



***FINAL***

## **RECORD OF DECISION**

**FOR**

## **OPERABLE UNIT 5 SITES 1A-1, 1H, AND 6A**

**MARINE CORPS BASE CAMP PENDLETON, CALIFORNIA**

**January 30, 2008**

**Document Control Number: PARP-0004-FZN1-0005**



**NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST  
1220 Pacific Highway, San Diego, CA 92132-5190**



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## **DECLARATION**

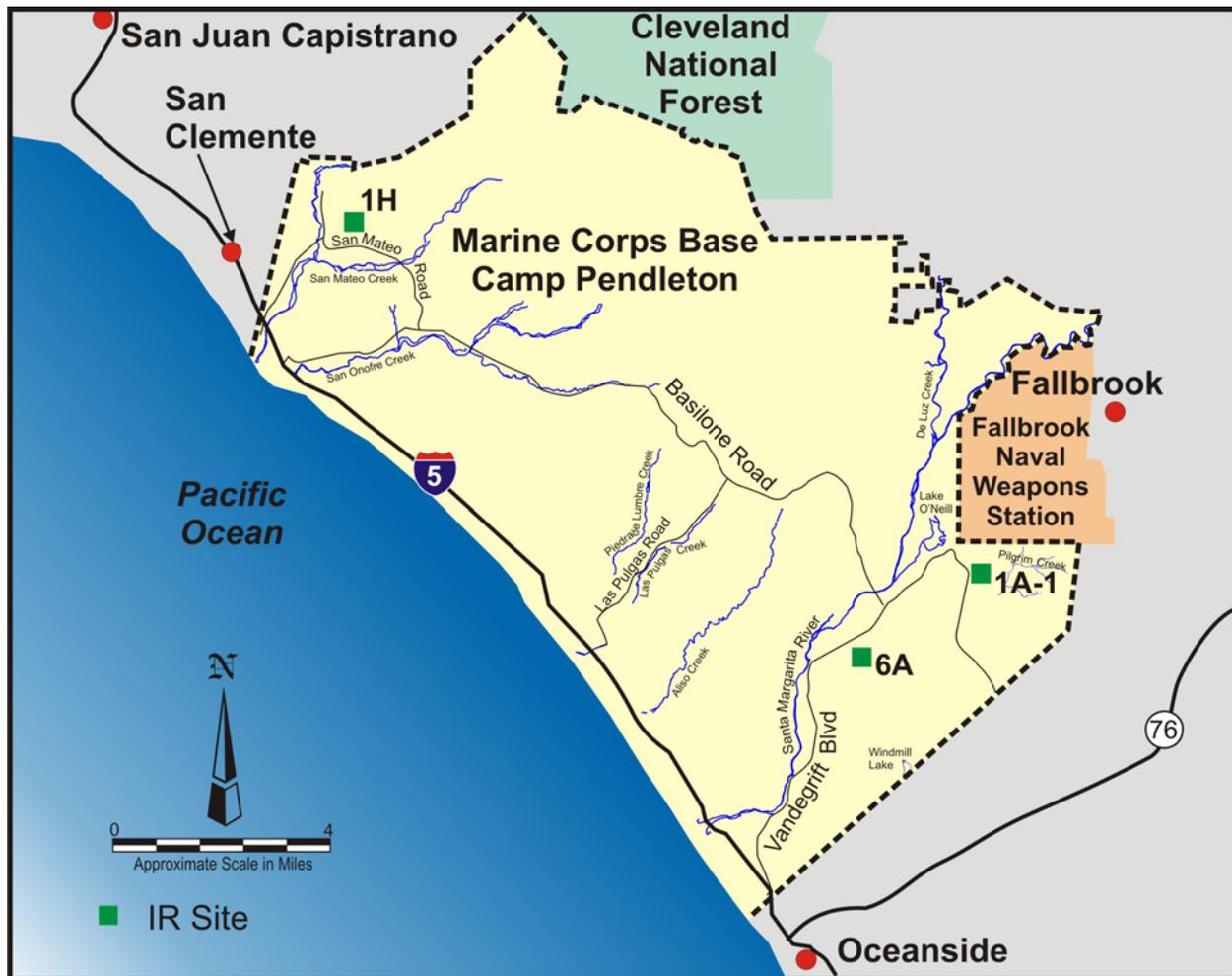
This Record of Decision (ROD) presents the selected remedies for soil and groundwater at Operable Unit (OU) 5 Installation Restoration Sites 1A-1 and 1H and documents the No Further Action decision for Site 6A at Marine Corps Base (MCB or Base) Camp Pendleton, California. The remedies were selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, Title 42 United States Code Sections (§) 9601 et seq., and in accordance with the National Contingency Plan, 40 Code of Federal Regulations 5 300, et seq. The decisions are based on information contained in the administrative record files for these sites. Information not specifically summarized in this ROD or its references but contained in the [administrative record](#)<sup>1</sup> for these sites has been considered and is relevant to the selection of the remedy at each site.

The Base was placed on the National Priority List in 1989. The United States Environmental Protection Agency (USEPA) Identification Number is CA2170023533. There are no enforcement activities at Sites 1A-1, 1H, and 6A.

The U.S. Department of the Navy is the lead agency and provides funding for site cleanups at MCB Camp Pendleton. The Navy, Marine Corps, and the USEPA Region 9 jointly selected the remedies with the concurrence of the California Environmental Protection Agency, which includes the California Department of Toxic Substances Control and the California Regional Water Quality Control Board, San Diego Region. [Responses to Comments](#)<sup>2</sup> from the agencies are included as Attachment 1. The Federal Facility Agreement for MCB Camp Pendleton, which was signed in October 1990, documents how the Navy and Marine Corps intend to meet and implement CERCLA in partnership with USEPA, Department of Toxic Substances Control, and Regional Water Quality Control Board. An annually updated Site Management Plan details the schedule for CERCLA clean up activities.

President Franklin D. Roosevelt dedicated MCB Camp Pendleton in September 1942, and it was designated as a permanent base in October 1944. The Base has an active duty population in excess of 35,000 and a civilian workforce of nearly 4,000 employees. Located 38 miles north of downtown San Diego, the Base occupies approximately 125,000 acres of land and is the Marine Corps' primary amphibious training center. The Base encompasses 17 miles of relatively undisturbed coastline along the Pacific Ocean. Rolling hills and valleys range inland an average of 10 to 12 miles. Land use consists of airfield operations, maneuver and impact areas, troop and family housing, recreation areas, and out-leased areas used by various entities (e.g., San Onofre Nuclear Generating Station, and agriculture). Most of the land is open and undeveloped and directly supports the training mission of the Base. Developed areas are isolated from one another by large areas of essentially undeveloped land used for training and maneuvers.

OU 5 is one of five OUs at MCB Camp Pendleton and four RODs have previously been prepared under CERCLA for the other OUs. The OU 1 ROD was signed in December 1995, OU 2 was signed in September 1997, OU 3 was signed in January 1999, and OU 4 was signed in June 2007. This ROD includes OU 5 Sites 1A-1, 1H, and 6A (Figure 1). Sites 21, 33, 1111, 1115, 12 Area Site 13, and 22/23 Area Groundwater are also part of OU 5, but will be addressed separately in a future ROD.



**Figure 1 Base Location Map and OU 5 ROD Sites**

This ROD documents the final response actions for Sites 1A-1, 1H, and 6A that are necessary to protect the public health, welfare, and the environment from actual or threatened releases of contaminants from these sites.

### Selected Remedies

The selected remedies meet the statutory requirements and are protective of human health and the environment, comply with Federal and State regulations that are applicable or relevant and appropriate to the remedial actions, are cost-effective, and use permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

**Site 1A-1**

Site 1A-1 has buried waste and ash that originally came from Site 1A, which was one of nine refuse burning areas used from 1942 through the early 1970s to burn refuse generated by Base operations. The soil at Site 1A-1 is contaminated with metals, dioxins and/or furans, and pesticides. The selected remedy consists of soil excavation, pretreatment of excavated soil, and off-Base disposal. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited uses and unrestricted exposure, a five-year review is not required. However, the site will be included in a five-year review to document status of the remedial action.

**Site 1H**

Site 1H was one of nine refuse burning areas used from 1942 through the early 1970s to burn refuse generated by Base operations. The soil at Site 1H is contaminated with metals and dioxins and/or furans. The selected remedy consists of soil excavation and off-Base disposal. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited uses and unrestricted exposure, a five-year review is not required. However, the site will be included in a five-year review to document status of the remedial action.

**Site 6A**

Site 6A is a paved area where scrap metal was temporarily stored for resale. Results of investigative activities concluded that no unacceptable risks to human health or the environment were present due to exposure to site soil. Therefore, no further action is necessary to protect public health or welfare or the environment from the former releases of hazardous substances into the soil at Site 6A. Because hazardous substances, pollutants, or contaminants will not remain on site above levels that allow for unlimited use and unrestricted exposure, a five-year review will not be required.

Therefore, no further action for soil is necessary to protect public health or welfare or the environment from the former releases of hazardous substances into the soil at Site 6A. Although groundwater beneath Site 6A is part of the 22/23 Area Groundwater Remedial Investigation and addressed separately, groundwater beneath Site 6A is not significantly impacted. There are no groundwater detections above Federal or State maximum contaminant levels in the two on-site wells, which supports the conclusion in this ROD that no further action for soil is necessary.

**Data Certification Checklist**

The information included in the Decision Summary for each site is contained in the following sections as outlined below.

<b>Data</b>	<b>Site 1A-1</b>	<b>Site 1H</b>	<b>Site 6A</b>
Chemicals of concern and their respective concentrations	1.2	2.2	3.2
Risk represented by the chemicals of concern	1.4	2.4	3.4
Cleanup levels established for chemicals of concern and the basis for these levels	1.6	2.6	Not applicable
How source materials constituting principal threats are addressed	1.5	2.5	Not applicable
Current and reasonably anticipated future land-use assumptions used in the risk assessment	1.3	2.3	3.3
Potential land and groundwater use that will be available at the sites as a result of the selected remedy	1.8	2.8	Not applicable
Estimated capital, annual operation and maintenance, and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected	1.7	2.7	Not applicable
Key factors that led to selecting the remedy	1.7 1.8	2.7 2.8	Not applicable

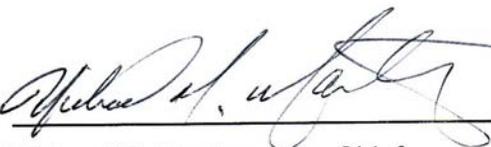
Additional information can be found in the administrative record file for each site. If contamination posing an unacceptable risk to human health or the environment is discovered after execution of this ROD, the Navy will undertake the necessary actions to ensure continued protection of human health and the environment.

**Authorizing Signatures**

For the United States Department of the Navy, Marine Corps Base Camp Pendleton,

Signature:  Date: 11 Feb 08  
J.B. Seaton, Colonel, United States Marine Corps, Commanding Officer  
Marine Corps Base Camp Pendleton

For the United States Environmental Protection Agency,

Signature:  Date: 21 Feb 08  
Michael M. Montgomery, Chief  
Federal Facilities and Site Cleanup Branch, USEPA, Region 9

For the California Environmental Protection Agency,

Signature:  Date: Feb 25, 2008  
John E. Scandura, Chief Office of Military Facilities,  
Southern California Operations Branch  
Department of Toxic Substances Control

Signature:  Date: Feb 25 2008  
John H. Robertus, Executive Officer  
California Regional Water Quality Control Board, San Diego Region

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## 1.0 SITE 1A-1 DECISION SUMMARY

### 1.1 Site Description and History

**Description:** Site 1A-1 is a debris disposal area of approximately 1.5 acres in the 14 Area of the Base. Site 1A-1 is approximately 800 feet north-northeast of Site 1A, which is immediately northeast of Base Sewage Treatment Plant No. 1 (Figure 1-1). Site 1A-1 is actively used as a military training area.

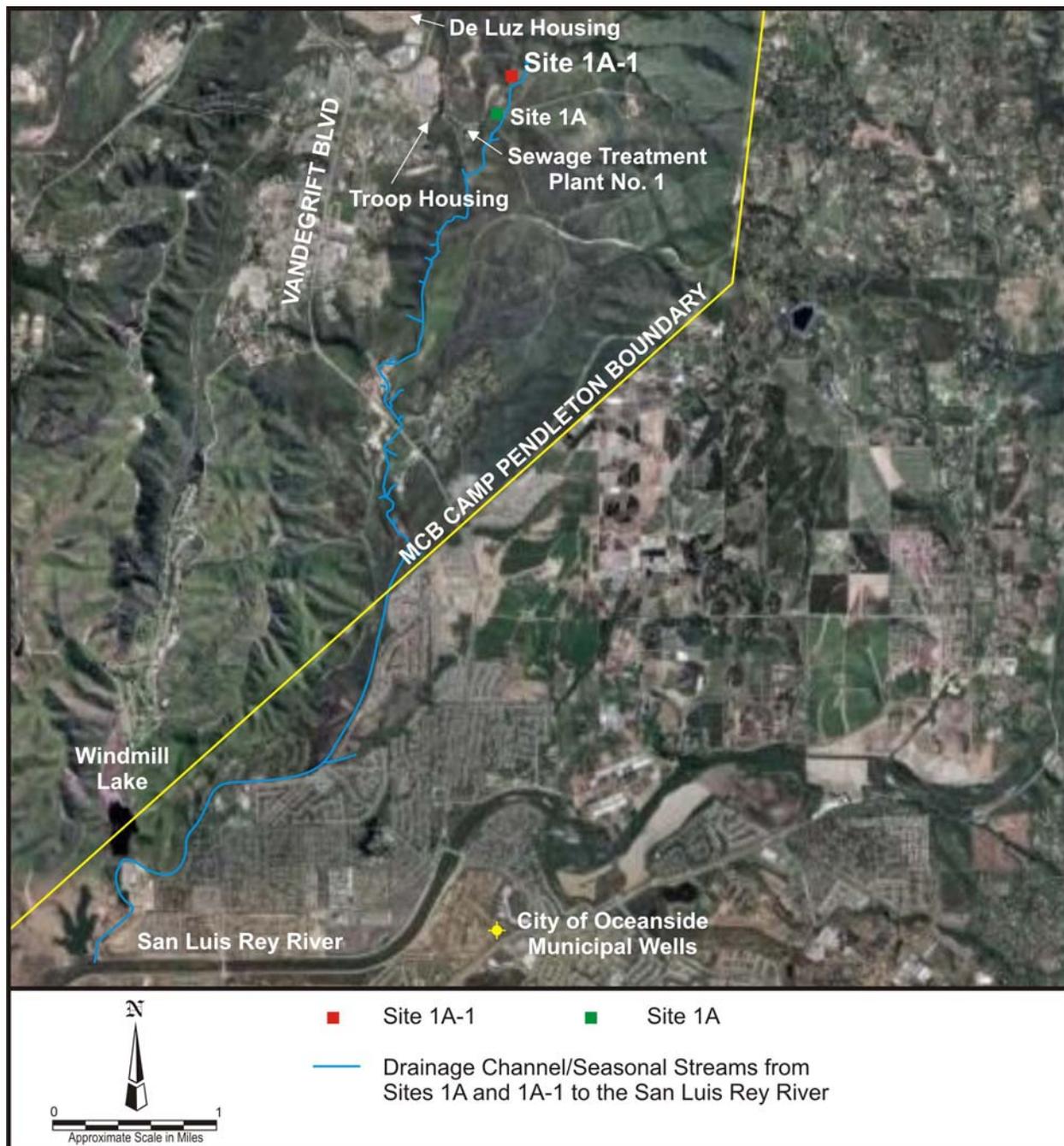


Figure 1-1 Site 1A-1 Location Map

**History:** Site 1A-1 contains buried waste and ash up to 10 feet thick that originally came from Site 1A. Site 1A was **one of nine refuse burning grounds<sup>3</sup>** used from 1942 through the early 1970s to burn refuse generated by Base operations. The burned refuse buried at Site 1A-1 appears to be covered by a discontinuous thin layer of relatively clean soils, but some burned debris, ash, and refuse is exposed at the surface. It is not known if all the burn ash and debris at Site 1A-1 was moved at one time or placed in various stages over time.



