landfills, 40 CFR § 258

Landfill closure requirements for municipal waste landfills are set forth in 40 CFR § 258, Subpart F. Because Site 7 did not receive wastes after the effective date of these requirements (09 October 1991), these requirements would not be applicable. However, the substantive portions of these requirements would be considered potentially relevant and appropriate because Site 7 received domestic wastes from NAVWPNSTA Seal Beach similar or identical to wastes managed in municipal solid waste landfills.

Provisions in 40 CFR § 258.60(a) and (b) require that the final cover system be designed to minimize infiltration and erosion. This section provides specific technical standards for cover design but allows for alternative cover designs if it is demonstrated that the alternative designs will achieve the same level of performance.

Section 258.61 requires postclosure maintenance for 30 years unless it can be demonstrated that a shorter or longer period of maintenance is required. If it can be demonstrated that the site poses no threat to public health and safety or to the environment, the postclosure maintenance period may be eliminated.

State Action-Specific ARARs

State requirements that are potential ARARs for capping / cover actions at Site 7 are described in the following sections.

Capping

Under CCR Title 22, § 66264.310(a)(7), a variance is allowed from any of the prescriptive cap requirements as long as it is demonstrated that the prescriptive cap is not necessary to protect public health, water quality, or other environmental quality.

Under CCR Title 27, § 20080(b) and Title 23, § 2510(b), engineered alternatives to the prescriptive landfill cover are allowed when the discharger can demonstrate that the construction or prescriptive standard is not feasible and there is a specific engineered alternative. The specific engineered alternative must be consistent with the performance goal addressed by the particular construction or prescriptive standard and must afford equivalent protection against water quality impairment. Under CCR Title 27, § 20080(c) and Title 23, § 2510(c), to demonstrate that compliance with prescriptive standards is not feasible, the discharger shall demonstrate that compliance with a prescriptive standard either: (1) is unreasonably and unnecessarily burdensome and will cost substantially more than engineered alternatives; or (2) is impractical and will not promote attainment of applicable performance standards considering all relevant technical and economic factors. These factors include present and projected costs of compliance, potential costs for response action in the event that waste or leachate is released to the environment, and the extent to which groundwater resources could be affected.

Under CCR Title 27, § 21090, the RWQCB can allow any alternative final cover that it finds will continue to isolate the waste and irrigation at least as well as would a final cover that is built in accordance with applicable prescriptive standards.

Landfill closure and postclosure requirements are contained in 40 CFR § 258 and CCR Titles 22, 23, and 27. Because the landfill addressed in this AM/RAP ceased operation prior to the effective date of any of these four sets of similar but not identical regulations, they are not "applicable" ARARs. Therefore, the DON reviewed them to determine whether any of the regulations were potentially "relevant and appropriate" ARARs. Because these regulations contain overlapping requirements, a table that compares 40 CFR § 258 and CCR Titles 22, 14, and 23 and identifies the most stringent or controlling ARARs is included as Table A4-4 in Appendix A of Attachment A. The purpose of this table is to facilitate identification of ARARs for removal action. When federal and state regulations were considered to be equally stringent, federal regulations were selected as controlling ARARs. The table contained in the Final EE/CA report that reflects the promulgation of CCR Title 27 and repeal of portions of Titles 14 and 23 is shown as Table A4-4 in Appendix A of Attachment A. The controlling action-specific ARARs are also identified in Table A4-4 in Appendix A of Attachment A.

Capping or covering of the landfill was evaluated for Site 7. Federal and state requirements for landfill closure are the primary sources of ARARs for this action.

Solid Waste Management and Capping (CCR Title 27, Division 2)

The following regulations were identified as potential ARARs for Alternative 2: CCR Title 27, division 2, subdivision 1, §§ 20650; 20820; 21130; 21090; 20210; 20220; 20230; 20950(a), (d), (e); 21769, 20090(d), 20950, 22207(a), 22212(a), and 22222. See Table A4-2 in Appendix A of Attachment A for ARAR determination.

South Coast Air Quality Management District Requirements

The removal action for Site 7 needs to comply with SCAQMD requirements. Requirements that have not been incorporated into the SIP are considered to be state ARARs. The following rules were identified as potential ARARs: SCAQMD Rules 401, 403, 404, 405, 407, 408, 431.1, 431.2, and 431.3 in Regulation IV; and Rule 1150 in Regulation XI.

