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MCB CAMP PENDLETON
SSIC # 5090.3

MARINE CORPS BASE
CAMP PENDLETON, CALIFORNIA

RECORD OF DECISION FOR
OPERABLE UNIT 1 - SITE 9 AND
GROUP A NO ACTION SITES
DRAFT

31 MARCH 1995

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CALIFORNIA 92132-5190

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1.0 DECLARATION

1.1 Site Name and Location

Marine Corps Base Camp Pendleton, California is located on Interstate 5 between San Diego and Los Angeles (Figure 1-1). The vast majority of the base is situated in San Diego County. A small portion of the northwest corner of the base is located in Orange County.

Installation Restoration Program sites at Camp Pendleton were assigned to one of four groups (A, B, C, or D) according to potential impact to human health and the environment. Group A sites are believed to have the highest potential for such impact and Group D sites the lowest.

This Record of Decision addresses Sites 9, 4, 4A, and 24. Operable Unit 1 consists only of Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond, located approximately 1 mile south of Las Flores Creek and 1/2 mile east of the Pacific Ocean, in the southwestern part of Camp Pendleton. Operable Unit 1 - Site 9 is the only site for which remedial action is required. This Record of Decision also includes the following sites which, with Site 9, were investigated during the remedial investigation of Group A sites:

- Sites 4 and 4A - Marine Corps Air Station Drainage Ditch and Concrete-Lined Surface Impoundment
- Site 24 - 26 Area Morale, Welfare, and Recreation Maintenance Facility.

1.2 Statement of Basis and Purpose

This Record of Decision presents the selected remedial action for the Marine Corps Base Camp Pendleton Operable Unit 1, Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond, Camp Pendleton, California, which was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record file for this site.

Sites 4, 4A, and 24 were determined to be in a protective state. That is, these sites pose no current or potential threat to human health or the environment. This decision is also based on the administrative record file for these sites.

The State of California concurs on the selected remedy.

1.3 Assessment of Site 9

Constituents of concern identified in soil at Site 9 are beryllium and petroleum hydrocarbons. Beryllium also is a naturally occurring metal, and investigations showed that naturally occurring background concentrations of this metal in soil vary from 0.1 to 1.1 parts per million. The maximum beryllium concentration observed at Site 9 was 1.9 parts per million. The concentration of total petroleum hydrocarbons in soil varies from 0.5 to 6,700 parts per million.

A health risk assessment was conducted to evaluate the current and potential risks posed by the chemicals in soil and in groundwater at Site 9. The results of the human health risk assessment indicated beryllium in soil is within the acceptable range of risks. Federal or State agencies have not published carcinogenic or non-carcinogenic risks associated with petroleum hydrocarbons. The concern for the petroleum hydrocarbon constituents in soil was whether it could leach into groundwater. Subsequent tests carried out to determine the leachability of site contaminants indicated that all contaminants, including petroleum hydrocarbons, will not leach to degrade the groundwater.

The site investigation also identified tetrachloroethene and trichloroethene in groundwater at Site 9. The results of the human health risk assessment indicate that risks due to these compounds in groundwater at Site 9 are within the acceptable risk range. The maximum concentration of tetrachloroethene was 18 parts per billion, while that for trichloroethene was 15 parts per billion. These concentrations exceed the State and Federal primary drinking water maximum contaminant levels of 5.0 parts per billion.

Based on the site assessment and risk evaluations for site 9 groundwater, it has been determined that the contaminants present at the site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

In accordance with the Environmental Protection Agency's Interim Guidance on Preparing Superfund Decision Documents (EPA, 1989a), this section does not include a discussion of the No Action sites.

1.4 Description of the Selected Remedy

This operable unit is the final remedial action for Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond. Both soil and groundwater media are included in Operable Unit 1. The baseline risk assessment revealed that contaminants present in the soils at Site 9 were of such low concentrations that risks to human health using a hypothetical future residential land use scenario are within the range of 10^{-4} to 10^{-6} for carcinogens, and result in a hazard index of less than 1.0. Therefore, the Camp Pendleton risk managers determined that the no action alternative is appropriate for soils.

For groundwater, it was determined that low levels of tetrachloroethene and trichloroethene present in the groundwater do not pose a significant risk to human health using either the maximum or average concentration of these chemicals and utilizing the current military use scenario in the risk calculations. Using the more stringent hypothetical residential land use scenario, the human health risks for these chemicals in groundwater are within the range of 10^{-4} to 10^{-6}. Although these compounds do not pose a significant health risk, both compounds were detected in individual groundwater samples at concentrations that exceed the State and Federal maximum contaminant levels. For this reason, and because of the aquifer characteristics at the site, dispersion and natural attenuation, with monitoring of the concentrations (institutional controls), is the selected groundwater remedy at the site.

The major components of the selected remedy include:

- Amendment of the base masterplan to restrict future access to the groundwater in the immediate vicinity of Site 9 for the duration of the long-term monitoring or until the contaminants in the groundwater are at or below maximum contaminant levels.
- Groundwater will be sampled and analyzed semi-annually for ten years to ensure that dispersion and natural attenuation is occurring.
- An evaluation will be performed once every 5 years to assess the effectiveness and document the progress of the alternative.

- Compliance monitoring consisting of eight sampling events will be conducted after 7 years to assess the effectiveness of the dispersion and natural attenuation of the low concentrations of tetrachloroethene and trichloroethene in the groundwater.

The remedy selected for Sites 4, 4A and 24 is No Action.

1.5 Statutory Determinations

This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. As indicated in the preamble to the National Contingency Plan, the use of natural attenuation as a remediation technique is consistent with the Environmental Protection Agency's groundwater protection policy when active restoration is not practical or warranted due to site conditions and groundwater is unlikely to be used in the forseeable future. However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. Active treatment of groundwater would involve extraction which would be hampered by the highly impermeable marine terrace deposits underlying the site.

Because this remedy will result in hazardous substances remaining on-site above State and Federal maximum contaminant levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective.