Looking southeast across Site 1A-1 towards Pilgrim Creek

There are no known records regarding the placement of waste at Site 1A-1, and no burning was conducted at the site. Former waste disposal activities have resulted in approximately **20,000 cubic yards<sup>4</sup>** of soil contaminated with waste material and ash containing **metals, dioxins and/or furans, and pesticides<sup>5</sup>**.

**Characteristics:** Site 1A-1 is located on the west side of a canyon sloping slightly east toward Pilgrim Creek, a streambed with intermittent flow (Figure 1-2). Site 1A-1 is approximately 285 to 350 feet above mean sea level within a north-south trending V-shaped valley of igneous **bedrock<sup>6</sup>** partly filled with unconsolidated alluvium (streambed sediments).

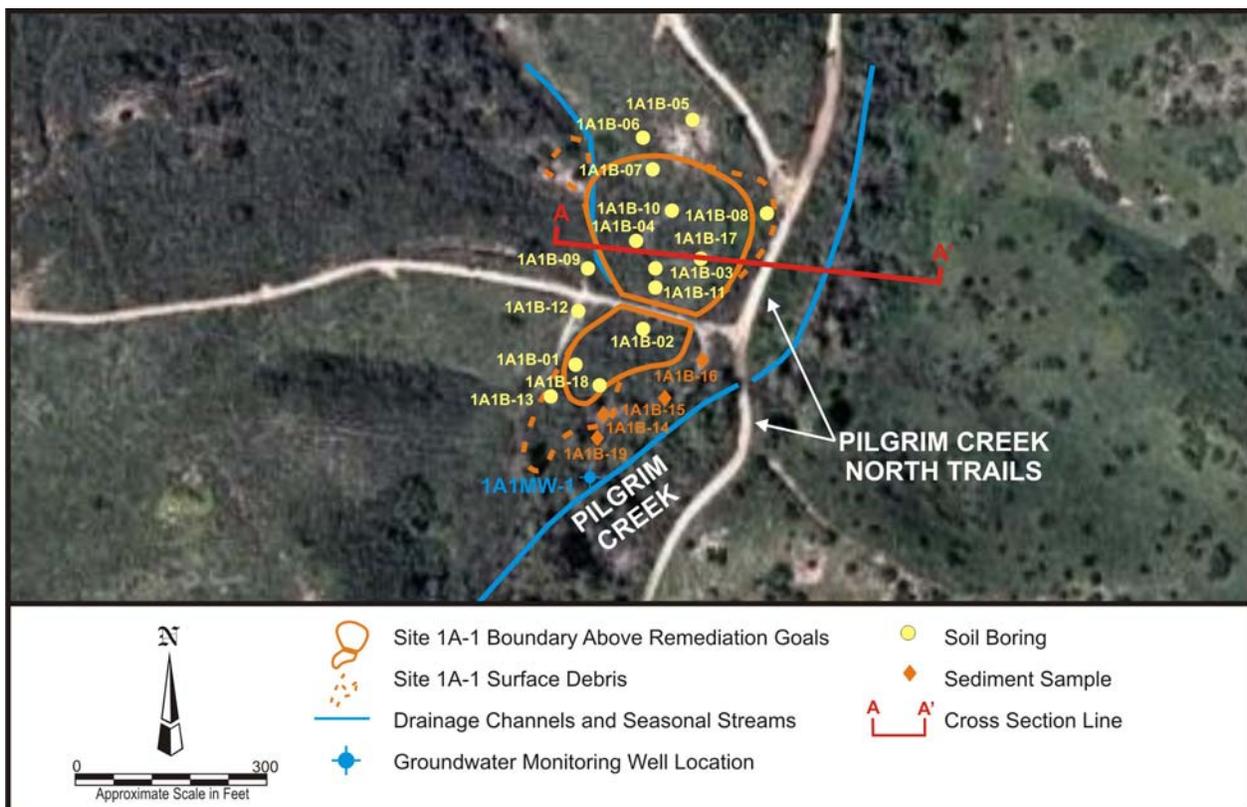


Figure 1-2 Site 1A-1 Boundary

The waste fill at the site overlies alluvium and bedrock. The bedrock does not contain groundwater<sup>7</sup>, but a portion of the alluvium underlying the waste fill contains groundwater. The nearest groundwater is in the Pilgrim Creek streambed, which is along the southeast edge of the site. As shown on Figure 1-3, groundwater is present in the native sand of the streambed sediments. This groundwater is normally at a depth of approximately 15 feet below ground surface, but rises to the ground surface during significant rainstorms. A small portion of the southeast portion of the waste fill is underlain by groundwater only when the groundwater level is high during flooding. Groundwater flow direction is toward the southwest, which is the same as the flow of the intermittent surface water. There are no perennial surface water features on the site, but surface water flows in the Pilgrim Creek streambed periodically during heavy continuous rains. Groundwater was only encountered in the borings drilled in the Pilgrim Creek streambed.

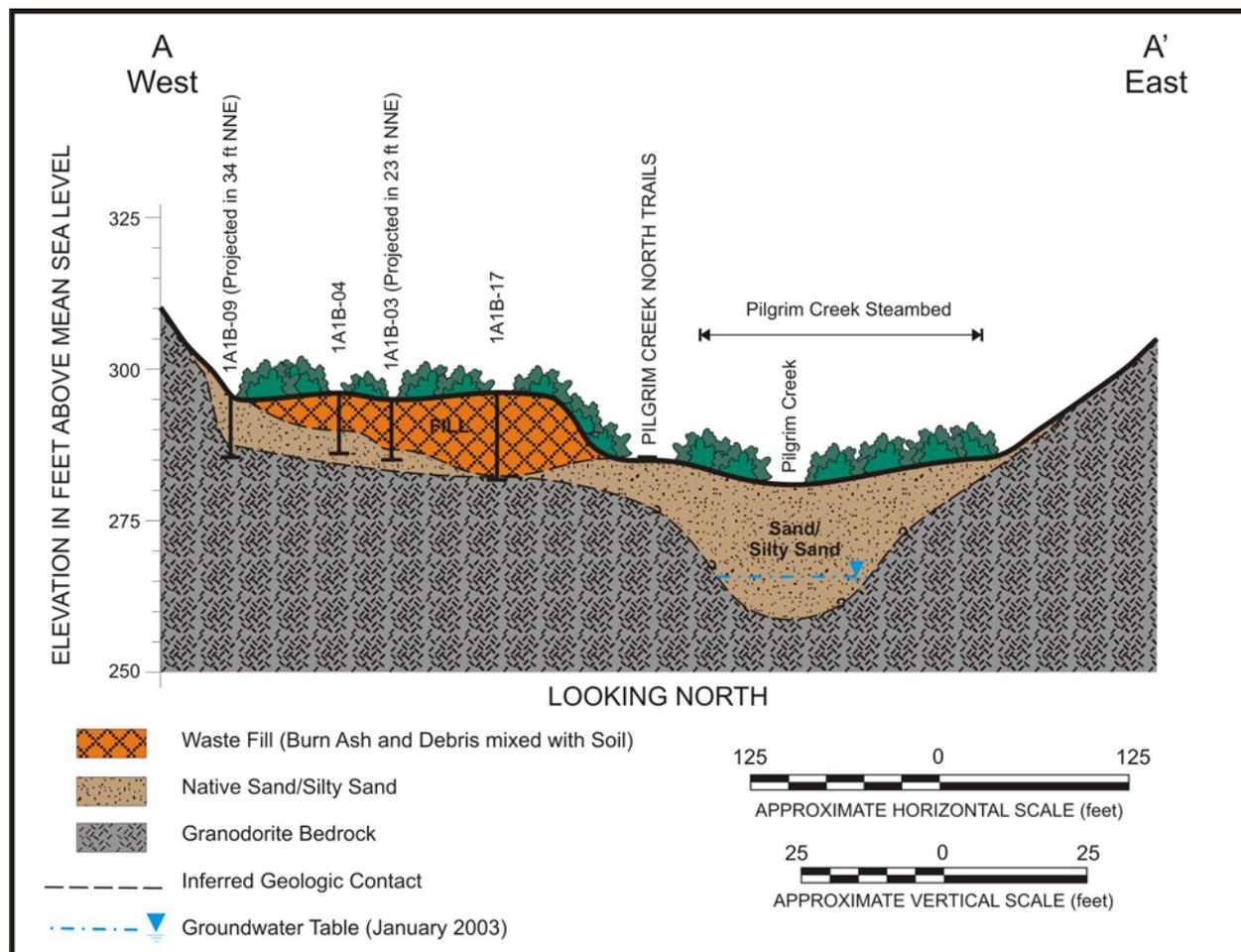
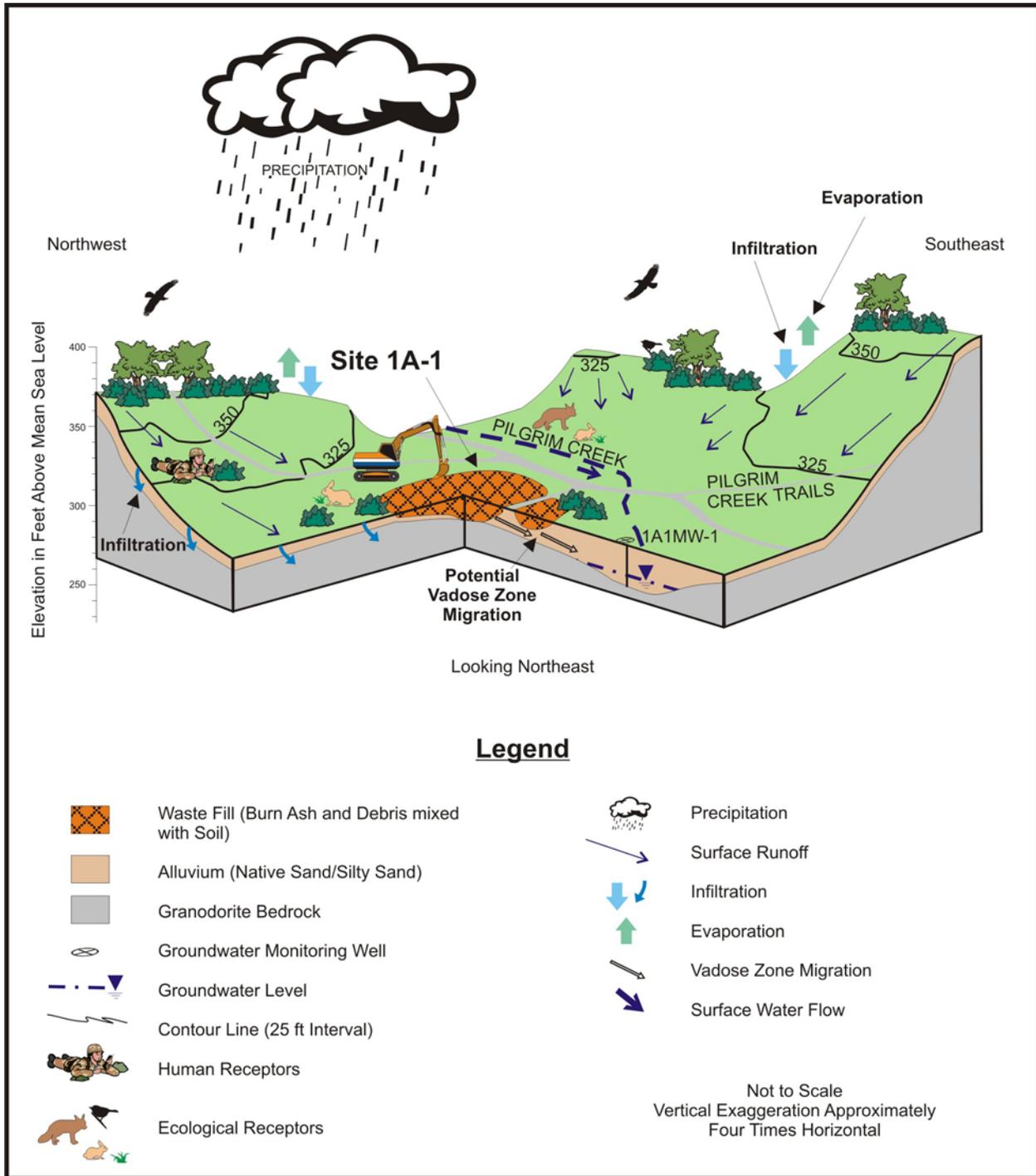


Figure 1-3 Site 1A-1 Generalized Cross Section A-A'

Site 1A-1 is within the known foraging area of **coastal California gnatcatchers**<sup>8</sup>. Biological resource monitoring may be required during any site remediation activities if conducted during the breeding season. Dominant habitats include a mixed sagebrush series and disturbed habitat. The common plant species include sage (white and black), coyote brush, and buckwheat. A few willows and sycamore trees are scattered throughout the area. The disturbed habitat consists primarily of ground sparsely vegetated with mustard or non-native grasses.

**Transport Pathways:** Precipitation may infiltrate to groundwater through the soil and waste at Site 1A-1 (Figure 1-4). If contamination were to leach from the waste, then the potential contaminant migration pathway would be down to the bedrock, and then along the bedrock surface to the groundwater in the stream channel. Pilgrim Creek is subject to flooding during heavy rainfall, which could cause erosion along the edge of the site that could affect the creek.



**Figure 1-4 Site 1A-1 Transport Pathways**

## 1.2 Previous Investigations

The source of soil contamination is buried waste and ash that originally came from refuse-burning operations conducted at Site 1A between 1942 and 1970. The site was discovered during site visits by the Department of the Navy and regulatory agencies in 2001, and it was decided to include Site 1A-1 in Operable Unit 5. The assessment of contamination and risk for Site 1A-1 is based on Remedial Investigation activities conducted in 2001 and Supplemental Remedial Investigation activities conducted in 2003. Table 1-1 summarizes the previous studies and investigations conducted at Site 1A-1. Sample locations are shown on Figure 1-2.

**Table 1-1 Previous Studies and Investigations**

Previous Study / Investigation*	Report Date	Investigation Activities
Remedial Investigation Report	2004	<p>2001 Field Investigation - Initial soil samples were collected to determine if contamination was present in soil from possible disposal activities. Eight borings were drilled, and surface and subsurface <b>soil samples</b><sup>9</sup> were analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, chlorinated herbicides, and metals. One sample was also analyzed for dioxins and/or furans. Further investigation was recommended to define the lateral and vertical extent of contamination and the volume of waste material.</p> <p>2003 Supplemental Field Investigation - The supplemental field sampling was conducted to delineate or define the volume of waste and determine if downgradient groundwater or Pilgrim Creek had been impacted by site activities. Soil samples from nine borings and two surface samples, including four sediment-sampling locations placed in the Pilgrim Creek streambed, were analyzed. In addition, one monitoring well was installed, and groundwater samples were collected and analyzed for volatile organic compounds, semi-volatile organic compounds, dioxins and/or furans, pesticides, polychlorinated biphenyls, chlorinated herbicides, metals, and geochemical parameters. Only <b>metals and geochemical parameters</b><sup>10</sup> were detected. Groundwater was only encountered in the borings drilled in the Pilgrim Creek streambed. Based on the results of the Remedial Investigation, a Feasibility Study was recommended to evaluate remedial alternatives to address soil contamination.</p>
Feasibility Study	2005	The Feasibility Study (FS) provided an evaluation of potential remedial alternatives for the site. Following the completion of the FS, one remedy was selected as the preferred remedy. The preferred remedy is excavation, pretreatment, and off-Base disposal of the affected soil.
Proposed Plan	2006	The Navy invited the public to comment on the proposed cleanup plan for contaminated soil at Site 1A-1.