California Fish and Game Code

The following regulations were identified as potential ARARs for Alternative 2: California Fish and Game Code §§ 2014; 2080; 3005, and 5650(a), (b), and (f). See Table A4-2 in Appendix A of Attachment A for ARAR determination.

Landfill/Waste Management Closure Requirements

The following regulations were identified as potential ARARs for Alternative 2: CWC §13176; Chapter 4, Article 4; Chapter 5, Article 1; SWRCB Order No. 97-03-DWQ. See Table A4-2 in Appendix A of Attachment A for ARAR determination.

Groundwater Monitoring

Federal and state requirements that pertain to groundwater monitoring for corrective action programs are described in the following sections.

Federal and State ARARS

Portions of the RCRA groundwater protection standards contained in CCR Title 22 are considered to be relevant and appropriate for the groundwater potentially impacted by releases from Site 7 because the hazardous constituents being addressed by this action are similar or identical to those found in RCRA hazardous wastes. In addition to concentration limits for groundwater, CCR Title 22, § 66264.100 requires that a water quality monitoring program be established to demonstrate the effectiveness of a corrective action program (CAP). Substantive provisions of the following requirements apply to the development and implementation of a monitoring program.

- Constituents of concern (CCR Title 22, § 66264.93)
- Concentration limits (CCR Title 22, § 66264.94)
- Monitoring points and points of compliance (CCR Title 22, § 66264.95)
- Monitoring parameters (CCR Title 22, § 66294.98)
- Statistical method for detecting a release (CCR Title 22, § 66264.97[e])
- Method for determining background (CCR Title 22, § 66264.97[e][11])

RCRA requirements for identification and management of solid and hazardous wastes are also potential federal action-specific ARARs identified. Soil cuttings and water generated in the course of installing and developing monitoring wells would be subject to RCRA requirements at CCR Title 22, § 66262.10(a) and § 66262.11 to determine whether such wastes should be classified as hazardous.

The DON has determined that soil and water for the development of wells at Site 7 would not be classified as RCRA-listed hazardous wastes. However, testing would still be required to classify these materials with respect to the RCRA hazardous waste characteristics. This determination would be made at the time the waste is generated. The appropriate requirements outlined in Table A4-1 in Appendix A of Attachment A for storing, manifesting, and transporting this material for final disposal would need to be followed only in the unlikely event that the soil cuttings and water from the development of wells are found to be classified as RCRA-characteristic hazardous wastes.

The soil cuttings and water generated from the development of wells also would be subject to state action-specific requirements to determine if these materials are non-RCRA hazardous waste. The appropriate management requirements of CCR Title 22, § 66264 would be followed should the testing unexpectedly classify these materials as non-RCRA hazardous waste.

Potential federal ARARs identified for groundwater monitoring include: CCR Title 22, §§ 66264.91 (a) and (c); 66264.95; 66264.97; 66264.98; 66264.99; 66264.100(a), (b), (c), (d), (g)(1) and (3). See Table A4-2 in Appendix A of Attachment A for ARAR determination.

State ARARs

The DTSC and RWQCB Santa Ana Region identified the following requirements for the development of a CAP monitoring program for landfill closure.

- Constituents of concern (CCR Title 27, § 20395 and Title 23, § 2550.3)
- Concentration limits (CCR Title 27, § 20400 and Title 23, § 2550.4)
- Monitoring points and points of compliance (CCR Title 27, § 20405 and Title 23, § 2550.5)
- Compliance period (CCR Title 27, § 20410 and Title 23, § 2550.8)
- Statistical method for detecting a release (CCR Title 27, § 20415[e] and Title 23, § 2550.7[e])
- Detection monitoring program (CCR Title 27, § 20420)
- Method for determining background (CCR Title 27, § 20415[e][10] and Title 23, § 2550.7[e][11])
- Corrective action monitoring (CCR Title 27, § 20430)

The DON has reviewed these provisions and has determined that they are identical to the corresponding CCR Title 22 sections cited above as potential federal ARARs, except for the more prescriptive sampling requirements found at CCR Title 23, § 2550.7(e)(12)(B). The DON accepts the substantive provisions of the more prescriptive requirements of CCR Title 23, § 2550.7(e)(12)(B) as potential state ARARs. See Table A4-3 in Appendix A of Attachment A for comparison of monitoring ARARs for CCR Title 22, 23, and 27.