FOR THE UNITED STATES MARINE CORPS, CAMP PENDLETON:

_____ _____

C.W. Reinke
Major General, U.S. Marine Corps

Date

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY:

Julie Anderson
Director, Federal Facilities Cleanup Office
U.S. Environmental Protection Agency, Region IX

Date

FOR THE STATE OF CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY:

John E. Scandura
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Date

Arthur Coe
Executive Officer
Regional Water Quality Control Board, San Diego Region

Date

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DRAWN BY	CHECKED BY	DRAWING NUMBER
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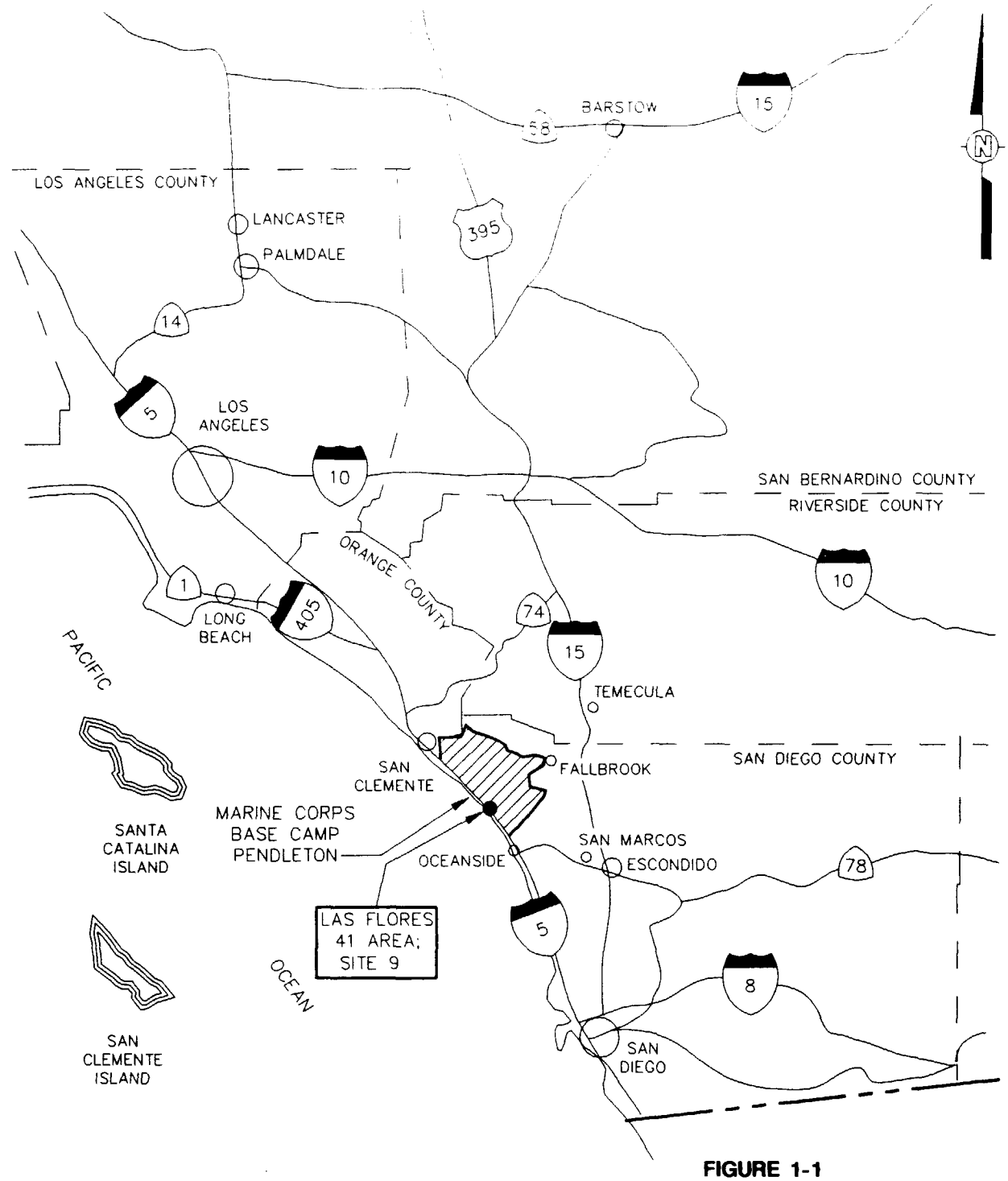

SCALE:
0 26 52 MILES

FIGURE 1-1

LOCATION MAP
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

CONTRACT N68711-89-D-9296
CLE-101-01F166-B7-0029

INTERNATIONAL TECHNOLOGY CORPORATION

SOURCE:

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY, 1984, "INITIAL ASSESSMENT STUDY, MARINE CORPS BASE, CAMP PENDLETON, CALIFORNIA," NEESA 13 057, PREPARED BY SCS ENGINEERS, INC., SEPT.

2.0 DECISION SUMMARY

2.1 Site Name, Location, and Description

Marine Corps Base (MCB) Camp Pendleton is the Marine Corps' primary amphibious training center for the West Coast. Located between the cities of Los Angeles and San Diego, California, MCB Camp Pendleton covers approximately 125,000 acres, almost entirely in San Diego County (Figure 1-1). Camp Talega, in 64 Area near the northwestern border of the base extends into Orange County. Surrounding communities include San Clemente to the northwest, Fallbrook to the east, and Oceanside to the south. The base is bordered to the west by the Pacific Ocean and encompasses 17 miles of coastal area; rolling hills and valleys range inland an average of 10 to 12 miles.

Site 9, Operable Unit (OU) 1, is located within a designated maneuver area in the southwestern part of MCB Camp Pendleton in the Las Flores 41 Area (Figure 1-1). The site is southwest of Stuart Mesa Road and consists of an approximately 500- by 400-foot engineered earthen impoundment (referred to as the waste stabilization pond) and adjacent areas, including a fenced grease disposal pit to the east of the waste stabilization pond (Figure 2-1). Currently, mounds of dirt and dark stains are visible on the bottom of the waste stabilization pond. The land surrounding the site is covered with natural vegetation.

The 41 Area Stuart Mesa waste stabilization pond is between two forks of a natural drainage arroyo on a relatively low-lying, wave-cut terrace. An ephemeral stream runs north and east of the stabilization pond and drains southwestward toward the Pacific Ocean. A small low-lying area along the southeast edge of the main impoundment covers an area approximately 200 by 50 feet (Figure 2-1).

Site 9 is located in marine terrace deposits, outside the Santa Margarita Basin, the largest groundwater basin on the Base and the major source of drinking water. No production (drinking water) wells are located downgradient from Site 9. The site is within 1/4 to 1/2 mile of the nonbeneficial groundwater use boundary, as defined within the *Comprehensive Water Quality Control Plan for the San Diego Basin* (SWRCB, 1975). Interstate 5 lies approximately along the line demarcating this boundary.