\*The documents listed are available in the [Administrative Record](#)<sup>1</sup> and provide detailed information used to support remedy selection at Site 1A-1.

The nature and extent of contamination was defined by constituent concentrations in media exceeding regulatory screening values and Base background concentrations. The nature and extent of contamination is summarized by media below.

### 1.2.1 Soil

The soil at Site 1A-1 is contaminated with burn ash and debris containing concentrations of metals, dioxins/furans, and pesticides above United States Environmental Protection Agency (USEPA) Region 9 industrial preliminary remediation goals. Field mapping, subsurface data collected during drilling, and analytical data were used to determine the lateral and vertical extent of contamination. The areal extent of contamination is shown on Figure 1-2. Thickness of the waste was determined to be up to 10 feet based on the soil borings drilled at the site.

### 1.2.2 Sediment

Field observations do not indicate the presence of debris in the Pilgrim Creek streambed, although trace concentrations of metals in the sediment samples indicate erosion of waste materials may have had a minor impact to streambed sediments directly adjacent to waste material. The detected concentrations of contamination in the streambed sediments are slightly above background levels and extend approximately 20 feet into the streambed. Therefore, the impact to the streambed does not appear to be significant.

### 1.2.3 Groundwater

To determine if waste disposal activities have affected downgradient groundwater, a monitoring well, 1A1MW-1, was installed in the Pilgrim Creek streambed. Among the chemicals of potential concern for Site 1A-1, only metals were detected in groundwater and the concentrations were within naturally occurring ranges. Additionally, none of the metals detected exceeded maximum contaminant levels or USEPA Region 9 drinking water preliminary remediation goals. Therefore, there is no evidence of site-related contaminants in downgradient groundwater.

**Supplemental computer evaluations<sup>11</sup>** were conducted to model the potential for contaminants in the waste soils to leach to the bedrock, and then along the bedrock surface to the groundwater in the stream channel. The computer groundwater modeling indicated that benzene was the only chemical of concern that could potentially leach from waste soils at significant concentrations (greater than its maximum contaminant level of 1 microgram per liter). However, the results from the model concluded that there was no significant threat to groundwater based on these concentrations.

## 1.3 Current and Potential Future Site and Resource Uses

Site 1A-1 is currently used as an active military training area. The site is no longer a waste disposal area, and the surrounding land is covered with natural vegetation, except Pilgrim Creek Trail along the eastern edge. The surrounding areas are also undeveloped and are designated as military training areas. The nearest troop housing is approximately 0.5 mile southwest (Figure 1-1). The nearest family housing, De Luz Housing, is approximately 0.75 mile northwest. Sewage Treatment Plant No. 1 is located approximately 2,500 feet southwest.

The site is in the San Luis Rey groundwater basin, which is the source of drinking water for the City of Oceanside. The nearest production wells are over four miles south of the site in the San Luis Rey River valley. There is no groundwater at Site 1A-1. There is a small amount of groundwater present in the sediments in the downgradient Pilgrim Creek streambed. However, the quantity of water would not be sufficient for municipal use.

Marine Corps Base (MCB) Camp Pendleton is expected to remain an active military installation into the future. Current land use is reasonably anticipated to continue indefinitely to support the mission of the facility. However, the Navy has assumed an unrestricted land use scenario in this record of decision (ROD) in an effort to avoid any form of future land use restrictions.

## 1.4 Summary of Site Risks and Hazards

### 1.4.1 Human Health Risk Assessment

A quantitative **human health risk assessment**<sup>12</sup> was completed for Site 1A-1 for exposure to soil. Potential cancer risks and non-cancer hazards were calculated based on reasonable maximum exposure and central tendency input parameters. The reasonable maximum exposure is defined as the highest exposure that could reasonably be expected to occur based on combining high-end input parameters (e.g., maximum or 95 percent upper confidence concentrations, exposure frequency, exposure duration, etc.) whereas the central tendency reflects use of average concentrations and exposure conditions.

For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between  $10^{-4}$  (a 1 in 10,000 chance of developing cancer) and  $10^{-6}$  (a 1 in 1,000,000 chance of developing cancer) using information on the relationship between dose and response. For non-cancer health effects, the hazard index represents the ratio of the reasonable maximum exposure concentration or the central tendency concentration to the reference dose, which is the dosage below which adverse health effects are not expected. A hazard index of 1 for non-cancer hazards and  $10^{-6}$  for cancer risks are used as the point of departure for determining performance standards for alternatives when applicable or relevant and appropriate requirements are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure.

As noted in Section 1.3, residential land use is considered highly unlikely at Site 1A-1. Therefore, the human health risk assessment focused on potential risks to nonintrusive and intrusive workers and a military trainee receptor from exposure to soil. However, risks and hazards to the hypothetical resident are assumed to be greater than those estimated for workers and military trainees based on more sensitive input parameters and exposure that is more significant. The estimated risks and hazards are summarized in Table 1-2 below.

**Table 1-2 Human Health Cumulative Risk and Hazard**

Receptor	USEPA				California-Modified			
	Reasonable Maximum Exposure		Central Tendency		Reasonable Maximum Exposure		Central Tendency	
	Chemical Specific Risk	Hazard Index	Chemical Specific Risk	Hazard Index	Chemical Specific Risk	Hazard Index	Chemical Specific Risk	Hazard Index
Nonintrusive Worker (Surface Soil)	$1.6 \times 10^{-4}$	0.11	$1.5 \times 10^{-6}$	0.006	$1.4 \times 10^{-4}$	0.39	$1.3 \times 10^{-6}$	0.02
Military Trainee (Soil 0 to 3 feet below ground surface)	$4.2 \times 10^{-6}$	0.08	$3.1 \times 10^{-7}$	0.006	$3.6 \times 10^{-6}$	0.27	$2.7 \times 10^{-7}$	0.02
Intrusive Worker (Soil 0 to 10 feet below ground surface)	$1.7 \times 10^{-6}$	0.04	$2.7 \times 10^{-7}$	0.006	$2.1 \times 10^{-6}$	0.38	$3.2 \times 10^{-7}$	0.06
Hypothetical Residential Receptor	Risks and hazards were not estimated in the RI, but are assumed to be greater than the industrial and military risks and hazards.							

Potential unacceptable risks are shaded in yellow

Potential unacceptable risks include cancer risks for a nonintrusive and intrusive workers and a military trainee receptor from exposure to soil. A separate evaluation was performed to characterize impacts from lead. Lead concentrations in soil at Site 1A-1 ranged up to 9,670 milligrams per kilogram, which exceeded USEPA Region 9's industrial soil preliminary remediation goal of 800 milligrams per kilogram.

Although the baseline risk to human health was not estimated for a hypothetical residential receptor, potential risks to a hypothetical resident were assumed to be greater than those estimated for the workers/military trainees and unacceptable, and cleanup goals based on an unrestricted land use scenario were derived in the Operable Unit 5 Feasibility Study. The Site 1A-1 remedial action objectives and goals presented in subsequent paragraphs address the unrestricted land use scenario since the Navy has assumed an unrestricted land use scenario in this ROD in an effort to avoid any form of future land use restrictions.

#### 1.4.2 Ecological Risk Assessment

During the **Ecological Risk Assessment**<sup>13</sup>, concentrations of chemicals of potential concern in soil were used to estimate exposures to a variety of potential ecological receptors: plants, terrestrial invertebrates, mammals, and birds. In Tier 1, estimated exposures were evaluated against screening ecotoxicity values, defined as protective (conservative) concentrations of chemicals that are not associated with adverse ecological effects. In Tier 2, further refinements were made to the exposure estimates and additional ecotoxicity concentrations were used, based on adverse-effect-inducing concentrations.

Because the screening ecotoxicity values were exceeded in Tier 1, the following chemicals of potential concern were carried through to the Tier-2 Baseline Ecological Risk Assessment: 15 metals, one polynuclear/polycyclic aromatic hydrocarbon, two polychlorinated biphenyls, nine pesticides, dioxins, three semi-volatile organic compounds, and ten volatile organic compounds. Based on the refined analysis conducted in the Tier-2 assessment, three metals of potential concern (antimony, lead, and zinc) and dioxins are present at concentrations that pose a potentially significant hazard to one or more ecological receptors.

#### 1.4.3 Basis for Response Action

Because potential human health and ecological risks were identified under current land use scenarios from exposure to antimony, arsenic, lead, zinc, and dioxins in soil, a response action is necessary to protect public health, welfare, and the environment from actual or threatened releases. Additionally, the Base mission requires that the land be available for training purposes and that no restrictions be placed on the land. Therefore, there are potential risks to human and ecological receptors from exposure to soil at Site 1A-1 based on the risk assessments. The boundary above remediation goals and surface debris are shown on Figure 1-2.

#### 1.5 Principal Threat Waste

Although a remedial response action is necessary (Section 1.4.3), there are no wastes at Site 1A-1 that constitute a "principal threat." Per the USEPA **Guide to Principal Threat and Low Level Threat Wastes**<sup>14</sup>, a principal threat waste is a source material that is 1) highly toxic and/or highly mobile; 2) generally cannot be reliably contained; and 3) could present substantial threat to human health or the environment if released. For example, liquids in drums, lagoons, or tanks; free product non-aqueous phase liquids over or under groundwater; surface soil with high concentrations of volatiles or dust-associated chemicals of concern; or highly toxic, non-liquid wastes in buried drums or tanks or in soil at high concentrations. Historical records do not indicate the disposal of hazardous or highly toxic source materials at Site 1A-1. The waste has remained relatively undisturbed and stable since placement several decades ago. Based on the

results of the human health risk assessment, cancer risks for potential exposure to chemicals of concern in soil for industrial workers exceed the point-of-departure (i.e., de minimus) lower end of the National Contingency Plan risk range ( $10^{-6}$ ), but only slightly (up to 1.6-times) exceed the upper end ( $10^{-4}$ ). This slight excess does not constitute a principal threat waste under current and reasonably anticipated future land use given: 1) the small magnitude of the excess; 2) the conservative (i.e., health-protective) nature of the industrial risk calculations; and 3) per the USEPA Guide to Principal Threat and Low Level Threat Wastes. Although no threshold level has been established to equate to a "principal threat," treatment alternatives generally should be evaluated when potential risks are  $10^{-3}$  or greater. Additionally, as discussed in Section 1.2.3, the chemicals of concern in waste soils are relatively immobile, and leaching of waste soils into groundwater is considered unlikely. Therefore, there are no wastes constituting principal threats at Site 1A-1.

## 1.6 Remedial Action Objectives

Remedial action objectives are established based on attainment of regulatory requirements, standards, and guidance; contaminated media; chemicals of concern; potential receptors and exposure scenarios; and human health and ecological risks. The following remedial action objectives were developed for soil contamination at Site 1A-1 to address the protection of human health and the environment:

- Minimize exposure to chemicals in soil (through inhalation, dermal contact, or ingestion) by human and ecological receptors that pose an unacceptable risk.
- Protect the beneficial uses and water quality objectives of the San Luis Rey groundwater basin.

Remediation goals (RGs) were developed to meet these remedial action objectives as presented in Table 1-3, with an assumed unrestricted land use scenario factoring into the selection of final RGs. When waste soils are removed, actual confirmation sample results can be compared to RGs to determine if site cleanup meets the unrestricted land use standards.

During the review of this ROD by the regulatory agencies, the California Department of Toxic Substances Control (DTSC) requested that confirmation samples of soil gas also be collected to determine the presence of benzene vapors in the subsurface soils following removal of waste soils. The Navy does not agree that the existing benzene concentrations in the waste material pose a significant risk to human health or the environment based on comparison to published regulatory risk standards. However, the requested soil gas confirmation sampling will be conducted as an added factor of safety and to satisfy the request of the DTSC. The soil gas confirmation sampling will be conducted in the area of the site that exhibited detectable benzene concentrations, and a post removal action risk assessment that will take into consideration the indoor air pathway to address detected concentrations of benzene.

Table 1-3 Soil Remediation Goals and Sources for Unrestricted Land Use

Chemical of Concern	Maximum Detected Conc.	Background Conc. <sup>a</sup> (0 to 5 feet)	Unrestricted HHRA RG <sup>b</sup>	Industrial HHRA RG <sup>c</sup>	ERA RG <sup>d</sup>	Final RG	Number of Samples Above RG/Total Samples
<b>Dioxins/Furans (ng/kg)</b>							
2,3,7,8-TCDD TEQ	2735.7	4.1	3.9	17	44	4.1 <sup>e</sup>	5/6
<b>Inorganics (mg/kg)</b>							
Antimony	108 J	8.8	31	--	16	16	10/58
Arsenic	27.7	4.6	0.06	1.8	--	4.6 <sup>e</sup>	13/58
Cadmium	16.9	1.6	2	--	--	2	10/58
Lead	9,670	29.1	150 <sup>f</sup>	--	73	73	16/58
Manganese	20,100	688	10,000	--	--	10,000	9/58
Vanadium	90.2	73.8	78	--	--	78	1/58
Zinc	8,650	111	23,000	--	250	250	15/58
<b>Pesticides (mg/kg)</b>							
p,p'-DDD	58 N	--	2	--	--	2	1/57
p,p'-DDE	20 J	--	1.4	--	--	1.4	3/57
p,p'-DDT	243	--	1.7	--	--	1.7	1/57

-- = Indicates chemical is not a chemical of concern for that category

J = estimated value

N = outside of calibration range

RG = Remediation Goal

Conc. = Concentration

CA-Mod = California modified toxicity data

ERA = ecological risk assessment

HHRA = human health risk assessment

a = Santa Margarita River basin background concentrations.

b = The HHRA preliminary RG with the lowest concentration was selected from among the combined receptor preliminary RGs as the final RG for each chemical of concern. The lower of the CA-Mod and USEPA unrestricted land use remedial goals is shown.

c = The lower of the CA-Mod and USEPA industrial land use remedial goals is shown.

d = The value selected, as a site- and chemical-specific ecological preliminary RG, is the lowest of the ecological preliminary RGs for any wildlife receptor, derived using an effect-based toxicity reference values

e = Proposed RG was set at background

f = The RG for lead is consistent with California use under an unrestricted land use scenario.

## 1.7 Description and Evaluation of Remedial Alternatives

To address soil contamination at Site 1A-1, an **initial screening of remedial technologies**<sup>15</sup> was completed to refine the remedy selection process. Five soil remedial approaches were retained as preliminary **process options**<sup>16</sup> and were evaluated with respect to implementability, effectiveness, and relative cost (high/moderate/low). All of these were incorporated into the four remedial alternatives for soil that were retained for a detailed comparative analysis in accordance with the **National Contingency Plan (NCP)**<sup>17</sup> criteria.

## 1.7.1 Description of Remedial Alternatives

The four remedial alternatives identified for soil at Site 1A-1 are presented below in Table 1-4.