Additional potential state ARARs identified for groundwater monitoring include the substantive provisions of the following: 40 CFR § 131.12; Chapters 3, 4, and 5 of the Santa Ana Regional Water Quality Control Board Basin Plan; SWRCB Res. 68-16; CWC, Division 7, Chapter 3, §§ 13240, 13241, 13242, 13243, 13263(a), 13360, and 13140; Chapter 4, Article 4; Chapter 10, Article 3; CCR Title 27, § 20080(g).

Excavation and Temporary Storage of Waste

Federal and State ARARs

If, based on the hazardous waste determination described under federal chemical-specific ARARs discussion, wastes are determined to be hazardous under RCRA, substantive requirements of CCR Title 22, § 66262.34 (pertaining to hazardous waste accumulation) will be applicable (or relevant and appropriate if waste does not meet the definition of hazardous waste but is similar to RCRA hazardous waste). The proposed removal action involves stockpiling excavated materials while waste characterization is performed. As such, the substantive requirements of CCR Title 22, §§ 66264.251, 66264.258(a) and (b), 66264.111, and 66264.114 (pertaining to the control of runon, runoff, and closure of waste piles) are relevant and appropriate requirements for the temporary storage of stockpiled materials. In addition, substantive requirements of 49 CFR §§ 171.2(f), 172.300, 172.302, 172.303, 172.304, 172.400, and 172.504 (pertaining to the Department of Transportation requirements for transport of hazardous materials) would be relevant and appropriate for transport of materials offsite.

If the excavated soil is determined to be neither RCRA nor non-RCRA hazardous waste, a designated waste determination must be made prior to disposal in accordance with the substantive provisions of CCR Title 27, § 20200. Temporary stockpiling of excavated materials while waste characterization is performed may be required.

South Coast Air Quality Management District Requirements

Fugitive dust may be generated during the excavation and handling of the contaminated soil. The removal action needs to comply with the SCAQMD requirements. Requirements that have not been incorporated into the SIP are considered to be state ARARs. The following rules were identified as potential ARARs: SCAQMD Rules 401, 403, 404, 405, 407, 408, 431.1, 431.2, and 431.3 in Regulation IV; and Rule 1150 in Regulation XI. See Table A4-2 in Appendix A of Attachment A for ARAR determination.

California Fish and Game Code

The following regulations were identified as potential ARARs for landfill capping and closure for Alternative 2: California Fish and Game Code §§ 2014; 2080; 3005, and 5650(a), (b), and (f). See Table A4-2 in Appendix of Attachment A for ARAR determination.

Disposal to Land

When disposing waste to land the following regulations should be evaluated as potential ARARs.

- RCRA LDRs at CCR Title 22, § 66268.40 (e.g., RCRA LDRs may be triggered when hazardous waste is treated and waste is placed in an onsite landfill)
- Universal treatment standards at CCR Title 22, § 66268.48
- LDRs at 40 CFR § 258; CCR Title 22, § 66264.250; CCR Title 23, Division 3, Chapter 15; and CCR Title 27, Division 2 Subdivision 1
- State land disposal restrictions at California HSC § 25157.8

If the contaminated soil is determined to be a hazardous waste, it must be disposed in a landfill that meets the design and operating requirements of CCR Title 22, § 66264.300–.310. Additionally, if it is classified as RCRA hazardous waste, the soil will be subject to the LDRs established in CCR Title 22, § 66268.40

(for RCRA hazardous waste) or CCR Title 22, § 66268.105 (for non-RCRA hazardous waste). These standards must be attained prior to land disposal of the waste.

If the soil is determined to be nonhazardous but it contains pollutants that could be released and cause degradation of groundwater, state regulations regarding waste discharge to land (CCR Title 27, Division 2, Subdivision 1) may be ARARs. CCR Title 27, § 20240 of these regulations require designated waste to be discharged only to approved waste management units.

Institutional Controls

Institutional controls are required to maintain the integrity of the landfill by preventing excavations or increased infiltration of surface waters, preventing land use that presents unacceptable risk to human health due to residual contamination, preventing use of groundwater that may be affected from soil contamination, protecting groundwater monitoring equipment, and preserving access to the sites and associated monitoring equipment for the DON and the FFSRA signatories. Such institutional controls shall consist of land-use restrictions designed to protect the landfill remedy. It is important to note that Site 7 will not be transferred to a nonfederal agency.

6. Project Schedule

The removal action is expected to begin November 2003 and is expected to be completed by December 2003.