2.2 Site History and Enforcement Activities

Construction of MCB Camp Pendleton started in March 1942, and the base was dedicated by President Franklin D. Roosevelt in September 1942. Although MCB Camp Pendleton has been an important training facility since its inception in 1942, it was not designated a permanent base until October 1944. The base currently supports more than 36,000 military personnel and employs approximately 4,600 civilians (Innis-Tennebaum Architects, Inc., 1990). MCB Camp Pendleton and the Department of the Navy (DON) have been actively engaged in the Installation Restoration (IR) Program since 1980. The IR Program is designed, in part, to evaluate and remediate, if necessary, contamination caused by hazardous substances, pollutants, or contaminants, pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

2.2.1 Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond

The waste stabilization pond was operated as a sewage lagoon for oxidation and percolation of raw sewage generated in 41 Area from 1963 to 1974 or 1975. In 1975, a wet well and a lift station (Building 41300) were installed, and raw sewage was pumped into a treatment facility in 43 Area. The sewer line to the waste stabilization pond and the outfall pipe in the pond were left in place as an emergency backup system and reportedly have been used occasionally until very recently.

The waste stabilization pond, which contains water only briefly following heavy rainfall, has been used for stockpiling soils contaminated with petroleum hydrocarbons, primarily fuel and oil. A visual inspection of the area in 1988 indicated that waste oils and other liquids may have been taken to Site 9 in the past. The area immediately northeast of the waste stabilization pond has been used for disposal of mess hall grease trap wastes, a practice that began after sewage treatment operations at Site 9 were discontinued.

On 15 November 1989, MCB Camp Pendleton was added to the National Priorities List (NPL), primarily in response to detection of an herbicide in two base drinking water production wells. Site 9 is not in the same drainage basin as

these production wells. Although MCB Camp Pendleton obtains its entire domestic and agricultural water supply from groundwater basins within its boundaries, no base production (drinking water) wells are located within 1 mile of Site 9. No production wells are located downgradient from Site 9, and the nearest upgradient production wells are more than 1 mile to the northeast.

In response to a site investigation (SI) of the waste stabilization pond in 1988, a remedial investigation/feasibility study (RI/FS) was recommended to determine the lateral and vertical extent of contamination at the site. As part of the Site 9 SI, 42 soil and 12 water (surface-water and groundwater) samples were collected during January and February 1988. Analytical results are summarized in Table 1-7 of the Draft Final RI Report for Group A Sites (SWDIV, 1993). The Phase 1 RI and associated data evaluation for Site 9 were conducted between February 1992 and April 1993. Results are documented in the 15 October 1993 Draft Final RI Report for Group A Sites (SWDIV, 1993). Three additional quarters of groundwater sampling (Phase 2 RI) were conducted between May 1993 and April 1994. With the concurrence of all parties to the Federal Facilities Agreement (FFA), Site 9 was designated Operable Unit 1 for the Marine Corps Base Camp Pendleton CERCLA investigations. A feasibility study (FS) was conducted to develop and evaluate remedial alternatives so that the risk managers could select the most feasible remedy for the site. The Feasibility Study Report was issued in September, 1994 (SWDIV, 1994). The RI Report and the Feasibility Study Report are the basis for the remedy selected for Operable Unit 1. Both documents are contained in the administrative record file.

2.2.2 Sites 4, 4A - MCAS Drainage Ditch and Concrete-Lined Surface Impoundment

The approximately 5-foot-deep by 20-foot-wide drainage ditch is located between the MCAS flight-line operations and the Atcheson, Topeka, and Santa Fe (AT&SF) railroad tracks along Vandegrift Boulevard, in the Chappo subbasin of the Santa Margarita River basin. The drainage ditch reportedly was used from the 1940s through the early 1980s for the disposal of liquid wastes generated by flight-line operations and also received contaminated runoff from spills and aircraft washing (NEESA, 1984).

For the Initial Assessment Study (IAS) (NEESA, 1984) and Site Inspection (SI) (Camp Dresser & McKee, Inc. [CDM], 1988) investigations, Site 4 consisted of just the drainage ditch. Site 4 was expanded to include the concrete-lined surface impoundment in May 1990 on the recommendation of the Regional Water Quality Control Board (RWQCB). This impoundment is designated Site 4A and is located between the MCAS drainage ditch and the MCAS, southwest of Building 2378. The hangar deluge system for fire suppression discharges into this impoundment.

Four base drinking water production wells are located within 1 mile of Site 4. Two base production wells, one upgradient and one downgradient from Site 4, are located within 1/4 mile of the site. Another base production well is located approximately 1/2 mile upgradient from Site 4. A fourth production well is located about 1 mile downgradient from the site.

Little information is available on airfield waste disposal practices during the 1940s and 1950s, but disposal to the drainage ditch is thought to have taken place primarily during the 1960s and 1970s (NEESA, 1984). No evidence was obtained during the IAS to ascertain whether the ditch received substantial quantities of industrial wastes prior to the early 1960s. The ditch has been present since the construction of the airfield and the Chappo Flats industrial complex in the early 1940s. Examination of historical aerial photographs and maps and discussions with base personnel during the IAS indicated that the airfield was not the scene of extensive flight operations or aircraft maintenance prior to the 1960s. Flight-line activities increased in the early 1960s, and two or three aircraft per week reportedly were spot painted along the flight line until about 1971. Corrosion control wastes reportedly were either placed in dumpsters and bowsers or discharged on the ground or into the drainage ditch (NEESA, 1984).

Hazardous substances reportedly placed in the drainage ditch include jet fuels, aviation gasoline (AvGas), kerosene, paints (including zinc chromate), paint strippers, toluene, methyl ethyl ketone (MEK), methyl isobutyl ketone, trichloroethene (TCE), trichloroethane (TCA), nitrocellulose lacquers and thinners, aliphatic thinners, and isopropanol. An estimated 11,000 to 25,000 gallons reportedly was discharged in or adjacent to the ditch prior to 1982

(NEESA, 1984). Other liquid wastes, including oils, hydraulic fluids, battery electrolyte solutions, and aircraft washing wastewater, reportedly were also discharged into the ditch but quantities could not be estimated. The on-site survey of the ditch conducted for the IAS revealed an oily sheen on the water at several locations and dead and discolored vegetation along the length of the ditch, possibly due to pest control measures.