Table 1-4 Remedial Alternatives for Site 1A-1

Alternative	Description	Cost
<b>1A1-1 No Action</b>	- The NCP (40 Code of Federal Regulations 300.430[e][6]) requires that a no action alternative be evaluated. Under this option, existing soil is left in place and nothing is done to clean up the soil contamination, prevent land use, or limit contaminant movement.	- \$0
<b>1A1-2 Land Use Controls</b>	- The alternative includes restrictions on future development and land use, as well as site inspection and monitoring to prevent unauthorized use as long as wastes remain at the site.	- Capital Cost: \$75,000 - O&M Cost: \$550,000 - <b>Total Cost: \$625,000<sup>18</sup></b> - Timeframe: 30 years
<b>1A1-3 Capping</b>	- The alternative includes installing a specially constructed cap (soil cover) that would limit exposure to the contamination underneath.  - Land use controls would also be implemented to restrict future development and land use and ensure that the cap is not breached through trenching or excavation.	- Capital Cost: \$1,010,000 - O&M Cost: \$2,115,000 - <b>Total Cost: \$3,125,000<sup>19</sup></b> - Timeframe: 50 years
<b>1A1-4 Excavation, Pretreatment, and Off-Base Disposal</b>	- Excavation of approximately 20,000 cubic yards of soil - Treatment of a portion of the excavated soil to incorporate chemical stabilizer - Sampling and analysis of soil stockpiles for waste characterization - Transportation of the excavated soil to an off-Base disposal facility - Confirmation sampling and analysis of excavation areas - Import and compaction of backfill and site restoration	- Capital Cost: \$8,383,000 - O&M Cost: \$0 - <b>Total Cost: \$8,383,000<sup>20</sup></b> - Timeframe: 2 years

1.7.2 Comparative Analysis of Alternatives

A comprehensive analysis of each alternative<sup>21</sup> with respect to the NCP threshold and balancing criteria is presented in the Operable Unit 5 Feasibility Study Report. The results of the comparative analysis are summarized below in Table 1-5.

Table 1-5 Comparative Analysis of Site 1A-1 Alternatives

Criteria	Alternative			
	1A1-1 No Action	1A1-2 Land Use Controls	1A1-3 Capping	1A1-4 Excavation, Pretreatment, and Off-Base Disposal
<b>Threshold Criteria</b>				
Overall Protection of Human Health and the Environment	No	No	Yes	Yes
Compliance with ARARs	No	No	Yes	Yes
<b>Balancing Criteria</b>				
Long-Term Effectiveness and Permanence	○	○	◐ to ●	●
Reduction of Toxicity, Mobility, or Volume by Treatment	○	○	○	◐
Short-Term Effectiveness	NR	●	◐	◐
Implementability	NR	◐	◐	●
Cost (\$ million)	0	0.6	3.1	8.4
<b>Modifying Criteria</b>				
State Acceptance	NR	NR	NR	●
Community Acceptance	NR	NR	NR	NC
○ Low   ◐ Moderate   ● High   NR = Not Rated NC = No comments received on proposed plan or during the public meeting				

1.7.2.1 Threshold Criteria

*Overall Protection of Human Health and the Environment.* Alternative 1A1-1 is not protective because it would leave contaminant concentrations in place that pose a potential threat to human health and ecological receptors. Alternative 1A1-2 would protect human receptors through land use controls, but not ecological receptors. Alternative 1A1-3 would protect human and ecological receptors by capping the impacted soils and using land use controls, effectively eliminating potential exposure pathways. Alternative 1A1-4 would be most protective of human and ecological receptors through removal and disposal of impacted soils in an appropriate off-Base disposal facility.

*Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).* Alternatives 1A1-1 and 1A1-2 would not comply with location-specific requirements of the Endangered Species Act and Resource Conservation and Recovery Act requirements for sites located within a floodplain as waste soils could be transported downstream during a heavy flooding. Alternatives 1A1-3 and 1A1-4 would comply with action- and location-specific requirements of

the Endangered Species Act, and coordination with the United States Fish and Wildlife Service would be required. Alternative 1A1-4 would also comply with Resource Conservation and Recovery Act clean closure requirements. Alternative 1A1-4 would be implemented in compliance with ARARs for excavation, waste piles, transportation, and disposal.

#### 1.7.2.2 Primary Balancing Criteria

*Long-Term Effectiveness and Permanence.* Alternatives 1A1-1 and 1A-2 are rated low because they do not provide long-term effectiveness and permanence. Although Alternative 1A1-2 does provide a degree of long-term effectiveness and permanence for human receptors through the implementation of land use controls, risk would remain to current ecological receptors.

Alternative 1A1-3 provides long-term effectiveness through elimination of human and ecological exposure pathways via capping. However, the effectiveness and permanence of Alternative 1A1-3 is dependant upon the adequacy of maintenance of the soil cover and land use controls. Therefore, it is rated moderate to high. Alternative 1A1-4 is rated high because it provides the greatest degree of long-term effectiveness and permanence because it involves complete removal of the contaminated soils from the area and backfilling of the excavation with clean import soil.

*Reduction of Mobility, Toxicity, or Volume through Treatment.* Alternatives 1A1-1, 1A-2, and 1A1-3 are rated low because they do not involve treatment. However, the soil cover of Alternative 1A1-3 would reduce infiltration and leaching of contaminants from the waste soils to groundwater. Alternative 1A1-4 is rated moderate because it includes stabilization pretreatment prior to disposal to reduce the toxicity of contaminants being taken off Base.

*Short-Term Effectiveness.* There is no exposure risk in the short term for Alternatives 1A1-1 and 1A-2 as no response actions would be taken. The short-term effectiveness of Alternative 1A-2 is rated high because minimal site activities are planned. Alternatives 1A1-3 and A1-4 are rated moderate because there would be potential risks to the construction worker and ecological receptors during construction of the cap or excavation activities, primarily associated with equipment movement and short-term dust exposure. However, air monitoring and engineering controls would control the potential for exposure. Workers would be required to wear appropriate levels of protection to avoid exposure during capping or excavation activities. The surrounding community would not be impacted, as construction activities would remain on Base, and no contaminated soil is planned to be taken off Base.

*Implementability.* This criterion is not rated for Alternative 1A1-1 because no activities would be conducted under this alternative. Alternatives 1A1-2 and 1A1-3 are readily implementable and involve commonly performed remedial operations, but are rated moderate because they require land use controls. Given that the Base mission is to support training, any area with a land use restriction would limit that function. Alternatives 1A1-2 and 1A1-3 are rated moderate due to the potential loss of land use. Alternative 1A1-4 is ranked high because excavation and disposal of contaminated soil at an off-Base disposal facility are readily implementable and no further actions (e.g. land use controls) would be necessary, if the site is cleaned up to the unrestricted land use remediation goals.

*Cost.* No cost is associated with Alternative 1A1-1. The estimated present worth costs for the alternatives range from of \$625,000 for Alternative 1A1-2 to \$8,383,000 for Alternative 1A1-4. The cost of each alternative increases as the degree of long-term protection of human health and the environment increases.

### 1.7.2.3 Modifying Criteria

*Regulatory Acceptance.* Regulatory involvement has been solicited throughout the Comprehensive Environmental Response, Compensation, and Liability Act process. The USEPA and the State of California concur with the selected remedy.

*Community Acceptance.* The proposed plan was issued for public review November 7 to December 8, 2006 and was discussed at a public meeting on November 14, 2006. No public comments or concerns were received.

## 1.8 Selected Remedy

### 1.8.1 Rationale for Remedy Selection

The selected remedy for Site 1A-1 is Alternative 1A1-4, Soil Excavation, Pretreatment of Excavated Soil, and Off-Base Disposal. This remedy was selected because it meets the remedial action objectives and the threshold criteria and provides the best balance of tradeoffs with respect to the balancing and modifying criteria. This remedy protects human health and ecological receptors by excavating contaminated soil exceeding chemical-specific unrestricted land use remediation goals, treating, and transporting the excavated soil off Base for disposal. The site would then be backfilled with clean imported soil as needed, and the vegetation would be restored. ARARs will be met by excavating soils exceeding chemical-specific remediation goals and by coordinating with the United States Fish and Wildlife Service, State Historic Preservation Officer, and appropriate Native American groups.

### 1.8.2 Description of Selected Remedy

The selected remedy, Alternative 1A1-4, is excavating contaminated soil exceeding chemical-specific unrestricted land use remediation goals, treating the soil to make it acceptable for disposal in a landfill, and transporting it to a disposal facility. The estimated volume of soil to be removed and transported is 20,000 cubic yards. The final limits of excavation will be determined by confirmation samples verifying that unrestricted land use remediation goals have been met (Table 1-3). Waste characterization testing will be conducted to classify the soil for proper off-site disposal. Sampling and analysis of excavated areas to make sure they are clean, bringing in clean backfill (as compared to remediation goals) as needed, and restoring site vegetation are the final stages.

### 1.8.3 Estimated Outcomes of the Selected Remedy

Once the selected remedy has been implemented, there will be no significant risk to human health or the environment since concentrations will be less than unrestricted land use remediation goals. Current non-residential land use at Site 1A-1 is expected to continue for the foreseeable future. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, it is anticipated that the five-year review will involve ensuring that the required closure documentation is in place. The current land uses are expected to continue at Site 1A-1, and there is no other planned land uses in the future. Confirmation samples will be collected during removal to ensure that the RGs for unrestricted land use are achieved.

### 1.8.4 Statutory Determinations

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

- Protection of Human Health and the Environment - The selected remedy is needed to protect human health and the environment. Protection will be achieved through excavation of all contaminated soil and waste exceeding chemical-specific RGs, transporting that material off Base, and backfilling the site with clean imported soil.

There are no short-term threats associated with the selected remedy that cannot be controlled. In addition, no adverse cross-media impacts are expected from the remedy.

- Compliance with ARARs - The ARARs include any federal or state standards, requirement, criteria, or limitations that are determined to be legally applicable or relevant and appropriate to a Comprehensive Environmental Response, Compensation, and Liability Act site or action. To Be Considered criteria are non-promulgated advisories or guidance issued by federal or state government and do not have the status of potential ARARs but are evaluated along with ARARs. A complete discussion of [Site 1A-1 ARARs<sup>22</sup>](#) for Alternative 1A1-4 is presented in Appendix A1.
- Cost-Effectiveness - The selected remedy represents the most reasonable value for the money because the Base will be able to continue to use the land to accomplish the Base's mission without restrictions. The costs are proportional to overall effectiveness by achieving the highest degree of long-term effectiveness and permanence within a reasonable timeframe.
- Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable - The selected remedy provides a high degree of long-term effectiveness and permanence by removing contaminated soils from the site and providing on Base treatment of soils prior to disposing contaminated soils at an off-Base facility.
- Preference for Treatment as a Principal Element – The selected remedy involves treatment of the excavated soil to incorporate a chemical stabilizer on Base prior to off-Base transport and disposal.
- Five-Year Review Requirements - The selected remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. However, the site will be included in a five-year review to document status of the remedial action.

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## 2.0 SITE 1H DECISION SUMMARY

### 2.1 Site Description and History

**Description:** Site 1H is a former burning ground and disposal area of approximately 0.9 acre in the 62 Area, near the western perimeter of the Base. The site is approximately 1,200 feet north of San Mateo Road (Figure 2-1). The site is actively used as a military training area.



**Figure 2-1 Site 1H Location Map**

**History:** Site 1H was one of nine refuse burning grounds used from 1942 through the early 1970s to burn refuse generated by Base operations. In accordance with common Base practice at the time, burning grounds served as the principal trash disposal areas on the Base prior to the 1970s. Until 1970, all refuse at the Base was disposed of by burning; however, no information is available on the specific years of operation or the amount of refuse disposed of at each burning ground, including Site 1H.

Former waste disposal activities have resulted in approximately **10,800 cubic yards<sup>23</sup>**, with waste material containing **metals and dioxins and/or furans<sup>24</sup>**.

**Characteristics:** Site 1H is located on a steep trail above San Mateo Road (Figure 2-2). The site is at an elevation between approximately 300 and 315 feet above mean sea level. It is densely vegetated with a grade ranging from 2 to 7 percent and is currently covered by approximately 3 feet of soil over the buried materials. The site drains to the southeast towards a stream-cut canyon.



Looking north at Site 1H from dirt road

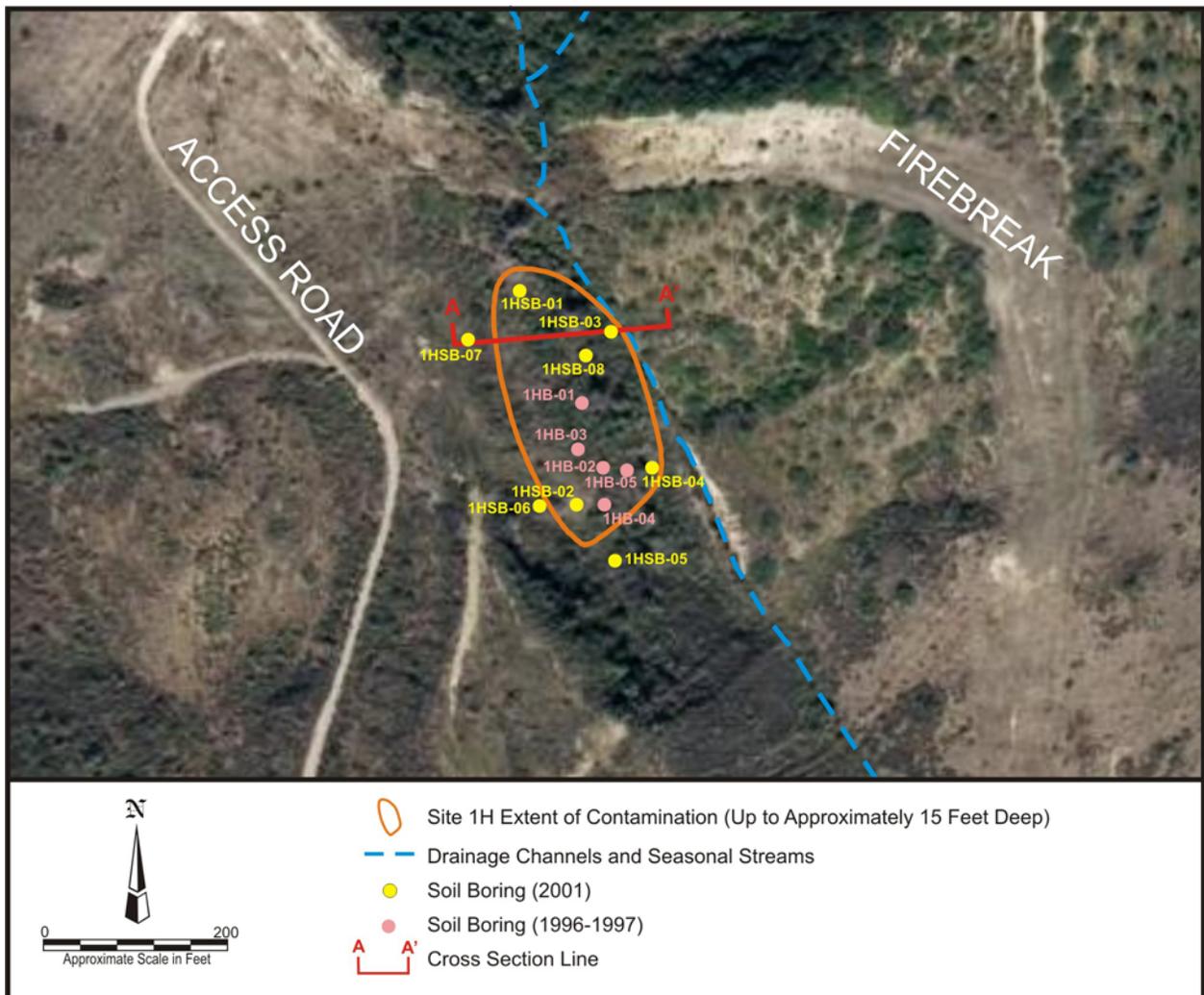


Figure 2-2 Site 1H Location Map

Geology is characterized by unconsolidated and semi-consolidated alluvium that overlies bedrock of the La Jolla Group. Weathered bedrock was encountered at 5 feet below ground surface (bgs) in the western portion, but was not encountered at depths up to 15 feet bgs at the rest of the site (Figure 2-3).