B. Estimated Costs

The estimated cost of the Alternative 3 removal action is based on a 5-year present-worth analysis summarized as follows:

Estimated Capital Cost: $2.1 to 5.7 million
Estimated Annual Operation and Maintenance Cost: $176,000 to 209,000
Estimated Removal Action Total (Present Worth): $2.3 to 5.9 million

Table 3 presents a summary of costs by major task and areas.

VI. Expected Change in the Situation Should Action Be Delayed or Not Taken

If action should be delayed or not taken, potential exposure of ecological receptors to lead, silver, DDT and metabolites, and Aroclor 1254 that exceeded the screening concentrations may occur. Also, aquatic organisms in the immediate vicinity of water seeps may be exposed intermittently to elevated levels of copper, lead, nickel, and zinc. Concentrations of pesticides in mussel tissue exceed NOAEL for those pesticides in birds and indicate possible risks to birds consuming large amounts of food from the area.

VII. Public Involvement

The RAB members and regulatory agencies reviewed the Site 7 EE/CA and the addendum. The Draft EE/CA was released for review by the RAB members and regulatory agencies for comments between 29 October 2001 and 6 February 2002. The Final EE/CA and Response to Comments was released 23 May 2002. A Draft Addendum to the EE/CA was released for review by the RAB members and regulatory agencies for comments between 21 May 2003 and 21 June 2003. The Final Addendum was released 31 July 2003 (Appendix F of Attachment A). The response to comments is provided in the Appendix E of the Final EE/CA.

VIII. Outstanding Policy Issues

None

IX. Recommendation

To date, the DON has not acquired evidence identifying other potentially responsible parties (PRPs) at this site. However, information acquired in the future including, but not limited to, information acquired during the implementation of the removal action or future response actions at the site could result in the identification of other PRPs.

This Action Memorandum was prepared in accordance with current EPA and Navy guidance documents for NTCRAs under CERCLA. Information supporting the Action Memorandum is based on site conditions and background information collected from previous field investigations at and adjacent to Site 7 since 1985 and analytical data collected as part of seven investigations since 1990. The previous investigations were discussed in Section II.A. Based on these investigations, it was determined that there are no documented impacts due to exposure to chemicals in soil, groundwater, or sediment at and adjacent to Site 7. The primary receptors that are most likely to be impacted by Site 7 under existing conditions are aquatic and marine life inhabiting the water column and residing in or on the sediment located along the eastern shoreline of Perimeter Pond. At adjacent Site 4 AOPCs 1A and 2A, there is a concern for a potential threat to terrestrial wildlife based on limited elevated detections of lead in soils. The Site 7 removal action was extended to include the adjacent areas of Site 4 AOPCs 1A and 2A. The removal actions of Site 7 and Site 4 AOPCs 1A and 2A will be performed concurrently. The general effects and numerical risks to aquatic ecological receptors are discussed in Section III.B and indicate that the current conditions at Site 7 present minimal potential risk to public health, welfare, or the environment. The purpose of this Action Memorandum is to identify and analyze removal actions to address contaminated soil at and adjacent to Site 7, NAVWPNSTA, Seal Beach. Four alternatives were identified and evaluated:

- Alternative 1—No Action
- Alternative 2—Capping and Long-term Maintenance/Monitoring
- Alternative 3—Repair of Existing Soil Cover and Groundwater Monitoring
- Alternative 4—Excavation and Offsite Disposal

Based on the comparative analyses of the removal action alternatives completed in Section V.5.3, the recommended removal action is Alternative 3. Alternative 3 consists of the following removal actions for the different areas identified at Site 7:

- Area 1—Repair of existing soil cover and groundwater monitoring
- Area 2—Groundwater monitoring

- Areas 3, 4, and 6—Removal of surface debris
- Area 5 and Site 4 AOPCs 1A and 2A—Excavation followed by offsite disposal and clean imported backfill

Alternative 3, Existing Soil Cover Repair and Groundwater Monitoring, is the recommended removal action for Site 7 and Site 4 AOPCs 1A and 2A because this alternative:

- Adequately protects public health and safety and the environment
- Complies with ARARs
- Meets the RAOs
- Provides moderate long-term effectiveness
- Provides high short-term effectiveness because of low impacts on the community, workers, and the environment when compared with Alternatives 2 and 4
- Provides adequate reliability and control with a few minor repairs to the existing cover
- Provides high technical feasibility and low administrative requirements when compared with Alternatives 2 and 4
- Provides high reasonableness of costs and offers the highest benefit in terms of achieving RAOs for the estimated cost