The SI confirmed the presence of organic and inorganic compounds in the sediment and subsurface soil (CDM, 1988). These compounds were primarily restricted to the main drainage ditch. The SI analyses included 12 surface soil samples and 11 subsurface soil samples from five boreholes; 8 surface-water samples collected during a single sampling event; and 9 groundwater samples, including duplicates, collected during two sampling events from two monitoring wells and two nearby base production wells.

Analytical results for samples collected as part of a vapor well installation project indicate that the impoundment sludge has a total recoverable petroleum hydrocarbon (TRPH) concentration of 600 parts per million (ppm), as determined by EPA Method 418.1, and that the liquid has an acetone concentration of 26 parts per billion (ppb), a total dissolved solids (TDS) concentration of 1,560 ppm, and no detectable TRPH (Dames & Moore, 1986). No information is available on the quantities or specific types of wastes received by this impoundment. Sites 4 and 4A were included in the remedial investigations of Group A sites conducted between February 1992 and April 1993. The results of the remedial investigation are contained in the RI Report (SWDIV, 1993).

2.2.3 Site 24 - 26 Area MWR Maintenance Facility

This section presents background information and summarizes the results of previous investigations for Site 24 - 26 Area Morale, Welfare and Recreation (MWR) Maintenance Facility.

Site 24 is located within the floodplain of the Santa Margarita River. The MWR maintenance facility is situated on a flat area surrounded by low hills on three sides. The site is in the 26 Area, which is primarily used for warehouse and maintenance facilities.

The MWR maintenance facility provides maintenance services for approximately 200 buildings at MCB Camp Pendleton. Potential sources of contamination at this site are the welding shop, the paint shop, and a hazardous waste storage area. Two base production wells are located within 3/4 mile downgradient from Site 24.

Base personnel report that the welding shop was used as an automotive maintenance shop before about 1970. The hazardous waste storage area reportedly has contained as many as 300 55-gallon drums.

Base personnel identified visual evidence of soil contamination, which was later confirmed by analytical results from soil sampling. MCB Camp Pendleton has taken measures to rectify past handling and storage problems, and large quantities of wastes are no longer stored on the site. In addition, visible soil contamination was removed.

Potential areas of contamination include the following:

- Welding shop - discolored soil near shop and around polyvinyl chloride (PVC) discharge pipe behind shop
- Soil near paint shed
- Unknown white substance outside paint locker
- Unknown spillage in drum storage area
- Petroleum spill from generator.

Base personnel have reported two separate spills at the MWR maintenance facility. A spill of approximately 150 gallons of No. 2 heating fuel occurred on 12 January 1990, and a spill of about 50 gallons of hydraulic oil occurred in April 1990. Visible soil contamination was removed from the spill areas.

Site 24 was not investigated during the IAS or the SI. During a 1990 inspection, Environmental and Natural Resources Management Office (ENRMO) personnel collected surface soil samples in areas of visible soil contamination (ENRMO, 1990). Compounds detected in soil samples included total petroleum hydrocarbons, various heavy metals, benzene, and a number of semivolatile

compounds. The site was included in the remedial investigation of Group A sites and the results are included in the RI report (SWDIV, 1993).

2.3 Highlights of Community Participation

The Draft Final Feasibility Study Report and the Proposed Plan for Operable Unit 1 - Site 9 Stuart Mesa Waste Stabilization Pond, were released to the public in January 1995. These two documents, as well as the Draft Final Remedial Investigation (RI) Report for Group A sites, were made available to the public in the information repositories maintained at the Base Library and at the Oceanside Public Library. The notice of availability for these two documents was published in the Blade-Citizen newspaper on December 11, 1994 and in the South County News on December 29, 1994. A public comment period was held from December 12, 1994 through January 27, 1995. In addition, a public meeting was held on January 4, 1995. Representatives from the Base, U.S. Environmental Protection Agency (EPA), California Environmental Protection Agency (Cal EPA) Department of Toxic Substances Control (DTSC), San Diego Regional Water Quality Control Board, and the Naval Facilities Engineering Command, Southwest Division were available to answer questions concerning Operable Unit 1 or the preferred alternative announced in the Proposed Plan. Neither base residents nor citizens of the neighboring communities attended the public meeting. Appendix A contains the verbatim transcript of the public meeting. In addition, no questions or comments were received from any source during the public comment period. Therefore, a Responsiveness Summary is not required and is not part of the administrative record file. This decision document presents the selected remedial action for Marine Corps Base Camp Pendleton Operable Unit 1 - Site 9, Waste Stabilization Pond, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for this site is based on the administrative record.

The public has also been notified, via Fact Sheets, that Sites 4, 4A, and 24 pose no threat to human health or the environment, and that no action is contemplated at these sites.

2.4 Scope and Role of Operable Unit 1

As with many Superfund sites, there are a large number of sites to be investigated under CERCLA at MCB Camp Pendleton. Unlike most other Superfund sites, RI/FS sites have not been preassigned to operable units. Rather, sites have been assigned to groups of sites by the parties to the Federal Facility Agreement (FFA). Sites are grouped based on potential impact to human health and the environment, and those determined to pose the highest threat are addressed first (e.g., Group A sites first). A listing of sites by group is provided in Table 2-1. Based on the results of the remedial investigation of Group A sites, it has been determined that no action is necessary to achieve protection of human health and the environment at Sites 4, 4A, and 24. Removal actions are underway, or in the planning stages at Sites 3, 5, and 6. Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond is the only site specified for Operable Unit 1. Both the soil and groundwater media were addressed in the Feasibility Study for Operable Unit 1. The baseline risk assessment revealed that neither soil nor groundwater posed a threat to human health or the environment at the site but two chemicals, TCE and tetrachloroethene (PCE), were detected in groundwater samples at concentrations exceeding Federal and State maximum contaminant levels. The purpose of this response is to prevent current or future exposure to contaminated groundwater, and to reduce concentrations of these chemicals in the groundwater through dispersion and natural attenuation. This operable unit will be the final response action for this site.

2.5 Summary of Site Characteristics

This section provides an overview of assessments conducted during the RI to characterize Operable Unit 1 - Site 9, and Sites 4, 4A, and 24. The summary of site characteristics presents the following information:

- Suspected sources of contamination
- Quantity, types, and concentration of hazardous substances
- Mobility, carcinogenicity, and volume of contaminants
- Lateral and vertical extent of contamination
- Potential pathways of contaminant migration
- Current risks and potential routes of human and environmental exposure.