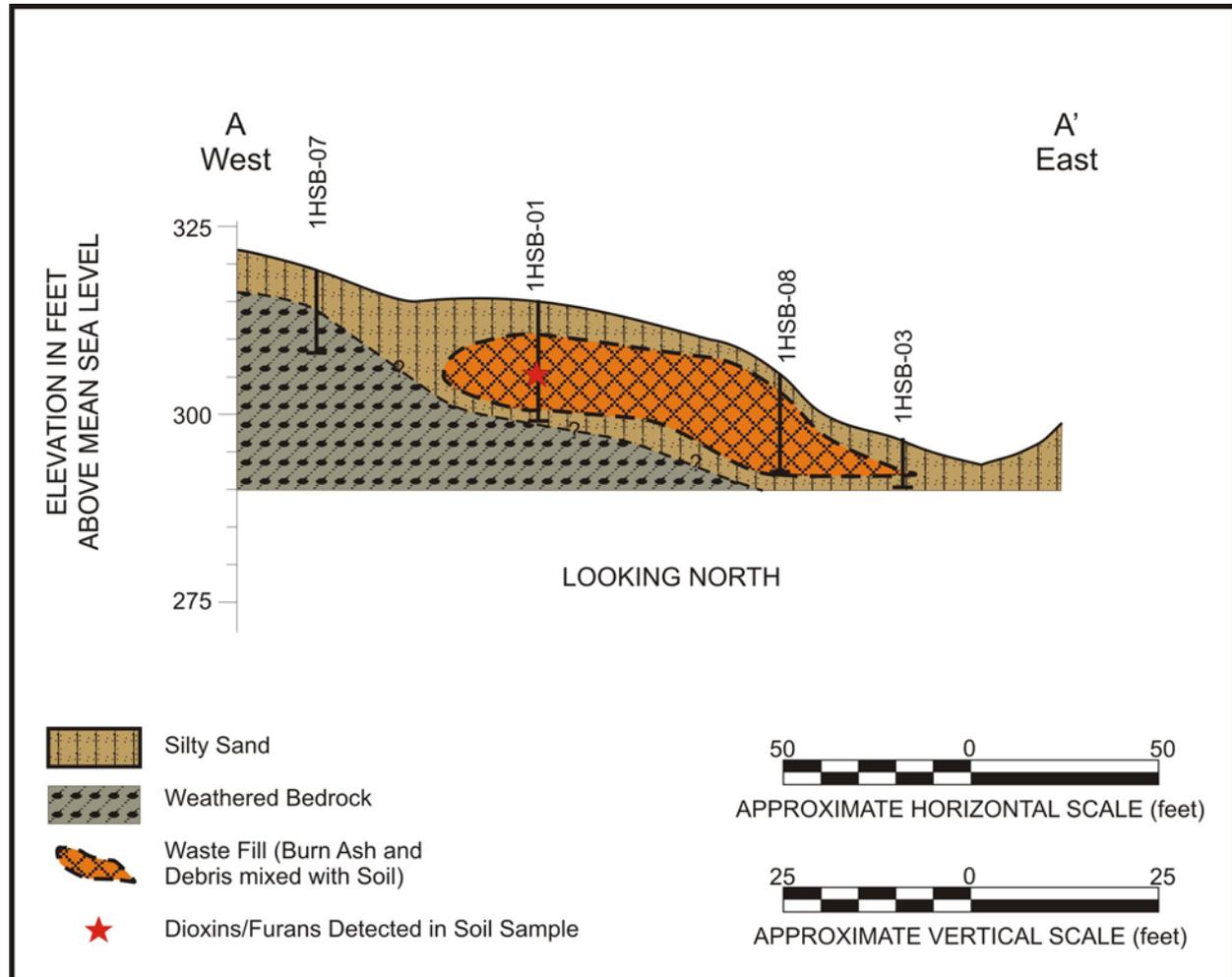


Figure 2-3 Site 1H Generalized Cross Section

Groundwater has not been encountered in borings as deep as 25 feet bgs. Surface water occurs intermittently in the alluvial valley approximately 4000 feet south of Site 1H along San Mateo Creek at an elevation of approximately 90 feet above mean sea level and, therefore, groundwater is assumed to occur in the valley at the surface water elevation. The elevation difference between the intermittent surface water in the valley and Site 1H is approximately 250 feet. Based on these elevation differences, the water table beneath Site 1H is estimated at an elevation of approximately 115 to 140 feet above mean sea level, which equates to a depth to water of 200 to 225 feet.

A pair of [coastal California gnatcatchers](#)<sup>25</sup> with two fledglings was observed on the site in August 2001. The dominant habitat type is non-native grassland consisting of wild oats. A few patches of sage and coyote brush are scattered throughout. Biological resource monitoring may be required during any site remediation activities if conducted during the breeding season.

**Transport Pathways:** Because of the significant depth to groundwater and the nature of the underlying sedimentary rock, the only potential contaminant transport pathway is erosion and runoff (Figure 2-4). If the cover soils were to become disturbed or wash away, waste soils could be transported down slope to the adjacent valley, potentially posing a threat to ecological receptors.

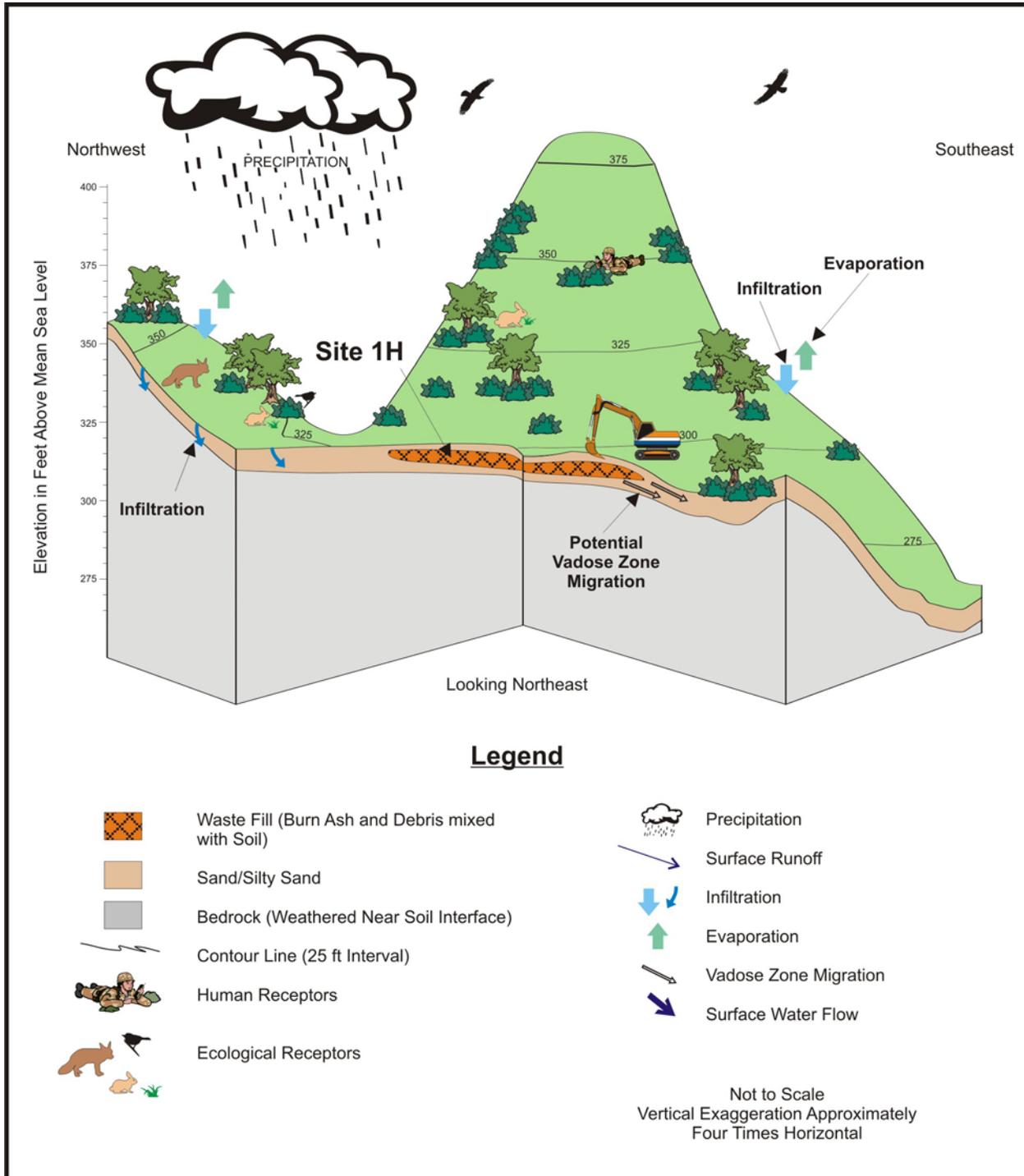


Figure 2-4 Site 1H Transport Pathways

## 2.2 Previous Investigations

The source of soil contamination is buried waste and ash that came from refuse-burning operations between 1942 and 1970. The assessment of contamination and risk for Site 1H is based on Remedial Investigation (RI) and Feasibility Study (FS) activities conducted between 1997 and 2001. Site 1H was included in the Operable unit (OU) 4 FS, but because of delays in schedule relative to the other OU 4 sites, the site was subsequently moved to OU 5. Table 2-1 summarizes the previous studies and investigations conducted at the site. Sample locations are shown on Figure 2-2.

**Table 2-1 Previous Studies and Investigations at Site 1H**

Previous Study / Investigation*	Report Date	Investigation Activities
Remedial Investigation Report	1997	June and July 1996 Phase 1 Field Investigation - Seven soil samples were collected from two soil borings and analyzed for metals, volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, and dioxins and/or furans. Based on the results, it was determined additional data were needed to evaluate risk to human health and the environment.
Remedial Investigation Report	1998	October 1997 Phase 2 Field Investigation - Eight additional soil samples were collected from three borings and <b>metals, pesticides, and dioxins and/or furans<sup>26</sup></b> were detected. Based on the results of the Remedial Investigation, a Feasibility Study was recommended to evaluate remedial alternatives to address soil contamination.
Remedial Investigation/ Feasibility Study	1999	Site 1H was included in the OU 4 Remedial Investigation/Feasibility Study Report to for the evaluation of possible remedial alternatives. Alternatives evaluated included no action, land use controls, and excavation and off-Base disposal.
Feasibility Study	2001	2001 Field Investigation - Based on comments on the draft OU 4 RI/FS Report, additional data were required to develop and fully evaluate alternatives for Site 1H. Soil samples were collected from eight borings during the OU 4 Feasibility Study and <b>dioxin and/or furans and metals<sup>27</sup></b> were detected at concentrations above residential soil preliminary remediation goals.  Following an evaluation of remedial alternatives to address soil contamination, soil excavation and off-site disposal was determined to be the preferred alternative.
Proposed Plan	2006	The Navy invited the public to comment on the proposed cleanup plan for contaminated soil at Site 1H.

\*The documents listed are available in [the Administrative Record<sup>1</sup>](#) and provide detailed information used to support remedy selection at Site 1H.

The nature and extent of contamination was defined by constituent concentrations in media exceeding regulatory screening values and Base background concentrations. The soil at Site 1H is contaminated with metals and dioxins and/or furans above United States Environmental Protection Agency (USEPA) Region 9 residential preliminary remediation goals. Field mapping, subsurface data collected during drilling, and analytical data, were used to determine the lateral and vertical extent of contamination. The aerial extent of contamination is shown on Figure 2-2.

The waste material, which is mixed with native soil, is present approximately 5 to 15 feet bgs and ranges from 2 to 10 feet thick.

**Fate and transport modeling**<sup>28</sup> was also conducted to model the potential for contaminants in the waste soils to leach to the bedrock, and then along the bedrock surface to downgradient groundwater. The results from the model concluded that there was no threat to groundwater.

### 2.3 Current and Potential Future Site and Resource Uses

Site 1H and the surrounding area are covered with natural vegetation, undeveloped, and designated as military training areas. Groundwater at Site 1H is approximately 200 to 225 feet below ground surface. The nearest Base production wells are approximately 1 mile west-southwest of Site 1H, and results of fate and transport modeling concluded that there is no threat to groundwater.

Marine Corps Base Camp Pendleton is expected to remain an active military installation into the future. Current land use is reasonably anticipated to continue indefinitely to support the mission of the facility.

### 2.4 Summary of Site Risks

#### 2.4.1 Human Health Risk Assessment

A quantitative **human health risk assessment**<sup>29</sup> was completed for Site 1H for exposure to soil. Potential cancer risks and non-cancer hazards were calculated based on reasonable maximum exposure (RME) input parameters. The RME is defined as the highest exposure that could reasonably be expected to occur based on combining high-end input parameters (e.g., maximum or 95-percent upper confidence limit concentrations, exposure frequency, exposure duration, etc.), whereas the central tendency reflects use of average concentrations and exposure conditions.

For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between  $10^{-4}$  (a 1 in 10,000 chance of developing cancer) and  $10^{-6}$  (a 1 in 1,000,000 chance of developing cancer) using information on the relationship between dose and response. For non-cancer health effects, the hazard index represents the ratio of the RME concentration or the central tendency concentration to the "reference dose," which is the dosage below which adverse health effects are not expected. A hazard index of 1 for non-cancer hazards and  $10^{-6}$  for cancer risks are used as the point of departure for determining performance standards for alternatives when applicable or relevant and appropriate requirements are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure.

The human health risk assessment was conducted to assess potential risks and hazards to nonintrusive and intrusive workers, military trainees, and hypothetical future residents from exposure to soil. Potential unacceptable risks and/or hazards include cancer risks for a hypothetical nonintrusive worker and cancer risks and non-cancer hazards to a hypothetical future resident from exposure to soil.

The risk screening indicated a cumulative cancer risk to a hypothetical future resident of  $5 \times 10^{-5}$  with approximately  $3 \times 10^{-5}$  attributable to arsenic (background and site related) and approximately  $1 \times 10^{-5}$  from dioxin (background and site related). The non-cancer hazard index was predicted to equal 2. The primary contributors were metals, although no individual metal exceeded a hazard quotient of 1. A separate evaluation was performed to characterize impacts

**Table 2-2 Human Health Cumulative Risk and Hazard**

Receptor	USEPA Reasonable Maximum Exposure	
	Cumulative Risk	Hazard Index
Hypothetical Non-Intrusive Industrial/Commercial Worker Receptor (Soil 0 to 1 foot below ground surface)	7.0 x 10 <sup>-6</sup>	0.08
Military Trainee (Soil 0 to 3.5 feet below ground surface)	2.0 x 10 <sup>-7</sup>	0.01
Hypothetical Adult Residential Receptor (Soil 0 to 10 feet below ground surface)	5.0 x 10 <sup>-5</sup>	2

Potential unacceptable risks are shaded in yellow

from lead. The calculated exposure point concentration of lead (2,400 milligram per kilogram [mg/kg]) for the site exceeded the USEPA residential soil preliminary remediation goal of 400 mg/kg and the LEADSPREAD child preliminary remediation goal of 150 mg/kg and is also identified as a chemical of concern. The estimated risks and hazards to each of these receptors are summarized in Table 2-2 above.

#### 2.4.2 Ecological Risk Assessment

The results of the [ecological risk assessment](#)<sup>30</sup> indicate that Site 1H does not currently represent a significant threat to ecological receptors because of the limited habitat quality, the small contaminated area, and the presence of clean soil in the upper 5 feet.

#### 2.4.3 Basis for Response Action

A response action is necessary under a future unrestricted land use scenario since the risk and hazard to a hypothetical resident exceeded the National Contingency Plan 10<sup>-6</sup> point-of-departure level. The Base mission requires that the land be available for training purposes and that no restrictions be placed on the land. The extent of contamination is shown on Figure 2-2.