TABLE 3. Calculation Site-Specific Lead Target Cleanup Goals for Site 4 AOPCs 1A and 2A

Species	FIR	SIR	Pplant	Pinvert	Pmam	Area Use Factor (AUF)		NOAEL TRV	LOAEL TRV	Estimated concentrations in site biota (mg/kg dry weight)			Estimated Exposure (mg/kg/d)					Total Exposure adjusted for Site Use	NOAEL HQ	LOAEL HQ	TCGs
	kg/kg/d	prop. FIR	prop. FIR	prop. FIR	prop. FIR	Area	Time			Small Mammals	Plants	Soil Invertebrates	Soil	Small Mammals	Plants	Soil Invertebrates	Total				
Harvest Mouse	0.169	0.02	0.9	0.1	0	1	1	0.92	4.7	12.988	8.251	113.077	1.547	0.000	1.251	1.905	4.703	4.703	5.11	1.00	459.0
Ground Squirrel	0.041	0.05	0.6	0.35	0	1	1	0.92	4.7	17.880	11.664	186.049	1.743	0.000	0.287	2.669	4.698	4.698	5.11	1.00	850.6
Skunk	0.053	0.05	0.35	0.4	0.2	0.147	1	0.92	4.7	45.998	32.448	810.630	13.848	0.483	0.597	17.041	31.970	4.700	5.11	1.00	5270.0
Robin	0.206	0.02	0.44	0.54	0	0.286	0.5	0.014	8.75	31.082	21.226	440.212	10.197	0.000	1.926	49.010	61.133	8.742	624.43	1.00	2473.0

TCGs - target cleanup goals
FIR - food ingestion rate
SIR - soil ingestion rate
Pplant - proportion of plant material in the diet
Pinvert - proportion of invertebrates in the diet
Pmam - proportion of vertebrates or small mammals in the diet
prop. FIR - proportion of food ingestion rate
TRV - toxicity reference value
NOAEL - no observed adverse effect level
LOAEL - lowest observed adverse effect level
HQ - hazard quotient

Notes:
1) Food ingestion rates (FIR) from BNI (2001)
2) Soil ingestion from BNI (2001) except for robin which was from Sample and Suter (1994)
3) Diet composition from BNI (2001) for ground squirrel and skunk. Diet for harvest mouse based on Webster and Jones (1982). Diet for robin based on annual mean from EPA (1993).
4) AUF based on area was the sum of area of Site 4 AOPCs 1A and 2A divided by home range reported in BNI (2001) for skunk and robin.
5) AUF- time: Mouse, squirrel and skunk assumed to be resident. Individual robins assumed to be migratory - although birds may be found at site year-round, individuals only spend 1/2 of year on site
6) Mammal TRVs from Kimmel et al. (1980), Grant et al. (1980), and Fowler et al. (1980). Avian TRVs from EFA-West (1998).
7) Small mammal bioaccumulation estimated using herbivore model from Sample et al. (1998).
8) Plant bioaccumulation estimated using model from Efroymson et al. (2002).
9) Soil invertebrate bioaccumulation estimated using earthworm model from Sample et al. (1999)
10) Species-specific PRG calculated based on LOAEL

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This decision document represents the selected removal action for Site 7 and Site 4 AOPCs 1A and 2A of NAVWPNSTA Seal Beach, developed in accordance with CERCLA (42 U.S.C. § 9604, 10 U.S.C. § 1705, and EO 12580) as amended and is not inconsistent with the NCP. This decision is based on the administrative record for the site.

________________________________ ________________

R.A. Mirick, Captain — Date
Commanding Officer
U.S. Navy

________________________________ ________________

Katherine Leibel — Date
Remedial Project Manager
Federal Facilities Unit B
Office of Military Facilities
Southern California Region
Department of Toxic Substances Control

________________________________ ________________

John Broderick — Date
SLIC / DoD Section
Regional Water Quality Control Board,
Santa Ana Region

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Attachment A
23 May 2002 Final Engineering Evaluation/ Cost Analysis (EE/CA), Non-Time Critical Removal Action for Site 7 Station Landfill, Naval Weapons Station, Seal Beach, Orange County, California

In the final document, this attachment will include the 23 May 2002 Final EE/CA and 31 July 2003 Final EE/CA Addendum.

Attachment B
Administrative Record Index

TO BE PROVIDED IN THE FINAL.

Attachment C
Public Notices and Removal Action Fact Sheet

TO BE PROVIDED IN THE FINAL.