The suspected sources of contamination at each site are identified in Section 2.2 of this Decision Summary. Summary tables presented in this section are used to identify contaminants and their concentrations (Tables 2-2 through 2-15). A general discussion

of the factors that determine contaminant mobility is presented in Section 2.5.4, and the chemical parameters that affect environmental transport and persistence are listed for each contaminant in Table 2-16 of this section. The carcinogenicity of site contaminants is discussed in Section 2.6. The volume of contamination presented in this section was determined for soil at Operable Unit 1 (Site 9) during the FS. No attempts have been made to determine the volume of contamination at the other sites since they do not require remedial action. The lateral extent of contamination is depicted on site maps in this section and the vertical extent of contamination is described in the text by noting the maximum depth at which contamination was detected.

Criteria Used in Generating Tables and Figures

Analytical data for each media at each site were summarized and compared to Federal and State standards (described in detail in the RI report), as appropriate. Tables 2-2 through 2-15 summarize contaminant concentrations, including maximum values, detected at each site. Total petroleum hydrocarbons (TPH), analyzed by EPA Method M8015, is reported as diesel or gasoline, depending on the calibration standard used. These concentrations are listed at the end of each table, as applicable.

2.5.1 Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond

This section presents brief summaries of analytical results from soil sampling, three quarters of groundwater sampling, one quarter of surface-water sampling, and an evaluation of biota at Site 9.

2.5.1.1 Soils and Vadose Zone

Concentration ranges of organics and metals in Site 9 soil samples (validated analytical results) are presented in Tables 2-4 and 2-5, respectively, along with risk-based PRGs and background soil values, as appropriate. Soil samples were collected from 19 borings to characterize Site 9. TPH was detected at concentrations exceeding 1,000 mg/kg in the former effluent lagoon area (Figure 2-1). A geologic cross-section showing the approximate vertical extent of soil contamination at Site 9 is presented in Figure 2-2. Analytical results are briefly summarized and evaluated below:

- The highest concentrations of TPH were detected at the north end of the former effluent lagoon. A TPH concentration of 6,700 mg/kg was detected in soil boring 9B-17 at approximately 6 feet below surface. Below 6 feet, TPH concentrations are very low or nondetect.

- TPH was generally detected in shallow soils. The borings within the contour line shown in Figure 2-1 exhibit elevated concentrations of TPH at the surface. In addition, these borings exhibit concentrations of beryllium above the risk-based PRG and, typically, greater than the statistical mean of the risk-based PRG, as adjusted for background metals concentrations (Section 2.6). The statistical mean for beryllium is 0.3 mg/kg. Therefore, concentrations of beryllium are included in the boxes for the borings within the contour line in Figure 2-1.

- Beryllium is a naturally occurring background metal in soil (Tables 2-2 and 2-3). A site-specific statistical evaluation was performed for beryllium in the soil at Site 9. Statistical results indicate that a beryllium concentration of 0.69 mg/kg (or less) is the 95 percent upper confidence level of the background distribution. No samples collected to a depth of 5 feet below surface (maximum depth for ecological or human health risk assessment) outside the extent of the contamination contour shown in Figure 2-1 contained beryllium concentrations exceeding 0.69 mg/kg.

2.5.1.2 Groundwater

Validated groundwater analytical results are summarized in Table 2-6, and illustrated in Figure 2-3. Groundwater analytical results for Site 9 are summarized as follows:

- Tetrachloroethene (PCE) concentrations of 6.0, 10, and 4.0 µg/l were detected in well 9W-07A during the first, second, and third rounds of groundwater sampling, respectively. The MCL for PCE is 5.0 µg/l. Well 9W-07A is the shallow well of a three-well cluster and is screened at 29 to 39 feet below grade.

- 1,2-Dichloroethane (1,2-DCA) was detected at a concentration of 2.0 µg/l in well MW-05 during the first round of groundwater sampling. The MCL for 1,2-DCA is 0.5 µg/l. Well MW-05 was dry during fourth quarter 1992 sampling (second round) and could not be accessed for sampling during the third round because of flooding. 1,2-DCA was not detected during the second quarter 1993 sampling. Figure 2-3 includes second quarter 1993 (Phase 2 RI) analytical results for this well and other wells in which MCLs were exceeded during at least one quarter of sampling and for which samples could not be collected during the three previous quarters.

- TCE concentrations of 11 and 15 µg/l were detected in well MW-04D during the first and second rounds of groundwater sampling, respectively. The MCL for TCE is 5 µg/l. Well MW-04D was not sampled during the third round of groundwater sampling because of flooding. TCE was detected at a concentration of 5 µg/l during second quarter 1993

sampling. Well MW-04D was installed during the previous SI and is screened from approximately 16 to 31 feet below grade.

- Antimony and nickel exceeded MCLs in upgradient and downgradient wells. Statistical evaluations (RI Report) indicate that these are background concentrations.

- Mercury was detected in wells 9W-07A and 9W-07B during third quarter 1992 sampling but has not been detected in several subsequent sampling events (fourth quarter 1992 and first and second quarters 1993) and, thus, appears to be related to field or laboratory contamination. Consequently, mercury is not included in Figure 2-3.

- TPH (analyzed using EPA Method M8015 with a diesel standard) was detected at a maximum concentration of 470 µg/l in well 9W-07A during third quarter 1992 sampling. TPH was not detected in this well during subsequent rounds of sampling. An MCL has not been established for TPH and, thus, TPH is not plotted in Figure 2-3.

Groundwater analytical data indicate that an area of volatile organic contamination (TCE, PCE, and 1,2-DCA) is present downgradient from the former effluent lagoon at Site 9. This area is shown by a contour line in Figure 2-3. No contaminants were detected in the wells upgradient from the former effluent lagoon.

2.5.1.3 Surface Water and Sediments

Two surface-water samples were collected from the impoundment following January 1993 flooding to supplement the ecological risk assessment. CLP metals analyses of these samples yielded the following maximum metals concentrations:

- Aluminum - 355 mg/l
- Arsenic - 1.4B µg/l
- Barium - 28.2BE µg/l
- Copper - 25 µg/l
- Iron - 758 µg/l
- Manganese - 53.4 µg/l
- Nickel - 8.1B µg/l
- Vanadium - 3.0B µg/l
- Zinc - 9.2B µg/l.

These validated analytical results are compared with standards in Table 2-7. Antimony, beryllium, cadmium, cyanide, cobalt, chromium, mercury, selenium, and thallium were not detected in these surface-water samples.

2.5.1.4 Biota

No biota samples were collected.