### 2.5 Principal Threat Waste

Although a remedial response action is necessary (Section 2.4.3), there are no wastes at Site 1H that constitute a “principal threat.” Per the USEPA [Guide to Principal Threat and Low Level Threat Wastes](#)<sup>14</sup>, a principal threat waste is a source material that: 1) is highly toxic and/or highly mobile; 2) generally cannot be reliably contained; and 3) could present substantial threat to human health or the environment if released. For example, liquids in drums, lagoons, or tanks; free product non-aqueous phase liquids over or under groundwater; surface soil with high concentrations of volatiles or dust-associated chemicals of concern; or highly toxic, non-liquid wastes in buried drums or tanks or in soil at high concentrations. Historical records do not indicate the disposal of hazardous or highly toxic source materials at Site 1H. The waste has remained relatively undisturbed and stable since placement several decades ago. The threat to groundwater from waste soils is negligible based on the nature of the waste and the depth to groundwater (approximately 200 to 225 feet bgs). Additionally, based on the results of the human health risk assessment, cancer risks based on unrestricted and/or industrial land use for potential exposure to chemicals of concern in soil are within the National Contingency Plan target risk range (10<sup>-4</sup> to 10<sup>-6</sup>). Per the USEPA Guide to Principal Threat and Low Level Threat Wastes, although no threshold level has been established to equate to a “principal threat,” treatment alternatives generally should be evaluated when potential risks are 10<sup>-3</sup> or greater. Therefore, there are no wastes constituting principal threats at Site 1H.”

## 2.6 Remedial Action Objectives

Remedial action objectives are established based on attainment of regulatory requirements, standards, and guidance; contaminated media; chemicals of concern; potential receptors and exposure scenarios; and human health and ecological risks. The following remedial action objective was developed for soil contamination at Site 1H to address the protection of human health and the environment:

- Minimize exposure to chemicals in soil (through inhalation, dermal contact, or ingestion) to human receptors that pose an unacceptable risk.

**Remediation goals**<sup>31</sup> (RGs) were developed to meet this remedial action objective as presented in Table 2-3. Although the cumulative risk associated with background concentrations of dioxin and arsenic would exceed  $10^{-6}$ , soil RGs are based on background concentrations for these chemicals since remediation to levels below background is not feasible, practicable, or recommended by the Department of Toxic Substances Control or USEPA. Unacceptable cumulative effects above a target hazard of one are not expected from exposure to post-remediation levels for the noncarcinogenic chemicals (antimony, copper, manganese, and mercury) given: 1) post-excavation soil concentrations considering the entire site/exposure area are expected to be well below RGs (i.e., post-remediation concentrations will not be right at the RGs for all four chemicals); 2) it is overly conservative to assume all four of these chemicals are toxic to the same organ; and 3) the conservative (i.e., health-protective) assumptions incorporated into calculating unrestricted land use RGs. Table 2-3 shows the RG for each remedial chemical of concern that was determined in the OU 4 Feasibility Study.

**Table 2-3 - Soil Remediation Goals for Unrestricted Land Use**

Chemical of Concern	Maximum Detected Conc.	Background Concentration <sup>a</sup> (0 to 10 feet)	Human Health Risk Assessment Residential Soil Preliminary Remediation Goal <sup>b</sup>	Final Remediation Goal	Number of Samples Above RG/Total Samples
<b>Dioxins/Furans (ng/kg)</b>					
2,3,7,8-TCDD TEQ	70	4.1	3.9	4.1 <sup>b</sup>	3/3
<b>Inorganics (mg/kg)</b>					
Antimony	273	8.4	31	31	2/49
Arsenic	64.3	10.9 <sup>c</sup>	0.4	10.9 <sup>d</sup>	8/49
Copper	5,930	26	2,900	2,900	2/49
Lead	21,200	21.7	400	150 <sup>e</sup>	12/49
Manganese	6,780	655	1,800	1,800	10/49
Mercury	2.9	0.1	2.3	2.3	1/49

a = Background values were primarily based on data from the Santa Margarita basin, which represents the largest population of background data.

b = USEPA Region 9 Residential PRG

c = Background for arsenic was compared to upgradient boring 2FBG-08.

d = Proposed remediation goal was set at background

e = The RG for lead is a Department Of Toxic Substances Control, Human and Ecological Risk Division-required cleanup value for an unrestricted land use scenario.

## 2.7 Description and Evaluation of Remedial Alternatives

To address soil contamination at Site 1H, an **initial screening of remedial technologies**<sup>32</sup> was completed to refine the remedy selection process. Six soil remedial approaches were retained as preliminary **process options**<sup>33</sup> and were evaluated with respect to implementability,

effectiveness, and relative cost (high/moderate/low). All of these were incorporated into the five remedial alternatives for soil that were retained for a detailed comparative analysis in accordance with the **National Contingency Plan (NCP)**<sup>34</sup> criteria.

### 2.7.1 Description of Remedial Alternatives

The remedial alternatives identified for soil at Site 1H are presented in Table 2-4 below.

**Table 2-4 Remedial Alternatives for Site 1H**

Alternative	Description	Cost
<b>1H-1 No Action</b>	- The National Contingency Plan (40 Code of Federal Regulation 300.430[e][6]) requires that a no action alternative be evaluated. Under this option, existing soil is left in place and nothing is done to clean up the soil contamination, prevent land use, or limit contaminant movement.	- \$0
<b>1H-2 Land Use Controls</b>	- The alternative includes restrictions on future development and land use, as well as site inspection and monitoring to prevent unauthorized use as long as wastes remain at the site.	- Capital Cost: \$135,000 - O&M Cost: \$550,000 - <b>Total Cost: \$685,000</b> <sup>35</sup> - Timeframe: 30 years
<b>1H-3 Capping</b>	- The alternative includes installing a specially constructed cap (soil cover) that would prevent exposure to the contamination underneath. - Land use controls would also be implemented to restrict future development and land use and to ensure that the cap is not breached.	- Capital Cost: \$780,000 - O&M Cost: \$1,092,000 - <b>Total Cost: \$1,872,000</b> <sup>36</sup> - Timeframe: 30 years
<b>1H-4 Excavation and Off-Base Disposal</b>	- Excavation of approximately 10,800 cubic yards of soil - Sampling and analysis of soil stockpiles for waste characterization - Transportation of the excavated soil to an off-Base disposal facility - Confirmation sampling and analysis of excavation areas - Import and compaction of backfill material - Site restoration	- Capital Cost: \$2,909,000 - O&M Cost: \$0 - <b>Total Cost: \$2,909,000</b> <sup>37</sup> - Timeframe: 2 years
<b>1H-5 Excavation and On-Base Disposal</b>	- Excavation of approximately 10,800 cubic yards of soil - Sampling and analysis of soil stockpiles for waste characterization - Transportation of the excavated soil to an on-Base disposal facility - Confirmation sampling and analysis of excavation areas - Import and compaction of backfill material - Site restoration	- Capital Cost: \$2,466,000 - O&M Cost: \$0 - <b>Total Cost: \$2,466,000</b> <sup>38</sup> - Timeframe: 2 years after CAMU built

2.7.2 Comparative Analysis of Alternatives

A comprehensive analysis of each alternative<sup>39</sup> with respect to the National Contingency Plan threshold and balancing criteria is presented in the Feasibility Study Report. The results of the comparative analysis are summarized below in Table 2-5.

Table 2-5 Comparable Analysis of Alternatives for Site 1H

Criteria	Alternative				
	1H-1 No Action	1H-2 Land Use Controls	1H-3 Capping	1H-4 Excavation and Off-Base Disposal	1H-5 Excavation and On-Base Disposal
<b>Threshold Criteria</b>					
Overall Protection of Human Health and the Environment	No	Yes <sup>a</sup>	Yes	Yes	Yes
Compliance with ARARs	No	Yes <sup>a</sup>	Yes	Yes	Yes
<b>Balancing Criteria</b>					
Long-Term Effectiveness and Permanence	○	◐	◐ to ●	●	●
Reduction of Toxicity, Mobility, or Volume by Treatment	○	○	○	○	○
Short-Term Effectiveness	NR	●	◐	◐	◐
Implementability	NR	◐	◐	●	◐
Cost (\$ million)	0	0.7	1.9	2.9	2.5
<b>Modifying Criteria</b>					
State Acceptance	NR	NR	NR	●	NR
Community Acceptance	NR	NR	NR	NC	NR

○ Low   ◐ Moderate   ● High   NR = Not Rated

NC = No comments received on proposed plan or during the public meeting

a = Alternative 1H-2 meets the threshold criteria of overall protection of human health and the environment and compliance with ARARs, but the alternative was not chosen because land use controls are not considered practical due to the Base's mission of military training.

2.7.2.1 Threshold Criteria

*Overall Protection of Human Health and the Environment.* Alternative 1H-1 is not protective because it would leave contaminant concentrations in place that pose a potential threat for human health exposure. Alternative 1H-2 would protect human health exposure pathways through land use controls. Alternative 1H-3 would protect human health by capping the impacted soils and using land use controls, effectively eliminating potential exposure pathways. Alternatives 1H-4 and 1H-5 would be the most protective of human health through removal and disposal of impacted soils in an appropriate disposal facility.

*Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).* Alternative 1H-1 would not comply with location-specific requirements of the Endangered Species Act though Alternative 1H-2 would comply by monitoring to ensure cover soils remain in place. Alternatives 1H-3, 1H-4, and 1H-5 would be implemented to comply with action- and location-specific requirements of the Endangered Species Act, including coordination with the United

States Fish and Wildlife Service. Alternatives 1H-4 and 1H-5 would be implemented in compliance with ARARs for excavation, transportation, and disposal.

#### 2.7.2.2 Primary Balancing Criteria

*Long-Term Effectiveness and Permanence.* Alternative 1H-1 is rated low for long-term effectiveness and permanence because no measures or controls are associated with this alternative. Alternative 1H-2 would provide a degree of long-term effectiveness through limiting exposure and site uses. Alternative 1H-3 would provide a higher degree of long-term effectiveness through elimination of exposure pathways via capping as well as limiting site uses. The effectiveness and permanence of Alternatives 1H-2 and 1H-3 are dependent upon the adequacy of maintenance of the land use controls and/or soil cover. Alternatives 1H-4 and 1H-5 would provide the greatest degree of long-term effectiveness and permanence because they involve removal of the contaminated soils from the area and backfilling of the excavation with clean import soil.

*Reduction of Mobility, Toxicity, or Volume through Treatment.* Although none of the alternatives evaluated include treatment, components of Alternatives 1H-3, 1H-4, and 1H-5 include measures that would reduce mobility, toxicity, and/or volume.

*Short-Term Effectiveness.* There is no exposure risk in the short term for Alternative 1H-1 as no response actions would be taken. Only administrative activities are planned as part of Alternative 1H-2, therefore there is no exposure risk in the short term. During implementation of Alternatives 1H-3, 1H-4, and 1H-5, there would be potential risks to the construction worker and ecological receptors during construction of the cap or excavation activities, primarily associated with equipment movement and short-term dust exposure. However, air monitoring and engineering controls would control the potential for exposure. Workers would be required to wear appropriate levels of protection to avoid exposure during capping or excavation activities. The surrounding community would not be impacted, as construction activities would remain on site.

*Implementability.* This criterion is not rated for Alternative 1H-1 because no activities would be conducted under this alternative. Alternatives 1H-2, 1H-3, and 1H-5 are readily implementable and involve commonly performed remedial operations, but are rated moderate because they require land use controls. Given that the Base mission is to support training, any area with a land use restriction would limit that function. These alternatives are rated moderate due to potential loss of land use. Alternative 1H-4 is ranked high because excavation and disposal of contaminated soil at an off-Base disposal facility are readily implementable and no further actions (e.g., land use controls) would be necessary.

*Cost.* No cost is associated with Alternative 1H-1. The estimated present worth costs for the alternatives range from \$685,000 for Alternative 1H-2 to \$2,909,000 for the most expensive alternative, 1H-4. The costs of the alternatives increase as the degree of long-term protection of human health and the environment increases. The only difference between Alternatives 1H-4 (\$2,909,000) and 1H-5 (\$2,466,000) are off-Base disposal of excavated soils versus on-site disposal of excavated soils, respectively.

#### 2.7.2.3 Modifying Criteria

*Regulatory Acceptance.* Regulatory involvement has been solicited throughout the Comprehensive Environmental Response, Compensation, and Liability Act process. The USEPA and the State of California concur with the selected remedy.

*Community Acceptance.* The proposed plan was issued for public review November 7 to December 8, 2006 and was discussed at a public meeting on November 14, 2006. No public comments or concerns were received.

## **2.8 Selected Remedy**

### **2.8.1 Rationale for Remedy Selection**

The selected remedy for Site 1H is Alternative 1H-4, Soil Excavation and Off-Base Disposal. This remedy was selected because it meets the threshold criteria and provides the best balance of tradeoffs with respect to the balancing and modifying criteria. This remedy protects human health and ecological receptors by excavating contaminated soil exceeding chemical-specific RGs and transporting it off Base for disposal. The site would then be backfilled as needed with clean imported soil, and the vegetation would be restored. ARARs will be met by excavating soils exceeding chemical-specific RGs and by coordinating with the United States Fish and Wildlife Service, State Historic Preservation Officer, and appropriate Native American groups.

### **2.8.2 Description of Selected Remedy**

The selected remedy, Alternative 1H-4 is excavating contaminated soil and transporting it to a disposal facility. The estimated volume of soil to be removed and transported is 10,800 cubic yards. The final limits of excavation will be determined by confirmation samples verifying that RGs have been met (Table 2-3). Waste characterization testing will be conducted to classify the soil for proper off-site disposal. Sampling and analysis of excavated areas to make sure they are clean, bringing in clean backfill (as compared to RGs), and restoring site vegetation are the final stages.

### **2.8.3 Estimated Outcomes of the Selected Remedy**

Once the selected remedy has been implemented, there will be no risk to human health or the environment. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, it is anticipated that the five-year review will involve ensuring that the required closure documentation is in place. The current land uses are expected to continue at Site 1H, and there is no other planned land uses in the future.

### **2.8.4 Statutory Determinations**

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

- Protection of Human Health and the Environment - The selected remedy is needed to protect human health by physically removing all contaminated soil and waste exceeding chemical-specific RGs, transporting that material off Base, and backfilling the site with clean imported soil. There are no short-term threats associated with the selected remedy that cannot be controlled. In addition, no adverse cross-media impacts are expected from implementation of the remedy.
- Compliance with ARARs - The ARARs include any federal or state standards, requirement, criteria, or limitations that are determined to be legally applicable or relevant and appropriate to a Comprehensive Environmental Response, Compensation, and Liability Act site or action. To be considered criteria are non-promulgated advisories or guidance issued by Federal or State government and do not have the status of potential ARARs but are evaluated along with ARARs. A complete discussion of [Site 1H ARARs<sup>40</sup>](#) for Alternative 1H-4 is in Appendix A2.
- Cost-Effectiveness - The selected remedy is the most reasonable value for the money because the Base will be able to continue to use the land to accomplish the

Base's mission without restrictions. The costs are proportional to overall effectiveness by achieving the highest degree of long-term effectiveness and permanence within a reasonable timeframe.

- Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable - The selected remedy provides a high degree of long-term effectiveness and permanence by removing contaminated soils from the site and disposing contaminated soils at an off-Base facility.
- Preference for Treatment as a Principal Element – The selected remedy does not involve treatment of the excavated soil, but reduces contamination on site by permanently removing contaminated soil.
- Five-Year Review Requirements - The selected remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. However, the site will be included in a five-year review in order to document status of the remedial action.

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### 3.0 SITE 6A DECISION SUMMARY

#### 3.1 Site Description and History

**Description:** Site 6A is a former scrap metal and recycling storage area in the 22 Area of the Base. Site 6A is approximately 7.2 acres in size and is located south of Building 2241, which houses the Defense Reutilization and Marketing Office (Figure 3-1).



**Figure 3-1 Site 6A Location Map**

**History:** The Defense Reutilization and Marketing Office temporarily stored scrap metal at the site. The storage area had been covered with a thin layer of soil by periodic flooding, and scraps of metal were reportedly pounded into the ground between 1994 and 1995, causing an uneven ground surface. The site was repaved with approximately three inches of asphalt. Previous investigations indicate the presence of scrap metal at a depth of approximately 8 inches below ground surface.

**Characteristics:** The ground surface at Site 6A is flat and covered with asphalt (Figure 3-2). A drainage ditch, which conveys surface water runoff from the site, is located south of the former scrap yard. Surface water is not generally present in the drainage ditch, except for runoff during rain events. The 22 Area, which includes Site 6A, is directly southeast of the Santa Margarita River channel and is subject to flooding. The Santa Margarita flood control project in 2000 included construction of a levee, a floodwall, and a pump station at the southwestern portion of the 22/23 Area, approximately 1,200 feet north of Site 6A.



Looking east at Site 6A bermed area

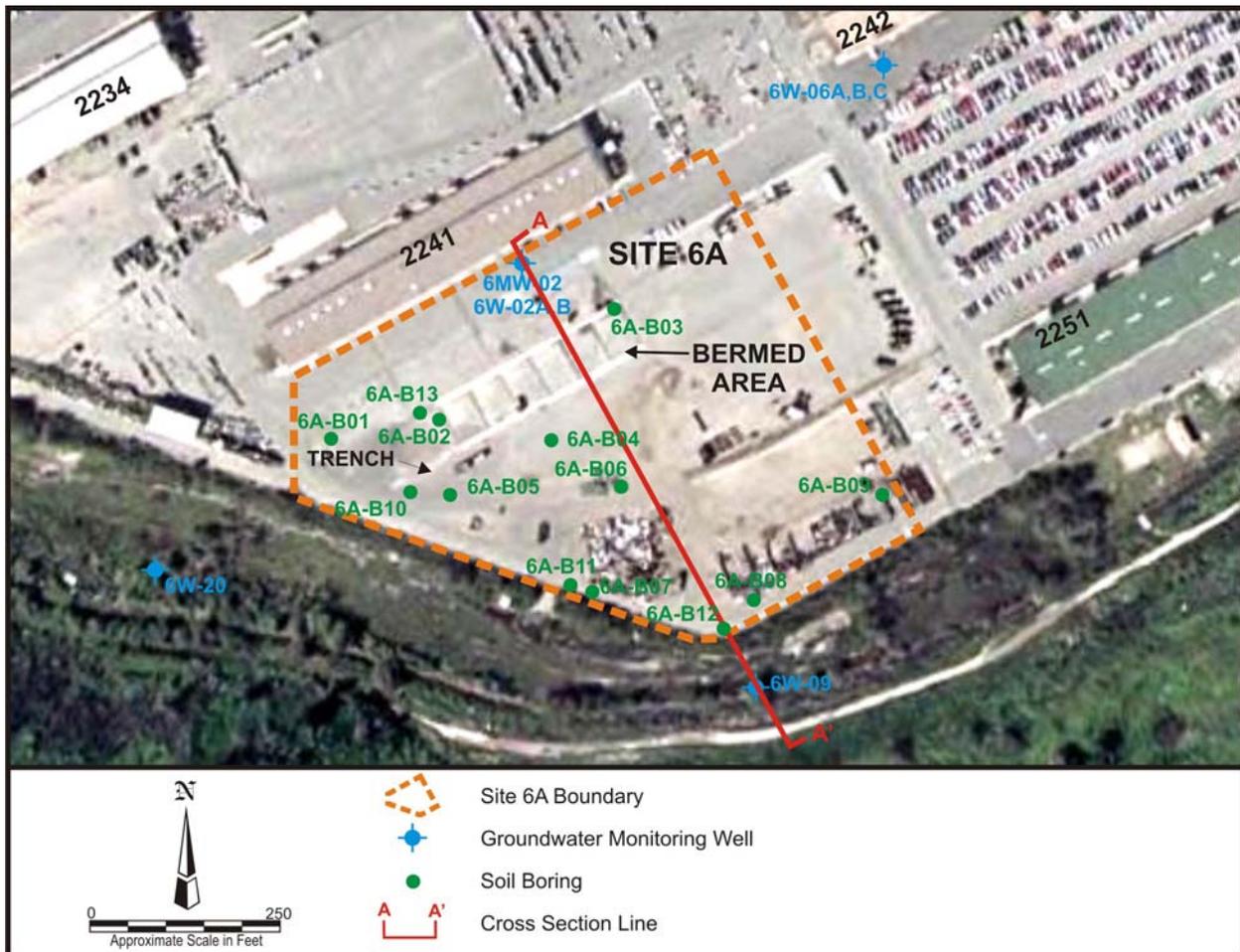


Figure 3-2 Site 6A Boundary

Subsurface geology at the site consists primarily of stream-deposited alluvium of the Santa Margarita River basin overlying bedrock. The alluvium consists of unconsolidated sand and silts with lesser amounts of clay and gravel (Figure 3-3).

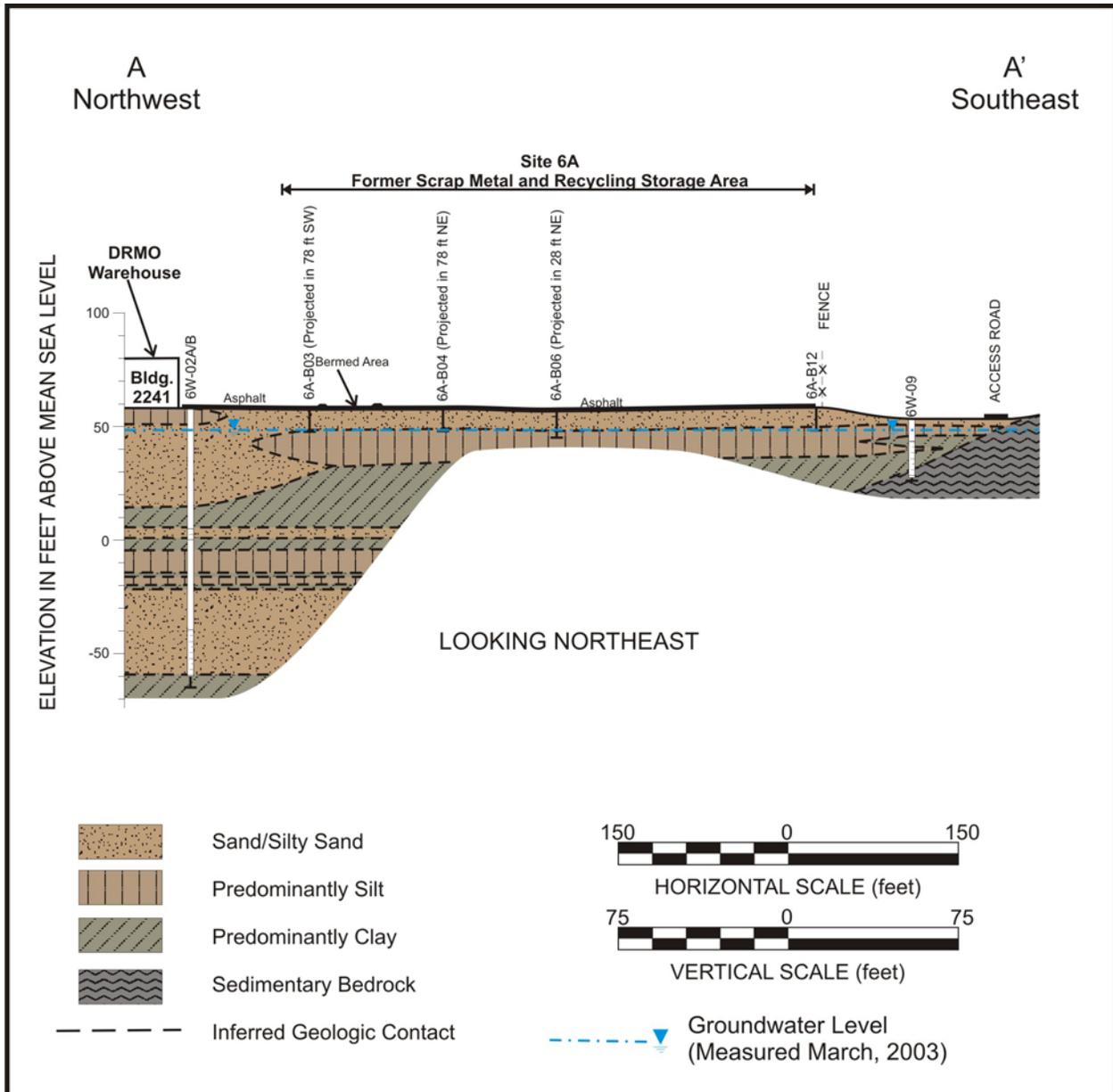


Figure 3-3 Site 6A Generalized Cross Section

The groundwater underlying Site 6A is encountered at 0 to 17 feet below ground surface and within the alluvial deposits in the Santa Margarita River basin. The groundwater flow direction is generally towards the west. Water elevations may vary by as much as 8 feet based on seasonal variation. The gradient typically ranges from 0.002 to 0.004 foot per foot throughout Site 6A.

Because Site 6A is completely paved, the site is poor quality habitat and does not support significant plant or animal communities.

**Transport Pathways:** Precipitation is prevented from infiltrating to groundwater through the soil at Site 6A because the site is paved (Figure 3-4). Site 6A groundwater has been impacted by volatile organic compounds from upgradient sources and is being investigated as part of the 22/23 Area Groundwater Remedial Investigation/Feasibility Study. Therefore, groundwater at Site 6A is addressed separately and not included in this Record of Decision (ROD).

Volatilization of contaminants from groundwater into indoor air is a potential exposure pathway at Site 6A. However, chemicals of potential concern (e.g., chlorinated solvents and 1,2,3-trichloropropane) were not detected or only detected slightly above their corresponding detection limits in shallow groundwater samples collected from monitoring wells at the site during the most recent 22/23 Area Groundwater investigation. These levels are well below United States Environmental Protection Agency’s subsurface-to-indoor air volatilization risk-based screening levels. Therefore, the subsurface-to-indoor air fate-and-transport pathway would not contribute significantly to the cumulative risks for the receptors evaluated as part of the Site 6A risk assessment.

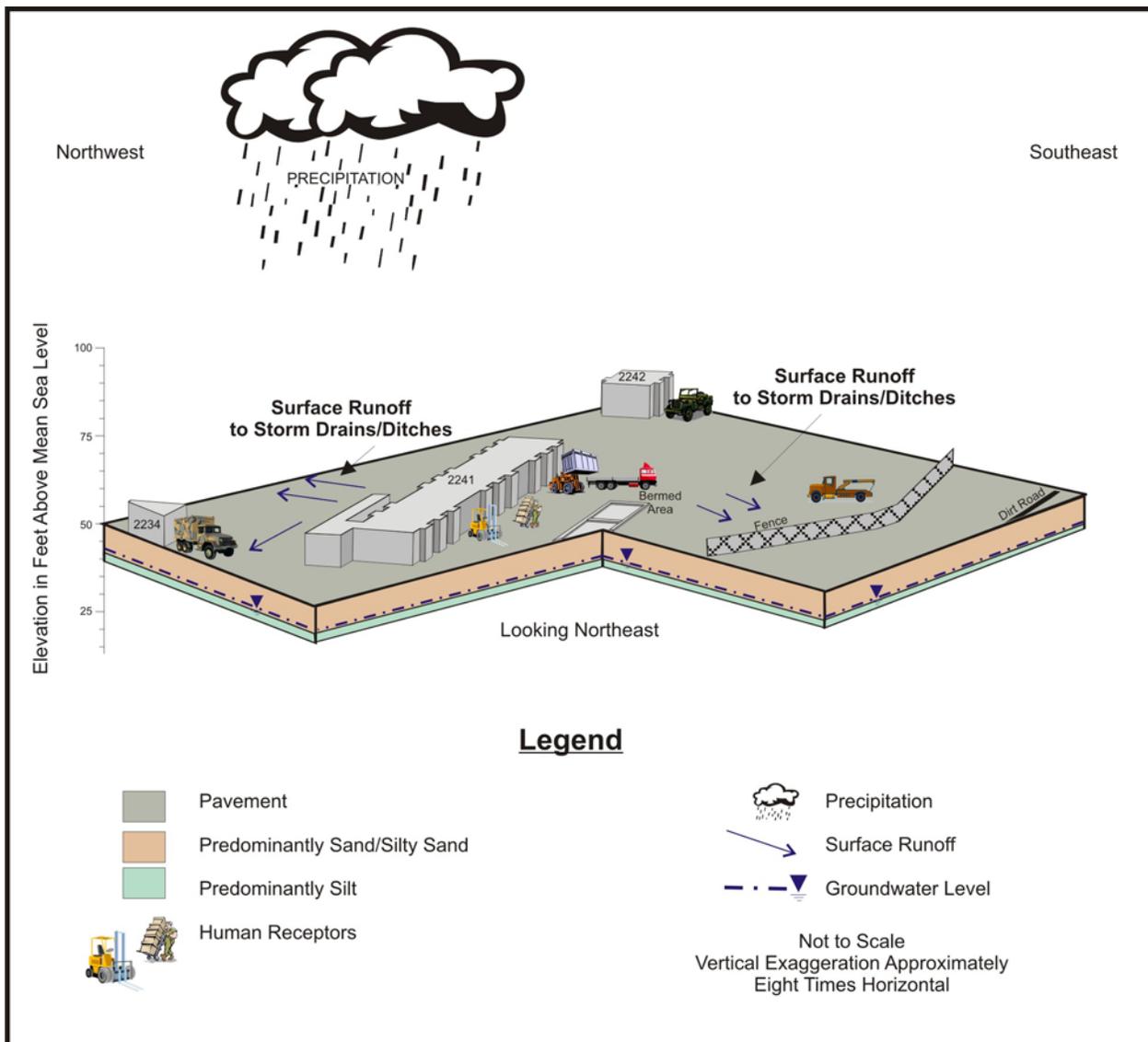


Figure 3-4 Site 6A Transport Pathways

### 3.2 Previous Investigations

The source of soil contamination is scrap metal beneath the asphalt surface. The assessment of contamination and risk for Site 6A is based on Remedial Investigation activities conducted in 2001 and 2003. Table 3-1 summarizes the previous studies and investigations conducted at the site. Sample locations are shown on Figure 3-2.

**Table 3-1 - Previous Studies and Investigations at Site 6A**

Previous Study / Investigation*	Report Date	Investigation Activities
Remedial Investigation Report	2004	<p>2001 Field Investigation - Nine borings were drilled and soil samples were collected and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), and metals. One sample was also analyzed for dioxins and/or furans. <b>VOCs, pesticides, PCBs, dioxins and/or furans, and metals<sup>41</sup></b> were detected. It was determined additional data were required to complete the risk assessment.</p> <p>2003 Supplemental Field Investigation – Subsurface soil samples from four borings were collected and analyzed. Based on the human health risk assessment, the site was recommended for no further action in the RI Report.</p>
Proposed Plan	2006	The Navy invited the public to comment on the proposed plan for no further action at Site 6A.

\*The documents listed are available in the [Administrative Record<sup>1</sup>](#) and provide detailed information used to support remedy selection at Site 6A.

The results of the Remedial Investigation indicated the presence of VOCs, pesticides, PCBs, dioxins and/or furans, and metals in site soil. Three dioxin and/or furans isomers were detected in a relatively deep (9 to 10 feet below ground surface) sample analyzed using Method 8280A. However, subsequent sampling using the more refined Method 8290 did not confirm the presence of elevated dioxins. Based on the results using varying methodologies, the relatively low concentrations, and the lack of visual evidence of burning, dioxin and/or furans are not present at concentrations of concern.