2.5.2 Sites 4 and 4A - MCAS Drainage Ditch and Concrete-Lined Surface Impoundment

This section presents brief summaries of analytical results from soil sampling, three rounds of groundwater sampling, surface-water sampling, and an evaluation of biota at Sites 4 and 4A.

2.5.2.1 Soils and Vadose Zone

Soil samples were collected from surface sediments (Site 4), hand-auger borings (Site 4), and angle borings (Site 4A). Concentration ranges of organics and metals detected in Site 4 soil samples are listed in Tables 2-8 and 2-9, respectively, along with risk-based PRGs and background soil values, as appropriate. No contaminants were detected at concentrations exceeding risk-based PRGs in the soils collected at Sites 4 and 4A. Consequently, no map showing soil contamination was prepared. Figure 2-4 is a boring location map. Soil analytical data are presented in Appendices X and Z of the RI report (SWDIV, 1993).

2.5.2.2 Groundwater

Groundwater sampling for Sites 4 and 4A was conducted during the third and fourth quarters of 1992 and the first quarter of 1993. Groundwater analytical results for wells at Sites 4 and 4A are shown in Figure 2-5. The results are listed in Table 2-10 and briefly summarized below:

- TCE was detected at concentrations of 19 and 17 µg/l in well 4W-04A during the third and fourth quarters of 1992, respectively. TCE was not detected in well 4W-04A during the first quarter of 1993. Well 4W-04A is

the shallow well of a two-well cluster and is screened from approximately 7 to 22 feet below grade.

- TCE was detected in well 4AW-03A at concentrations of 1.0 µg/l during third quarter 1992 sampling and 5.0 µg/l during fourth quarter 1992 sampling. TCE was not detected in this well during first quarter 1993 sampling. The MCL for TCE is 5.0 µg/l. Well 4AW-03A is the shallow well of a two-well cluster and is screened from approximately 9 to 24 feet below grade.

- 1,1-Dichloroethane (1,1-DCA) was detected in both wells at well cluster 4W-07 at concentrations exceeding MCLs (Figure 2-5). In addition, vinyl chloride was detected in well 4W-07B at a concentration of 1.0 µg/l during third quarter 1992 sampling. Vinyl chloride was not detected in this well during subsequent quarters of sampling (fourth quarter 1992 and first and second quarters 1993). The MCL for vinyl chloride is 0.5 µg/l. Well 4W-07A is the shallow well screened from approximately 8 to 23 feet below grade, and well 4W-07B is the deep well screened from approximately 72 to 87 feet below grade.

- Bis(2-ethylhexyl)phthalate was detected at a concentration of 6.0 µg/l in the duplicate sample collected from well 4W-05B during fourth quarter 1992 sampling, but was not detected in the environmental sample from that well. This contaminant was not detected in prior or subsequent sampling; thus, the concentration detected in the duplicate is considered anomalous.

- Nickel was detected in well 4W-3A at concentrations of 268 and 158 µg/l in samples collected during the third and fourth quarters of 1992, respectively, but was not detected in the subsequent quarter of sampling. Antimony was detected in wells 4W-3A, 4W-3B, 4W-4A, 4W-4B, 4W-5B, 4W-7A, 4W-7B, 4MW-02, and 4AW-3A at concentrations ranging from 9.0 to 15 µg/l. Possible sources for these metals are discussed in the RI Report. Statistical evaluation of these metals concentrations indicates that they are naturally occurring.

Base production wells 10S/04W-18M04 (4PW3), 10S/05W-13R02 (4PW2), and 10S/05W-23J01 (4PW1) were sampled in conjunction with the first round of groundwater sampling at Site 4. Well locations are plotted in Figure 2-5. Because of base operational schedules and recent flooding, these wells were not sampled during subsequent rounds of sampling. Contamination was not detected in these wells during the first round of RI sampling or in repeated sampling conducted by the base as required by the Safe Drinking Water Act.

Volatile organic concentrations detected at Site 4 may be part of a widespread plume in adjacent Area 22 and, consequently, will be evaluated as part of the

Phase 2 RI at Site 6 (Defense Property Disposal Office [Defense Reutilization and Marketing Office] Scrap Yard and Groundwater near Building 2241).

2.5.2.3 Surface Water and Sediments

Surface-water samples collected from the MCAS drainage ditch showed generally low concentrations of potential contaminants. Validated surface-water analytical results are summarized in Table 2-11. Analyte concentrations were generally low, below State and Federal surface-water standards (SWRCB, 1992; EPA, 1992a).

Toluene was detected in surface-water samples collected from Site 4, at a maximum concentration of 9.0 µg/l (sample 04SW003393 LABQC). The Federal surface-water quality standard for toluene is 17,500 µg/l. No other organics for which surface-water quality standards have been established were detected in the Site 4 surface-water samples.

Metals detected in the Site 4 surface-water samples include arsenic, chromium, copper, lead, and zinc. Maximum concentrations of these metals were below State and Federal standards (Table 2-11).

Ecological risk assessment and evaluation of the potential effects of these concentrations on plants and animals are presented in the RI Report (SWDIV, 1993). Available information does not indicate that these metal concentrations are adversely affecting plants or animals.

2.5.2.4 Biota

Filamentous algae were collected from the Santa Margarita River as part of the second round of bioassay sampling in June/July 1993. Locations 6BADSM1 and 6BADSM2 are representative of downstream and upstream locations (respectively) from the entry of the combined drainage from Sites 4 and 6. As such, results from these sampling locations will aid in evaluating possible contamination from the Site 4 drainage ditch. Location 6BADSM2 is approximately 100 feet upstream from the combined Site 4 and Site 6 drainage, and location 6BADSM1 is approximately 100 feet downstream. Aquatic sediment

bioassay results for these locations are presented in Appendix U of the RI report. Biota collected at the time of sampling was limited to filamentous algae. Analytical results for the field-collected algae samples are presented in Table 2-12.

Compared with lettuce bioaccumulation results, the river algae show generally low metals accumulation. The only exception was manganese, which was highest in tissue concentrations at the downstream sampling location. Most of the metals concentrations from the downstream location were higher than those from the upstream location (Table 2-12). Concentrations at these locations do not represent toxic levels of metals.

2.5.3 Site 24 - 26 Area MWR Maintenance Facility

This section presents brief summaries of analytical results from soil sampling, three rounds of groundwater sampling, and an evaluation of biota at Site 24.