Based on the Regional Water Quality Control Board's designated level methodology results, the maximum concentrations of all detected organic compounds in soil are well below their site-specific designated levels for groundwater protection. With the exception of cadmium detected in sample 6A-B07-A, concentrations of metals detected in soil are consistent with background levels, and there are no unacceptable risks from metals to groundwater at Site 6A.

### 3.3 Current and Potential Future Site and Resource Uses

Site 6A is paved and used for industrial purposes. Marine Corps Base Camp Pendleton is expected to remain an active military installation into the future. Current land use is reasonably anticipated to continue indefinitely to support the mission of the facility. However, the Navy has assumed an unrestricted land use scenario in this ROD in an effort to avoid any form of future land use restrictions.

Groundwater production wells are located north and west of Site 6A, within the Santa Margarita River valley. The nearest downgradient production well is 3,000 feet southwest of the site. Site

6A groundwater has been impacted by VOCs from upgradient sources and is being investigated and addressed separately as part of the 22/23 Area.

### 3.4 Summary of Site Risks

#### 3.4.1 Human Health Risk Assessment

A quantitative **human health risk assessment**<sup>42</sup> (HHRA) was completed for Site 6A for exposure to site soils. Potential cancer risks and non-cancer hazards were calculated based on reasonable maximum exposure (RME) input parameters. The RME is defined as the highest exposure that could reasonably be expected to occur based on combining high-end input parameters (e.g., maximum or 95 percent upper confidence concentrations, exposure frequency, exposure duration, etc.) whereas the central tendency reflects use of average concentrations and exposure conditions.

For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between  $10^{-4}$  (a 1 in 10,000 chance of developing cancer) and  $10^{-6}$  (a 1 in 1,000,000 chance of developing cancer) using information on the relationship between dose and response. For non-cancer health effects, the hazard index represents the ratio of the RME concentration or the central tendency concentration to the reference dose, which is the dosage below which adverse health effects are not expected. A hazard index of 1 for non-cancer hazards and  $10^{-6}$  for cancer risks are used as the point of departure for determining performance standards for alternatives when applicable or relevant and appropriate requirements are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure.

The HHRA was conducted to assess potential risks and hazards to hypothetical future residents from exposure to soil. The estimated risks and hazards are summarized in Table 3-2.

**Table 3-2 Human Health Cumulative Risk/Hazard**

Receptor	USEPA		California-Modified	
	Reasonable Maximum Exposure		Reasonable Maximum Exposure	
	Chemical Specific Risk	Hazard Index	Chemical Specific Risk	Hazard Index
Hypothetical Adult Resident (Mixed Soil 0 to 10 feet below ground surface)	$9.9 \times 10^{-6}$	0.19	$1.3 \times 10^{-5}$	0.2
(using only results above background)	$1.8 \times 10^{-7}$	0.14	$3.5 \times 10^{-6}$	0.15
Hypothetical Child Resident (Mixed Soil 0 to 10 feet below ground surface)	$1.8 \times 10^{-5}$	1.6	$2.4 \times 10^{-5}$	1.7
(using only results above background)	$1.9 \times 10^{-7}$	1.1	$6.1 \times 10^{-6}$	1.3

Cancer risks are below United States Environmental Protection Agency's (USEPA) acceptable risk range of  $10^{-4}$  to  $10^{-6}$  and non-cancer hazards are generally near or below USEPA's target hazard index of 1. Chemical-specific risks above risk ( $1 \times 10^{-6}$ ) were due primarily to arsenic and a lesser extent, cadmium. Arsenic was present in soil at levels consistent with naturally occurring background, with estimated arsenic background risks up to  $9 \times 10^{-6}$  (USEPA) and  $2 \times 10^{-5}$  California Environmental Protection Agency (CalEPA). Cancer risks due to cadmium were

below (USEPA) or slightly above (CalEPA) a  $1 \times 10^{-6}$  target; however, cadmium was not identified as a chemical of concern since it was only detected in one out of 30 samples and California has subsequently withdrawn the Cal-modified toxicity value. Cancer risks to future residents excluding arsenic are well below the lower end of the USEPA's acceptable risk range. The non-cancer hazard to an adult resident is below USEPA's target hazard index of 1. Although non-cancer hazards associated with future child residents are slightly greater than 1, there were no individual constituents with target organ effects greater than 0.5. The largest chemical-specific contributors were aluminum (0.4) and arsenic (0.4), both of which are present at the site at concentrations consistent with naturally occurring background levels. Further risk and hazard calculations were not necessary for an industrial land use scenario because: 1) arsenic is present in soil at concentrations consistent with naturally occurring levels; and 2) industrial risk and hazard estimates would be less than residential estimates.

Based on the results of the HHRA and comparing concentrations to background, there are no unacceptable risks associated with Site 6A, and no action is warranted to protect human health.

### 3.4.2 Ecological Risk Assessment

A screening ecological risk assessment was conducted at Site 6A. Navy policy for conducting an ecological risk assessment outlines a three-tiered approach to characterizing ecological hazards at contaminated sites: Tier-1 screening risk assessment; Tier-2 Baseline ecological risk assessment; and Tier 3 evaluation of remedial alternatives. The Tier-1 screening risk assessment employs existing site data and protective (conservative) assumptions to support decisions for (a) no further action, (b) further analysis in Tier 2, or (c) accelerated site remediation.

Site 6A is paved and lacks vegetation, and is located in the midst of a mission-active area. As a fundamental component of the ecological risk assessment process is the identification of complete exposure pathways, there must be a co-occurrence in space and time of an organism (an ecological receptor) and a contaminant source for an ecological risk assessment process to be warranted. Lacking this co-occurrence, there is no exposure of the receptor to the contaminant, and the receptor cannot be at-risk from that contaminant. For this developed site, there are currently no complete exposure pathways for ecological receptors. Lacking complete exposure pathways, no further action is necessary to protect ecological receptors.

### 3.5 Basis for No Further Action

There are no significant risks to human health and the environment due to site-related chemicals at Site 6A. Although future residential use of the site presents potential cancer risks and non-cancer hazards above USEPA's target levels, the concentrations of chemicals contributing to the risk are within background levels for the Base. Therefore, there are no unacceptable risks to human receptors.

The site does not contain ecological habitat suitable for supporting significant plant and animal communities. Considering the existing land use and lack of complete exposure pathways to ecological receptors, there are no unacceptable risks to ecological receptors.

Additionally, concentrations of chemicals in site soils are not a risk to groundwater as the maximum concentrations of all detected organic compounds in soil are well below their site-specific designated levels for groundwater protection.

Because there are no unacceptable human health and ecological risks associated with site-related chemicals at Site 6A, remedial alternatives were not identified or evaluated. No further action is recommended for Site 6A.

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#### 4.0 COMMUNITY PARTICIPATION

Community participation at Marine Corps Base (MCB) Camp Pendleton includes interviews, public meetings, fact sheets to update current cleanup activities, an information repository to access technical documents, information to local and regional media, and presentations to local groups. A significant and reasonable effort was made to inform the public of the proposed remedies outlined in this record of decision (ROD). However, as an operational military Base, many members of the MCB Camp Pendleton community may be either deployed or preparing for military missions.

The Community Involvement Plan provides detailed information on community participation related to the ongoing environmental investigation and cleanup efforts at MCB Camp Pendleton. The investigations conducted at Operable Unit 5, the findings, and potential remedial approaches have been presented and discussed with the community.

A Proposed Plan was developed to fulfill public participation requirements of Comprehensive Environmental Response, Compensation, and Liability Act Section 117 (a), which specify that the lead Agency (Navy) must publish a plan outlining remedial alternatives evaluated for each site and identify the preferred alternative. Information on documents and relevant information relied upon in the remedy section process are available for public review in the Administrative Record at the Information Repositories at the following locations:

Administrative Record  
Naval Facilities Engineering Command Southwest  
1220 Pacific Highway  
San Diego, CA 92132-5190  
(619) 532-3676

MCB Camp Pendleton Environmental Security Office  
Building 22165  
MCB Camp Pendleton, CA 92055-5008  
(760) 725-9744

Oceanside Public Library  
330 N Coast Hwy, Oceanside, CA 92054  
(760) 435-5600

The public review period for the Operable Unit 5 and Site 1H Proposed Plans was from 7 November to 8 December 2006. A Public Meeting was held on 14 November 2006 at the Stuart Mesa Community Center at MCB Camp Pendleton. All interested parties were encouraged to attend to learn more about the alternatives for each site, and to submit comments on the Proposed Plans to the Navy.

During the public review period, notices were placed in the Scout, the Base newspaper, and in the North County Times, which serves the northern San Diego County area. A significant and reasonable effort was made to inform the public of the proposed remedies outlined in this ROD. However, as an operational military Base, many members of the MCB Camp Pendleton community may be either deployed or preparing for military missions.

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## 5.0 RESPONSIVENESS SUMMARY

The public review period for the Operable Unit 5 and Site 1H Proposed Plans was 7 November to 8 December 2006. A Public Meeting was held on 14 November 2006 at the Stuart Mesa Community Center at Marine Corps Base (MCB) Camp Pendleton. No comments were received on the Operable Unit 5 and Site 1H Proposed Plans during the public comment period from 7 November to 8 December 2006, or at the public meeting held on 14 November 2006. The [court reporter record](#)<sup>43</sup> of the public meeting is provided in Appendix B. As noted in Section 4.0, because MCB Camp Pendleton is an operational military Base, many members of the MCB Camp Pendleton community may be either deployed or preparing for military missions.

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## 6.0 REFERENCES

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
1	administrative record	Declaration	Administrative Record Index for Sites 1A-1, 1H, and 6A
2	Response to Comments	Declaration	Response to Comments
3	one of nine refuse burning grounds	Section 1.1	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Section 2.1.1, page 2-1.
4	20,000 cubic yards	Section 1.1	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Section 2.3.3, page 2-12.
5	metals, dioxins/furans, and pesticides	Section 1.1	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Figures 2-7 through 2-9.
6	Bedrock	Section 1.1	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Section 2.1.2.3, pages 2-2 to 2-3.
7	Groundwater	Section 1.1	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Section 2.1.2.4, page 2-3 and Figures 2-3 to 2-6.
8	coastal California gnatcatchers	Section 1.1	Presentation Boards Presented at the Operable Unit 5 and Site 1H Proposed Plan Public Meeting, held on November 14, 2006
9	soil samples	Section 1.2	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Tables 2-4 through 2-10.
10	metals and geochemical parameters	Section 1.2	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Tables 2-13 and 2-14

## REFERENCES

FINAL

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
11	Supplemental computer evaluations	Section 1.2.3	Draft Final Operable Unit 5, Feasibility Study for Sites 1A-1, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. September 2005. Appendix C
12	human health risk assessment	Section 1.4.1	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Appendix I2
13	ecological risk assessment	Section 1.4.3	Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Appendix K5
14	Guide to Principal Threat and Low Level Threat Wastes	Section 1.5	Guide to Principal Threat and Low level Threat Wastes. November 1991. USEPA Office of Solid Waste and Emergency Response. OSWER Directive 9380.3-06FS.
15	initial screening of remedial technologies	Section 1.7	Draft Final Operable Unit 5, Feasibility Study for Sites 1A-1, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. September 2005. Figure 2-3
16	process options	Section 1.7	Draft Final Operable Unit 5, Feasibility Study for Sites 1A-1, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. September 2005. Figure 2-4
17	NCP	Section 1.7	Final Proposed Plan for Cleanup of Soil and Groundwater at MCB Camp Pendleton for Operable Unit 5 Sites, November 2006, Figure 3.
18	Total Cost: \$625,000	Section 1.7.1	Draft Final Operable Unit 5, Feasibility Study for Sites 1A-1, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. September 2005. Appendix F, Table F1-2
19	Total Cost: \$3,125,000	Section 1.7.1	Draft Final Operable Unit 5, Feasibility Study for Sites 1A-1, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. September 2005 Appendix F, Table F1-3
20	Total Cost: \$8,383,000	Section 1.7.1	Draft Final Operable Unit 5, Feasibility Study for Sites 1A-1, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. September 2005 Appendix F, Tables F1-4 and F1-5.
21	comprehensive analysis of each alternative	Section 1.7.2	Draft Final Operable Unit 5, Remedial Investigation for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Section 2.6.3, pages 2-29 through 2-36.
22	ARARs	Section 1.8.4	Appendix A1

<b>Item</b>	<b>Reference Phrase in ROD</b>	<b>Location in ROD</b>	<b>Identification of Referenced Document Available in the Administration Record</b>
23	10,800 cubic yards	Section 2.1	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Section 4.1.3.2.1, page 4-4.
24	metals and dioxins/furans	Section 2.1	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Figure 4-4.
25	coastal California gnatcatchers	Section 2.1	Presentation Boards Presented at the Operable Unit 5 and Site 1H Proposed Plan Public Meeting, held on November 14, 2006.
26	Metals, pesticides, and dioxins/furans	Section 2.2	Draft Final Remedial Investigation Report for Group D Sites, Remedial Investigation/Feasibility Study, Marine Corps Base Camp Pendleton, California. July 1997. Appendix F, Figure 1.
27	dioxin/furans and metals	Section 2.2	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Tables 4-1 and 4-2
28	fate and transport modeling	Section 2.2	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Appendix L
29	human health risk assessment	Section 2.4.1	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Appendix I3
30	ecological risk assessment	Section 2.4.2	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Appendix J2
31	remedial goals	Section 2.6	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Sections 1.5 through 1.7, pages 1-4 through 1-7.
32	initial screening of remedial technologies	Section 2.7	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Figure 4-5
33	process options	Section 2.7	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Figure 4-6

## REFERENCES

FINAL

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
34	NCP	Section 2.7	Final Proposed Plan for Cleanup of Soil at MCB Camp Pendleton for Operable Unit 4 Site 1H, November 2006, Figure 3.
35	<b>Total Cost: \$685,000</b>	Section 2.7.1	Final Proposed Plan for Cleanup of Soil at Marine Corps Base Camp Pendleton for Operable Unit 4 Site 1H, November 2006. Cost revision prepared for Alternative 1H-2
36	<b>Total Cost: \$1,872,000</b>	Section 2.7.1	Final Proposed Plan for Cleanup of Soil at Marine Corps Base Camp Pendleton for Operable Unit 4 Site 1H, November 2006. Cost revision prepared for Alternative 1H-3
37	<b>Total Cost: \$2,909,000</b>	Section 2.7.1	Final Proposed Plan for Cleanup of Soil at Marine Corps Base Camp Pendleton for Operable Unit 4 Site 1H, November 2006. Cost revision prepared for Alternative 1H-4
38	<b>Total Cost: \$2,466,000</b>	Section 2.7.1	Final Proposed Plan for Cleanup of Soil at Marine Corps Base Camp Pendleton for Operable Unit 4 Site 1H, November 2006. Cost revision prepared for Alternative 1H-5
39	<b>comprehensive analysis of each alternative</b>	Section 2.7.2	Draft Final Feasibility Study for Operable Unit 4, Marine Corps Base Camp Pendleton, California, December 2003. Section 4.6.3, pages 4-26 through 4-35.
40	<b>ARARs</b>	Section 2.8.4	Appendix A2
41	<b>VOCs, pesticides, PCBs, dioxins/furans, and metals</b>	Section 3.2	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Tables 3-3 through 3-7.
42	<b>human health risk assessment</b>	Section 3.4.1	Draft Final Operable Unit 5, Remedial Investigation Report for Sites 1A-1, 6A, 21, 1111, and 12 Area, Site 13, MCB Camp Pendleton, California. July 2004. Appendix I3
43	<b>court reporter record</b>	Section 5.0	Appendix B

**Attachments and Appendices for this Record of Decision are available by placing a request using the Customized CERCLIS/RODS Report Order Form.**

**<http://www.epa.gov/superfund/sites/phonefax/rods.htm>**