2.5.3.1 Soils and Vadose Zone

Ranges of organic and metal concentrations detected in Site 24 soil samples are presented in Tables 2-13 and 2-14, respectively, along with risk-based PRGs and background soil values, as appropriate. Only two isolated soil samples at Site 24 contained concentrations of contaminants above the risk-based PRGs or a TPH level of 100 mg/kg, as shown in Figure 2-6. Soil analytical results are summarized below:

- A gamma-BHC (Lindane) concentration of 3.0 µg/kg and alpha- and gamma-chlordane concentrations of 6.7 and 3.6 µg/kg, respectively, were detected at a depth of 6 feet and an anomalous pyrene concentration of 44 µg/kg was detected at a depth of 20 feet in boring 24B-1, near the drum storage area. These concentrations are below the associated risk-based PRGs. No other contaminants were detected in the three borings sampled around this location.

- Aroclor-1254, a polychlorinated biphenyl (PCB), was detected at a concentration of 480 µg/kg in the surface sample from boring 24B-4, adjacent to the paint shop. This concentration is below State and Federal cleanup levels. No PCBs were detected in seven deeper samples to a depth of 30 feet below surface at this boring.

- Maximum alpha- and gamma-chlordane concentrations of 7.5JX and 4.3JX µg/kg were detected at a depth of 1.5 feet in boring 24B-6, adjacent to the welding shop. These concentrations are below the risk-based PRGs. Chrysene and fluoranthene were also detected at concentrations below the risk-based PRGs in this sample, but were not detected in deeper samples. No contaminants were detected in the deepest sample in this boring, at 15.8 feet. A lead concentration of 295N* mg/kg in the surface sample from boring 24B-5 was the maximum for the site and is well below lead model action levels (Section 2.6).

- Boring 24B-8, located in a ditch into which two spills of heating fuel and hydraulic oil reportedly drained in 1990, contained maximum concentrations of the following compounds for this site:

  - 4,4'-Dichlorodiphenyldichloroethane (4,4'-DDD) - 200 µg/kg; less than the risk-based PRG

  - 4,4'-Dichlorodiphenyldichloroethene (4,4'-DDE) - 72 µg/kg; less than the risk-based PRG

  - 4,4'-Dichlorodiphenyltrichloroethane (4,4'-DDT) - 140 µg/kg; less than the risk-based PRG

  - bis(2-Ethylhexyl)phthalate - 1,600 µg/kg; less than the risk-based PRG

  - Fluoranthene - 550J µg/kg; less than the risk-based PRG

  - Pyrene - 470J µg/kg; less than the risk-based PRGs

  - Total petroleum hydrocarbons - 180 mg/kg.

- Beryllium is present in borings throughout the site above the risk-based PRG, but poses a cumulative ILCR of less than 10^{-6}.

- The metals concentrations in soil reported for a sample collected from granitic bedrock at a depth of 24.8 feet in boring 24B-3 are 1.5 to 3.0 times those typically found in background samples collected from the alluvium. Concentrations are believed to be naturally occurring. The sample with the highest beryllium concentration (collected at 24.8 feet below surface in boring 24B-3) is a background sample.

Only minimal soil contamination was detected at known contaminant sources throughout Site 24, as shown in Figure 2-7. No soil contaminants at Site 24 pose a cumulative ILCR of 10^{-6} or an HI greater than 1.0.

2.5.3.2 Groundwater

Groundwater analytical results are summarized in Table 2-15. Complete analytical data are presented in the RI report. Well locations are shown in Figure 2-6, and analytical results are briefly summarized below:

- Naturally occurring metals were the only compounds detected above MCLs in groundwater at this site, as follows:
  - Selenium was detected at concentrations of 13.4 and 15.5 µg/l in upgradient well 24W-12, near the former base laundry facility. Concentrations of selenium ranged from 10.4 to 21.1 µg/l in downgradient well 24W-9. These were the only two wells in which selenium exceeded the MCL. Selenium concentrations were below the MCL in these wells during the last quarter of sampling.
  - Nickel exceeded the MCL in wells 24W-9A, 24-10A, and 24W-11A. Concentrations ranged from 105 to 459 µg/l.
  - Chromium exceeded the MCL once in well 24W-11A during third quarter 1992 sampling. Concentrations detected during two subsequent quarters of sampling (10.2 and 11.3 µg/l) decreased well below the MCL of 50 µg/l. Consequently, the sample collected during the first round of sampling is believed to have been contaminated during the sampling event or at the laboratory.
  - Antimony exceeded the MCL once in well 24W-11A. A concentration of 48.7 µg/l was detected during the third quarter 1992 sampling. Antimony was not detected in the two subsequent sampling rounds. Consequently, the sample collected during the third quarter 1992 is believed to have been contaminated during the sampling event or at the laboratory.

No potential groundwater contaminants at Site 24 pose a cumulative ILCR of 10^{-6} or an HI greater than 1.0.

Antimony, nickel, and selenium are the only compounds detected at Site 24 at concentrations exceeding MCLs, except for a one-time concentration of chromium, which is considered suspect. Groundwater metals concentrations exceeding MCLs may be due to the influence of shallow granitic bedrock beneath the site or other sources (RI Report).

Given the operational history of Site 24, the mobility of these metals in the soil, and the results of the RI, these metals are not considered site-related. In

addition, nickel, antimony, and selenium exceed MCLs in upgradient and downgradient wells throughout the base; results of statistical evaluations of wells throughout the base show that the upgradient and downgradient populations of these metals are not significantly different at the 95 percent confidence level; and several potential sources have been identified for these metals. The absence of other contaminants at this site indicates that antimony, nickel, and selenium concentrations are not related to the site and that groundwater has not been impacted by the site.

2.5.3.3 Biota

No biota samples were collected for analysis.

2.5.4 Contaminant Fate and Transport

The fate and transport of COCs at MCB Camp Pendleton sites are important factors for risk assessment. The potential routes of migration in the environment and pathways of human exposure are determined by the physical and chemical properties of chemicals released. These considerations are discussed in great detail in Section 5.0 of the RI Report. Table 2-16 lists pertinent chemical and physical parameters of chemicals detected at Group A sites, which are provided for use as a ready reference during the following site specific discussions.

2.5.4.1 Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond

The primary contaminants at Site 9 are beryllium in soil and TCE and PCE in groundwater. As a conservative assumption, contaminant concentrations in current and future land use scenarios are assumed to be the same.

The sole contributor to risk in soil above the target risk criterion of 10^{-6} is beryllium. Beryllium is present in both soil and groundwater, but statistical testing for background chemicals eliminated beryllium for groundwater. Because beryllium is found in both media, transport effects are assessed as being adequately described by the sampling data.

2.5.4.2 Sites 4 and 4A - MCAS Drainage Ditch and Concrete-Lined Surface Impoundment

The primary contaminants detected at Sites 4 and 4A are organochlorine pesticides, including DDT and its degradation products. High log K_{ow} values (>3) indicate that these contaminants are not likely to move in the soil. As a conservative measure for future land use scenarios, the concentrations in surface soil and the vadose zone are assumed to remain the same.

The primary contributors to risk at Sites 4 and 4A are 4,4'-DDT (log K_{ow} 6.19) and dieldrin (log K_{ow} 4.09) (Howard, 1991). Chemicals with log K_{ow} values above 3.0 are expected to have retarded movement in soil; as such, degradation processes should be predominant and impact on groundwater should be insignificant. This is confirmed by groundwater monitoring results (i.e., pesticides were not detected in Site 4 and Site 4A monitoring wells). The fate and transport of the volatile organic compounds (VOCs) detected in Site 4 monitoring wells will be addressed as part of the evaluation of Site 6 in the Group C RI report.

2.5.4.3 Site 24 - 26 Area MWR Maintenance Facility

Primary contributors to risk in soil at Site 24 are as follows:

Chemical	log K_{ow}
bis(2-Ethylhexyl)phthalate	5.3
4-4'-DDE	5.69
4-4'-DDT	6.19
n-Nitrosodiphenylamine	2.79

Chemicals with log K_{ow} values above 3.0 are expected to have retarded movement in soil; as such, degradation processes should be predominant and impact on groundwater should be insignificant. The greatest risk contributed by a single COC is $2x10^{-8}$ for 4,4'-DDT in soil.

N-nitrosodiphenylamine, with a log K_{ow} value of 2.79, will have more tendency to move in the soil than bis(2-ethylhexyl)phthalate, 4,4'-DDE, and 4,4'-DDT, but still is not very mobile. It has an estimated half-life in soil of 34 days (Howard et al., 1991). N-nitrosodiphenylamine was not detected in groundwater sampled during

the RI. Travel through the vadose zone of Site 24 to groundwater should require at least several half lives and, therefore, the impact from N-nitrosodiphenylamine should be much less than the target risk criteria. It has a current surface soil maximum cancer risk of $4x10^{-9}$.

Building 2662, the MWR maintenance facility, was built in 1944 and has been used for maintenance throughout its history. However, neither VOCs typically associated with maintenance facilities nor pesticides present in the soil were detected in groundwater sampled during the RI. Numerical modeling was considered unnecessary because contamination was not detected in groundwater, and is limited to the near surface in soil.

2.6 Summary of Site Risks

Baseline human health and ecological risk assessments for the Group A sites were conducted using data collected during the RI for Group A Sites. All RI data have been validated and the quality is acceptable to support the recommendation of this ROD. Both risk assessments are provided in their entirety in Sections 6.0 and 7.0 of the Draft Final RI Report for Group A Sites (SWDIV, 1993). This summary includes Group A Sites 9, 4, 4A, and 24.

2.6.1 Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond

Several additional rounds of groundwater sampling have been conducted since the completion of the baseline human health risk assessment. Site 9 groundwater data have since been reevaluated as presented in the Draft Final Feasibility Study for Site 9 (SWDIV, 1994).

2.6.1.1 Human Health Risks

The human health risk assessment (HHRA) was conducted in accordance with the requirements of the NCP (EPA, 1990). The overall objective of the HHRA is to provide a conservative estimate of the incremental lifetime cancer risk (ILCR) and the potential noncarcinogenic health impact (hazard index [HI]) from chemical contaminants at Site 9. Site 9 contaminants were evaluated for potential impact on human health for the no action alternative, which consists of

the current site disposition with no remediation. The assessment was augmented with additional scenarios for future land uses.

The quantitative results were compared to target risk criteria. A reasonable maximum exposure (RME) ILCR of 10^{-6} is considered the "point of departure" above which risk management should be considered, according to Title 40, Code of Federal Regulations (CCR), Section 300.430(e)(2)(i)(A)(2). An ILCR above 10^{-4} requires remediation to achieve acceptable concentration levels representing risks of 10^{-6} to 10^{-4}. An HI greater than the target criterion of 1.0 is to be addressed by the risk managers and may require remediation. Risk assessment values are tabulated and summarized for each FS alternative in Section 5.0.

Contaminant Identification

The environmental sampling data were collected according to knowledge-based, purposive sampling decision logic, with additional samples to provide data on areas of high, medium, and low contamination. The extent of contamination for each of the sites was based on the analyte concentration within a boring exceeding a risk-based criterion concentration referenced to either 10^{-6} ILCR or 1.0 HI. Evaluation of the data sets to determine chemicals of potential concern (COPCs) adhered to the *Risk Assessment Guidance for Superfund* (RAGS) (EPA, 1989b, Exhibit 5-1). Background was determined empirically from the RI sampling and analytical data for geologically consistent areas (i.e., marine terrace for Site 9). The Student's t-test was used for soil and the analysis of variance (ANOVA) statistical procedure was used for groundwater to eliminate detected chemicals representing background.

Between the time of preparation of the baseline HHRA and the preparation of this report, additional groundwater monitoring wells (Phase 2 RI) were installed at Site 9 and four additional quarters of groundwater data were collected from all Site 9 wells (Phases 1 and 2). Groundwater data collected through the end of 1993 (five quarters) were reevaluated using ANOVA to assess the concentrations of arsenic in upgradient versus downgradient wells. The results show that no significant difference exists between the upgradient and downgradient groups of data and that arsenic concentrations are not site related. The statistical

calculations are provided in Appendix G (SWDIV, 1994). The summary of the HHRA presented herein has been revised to reflect this information.

A significant number of nondetect results for both upgradient and downgradient wells may bias the outcome of the ANOVA, but nondetect results cannot be excluded because of technical considerations. Elimination of nondetect results in biased estimates of both mean and standard deviation (Gilbert, 1987). However, use of one-half the detection limit is unbiased for estimation of the mean if all measurements between the detection limit and zero are equally likely to occur (Gilbert, 1987). Therefore, one-half the detection limit was used in this ANOVA analysis for nondetect data.

The COCs for soil and groundwater identified at Site 9 as a result of the HHRA are listed in Table 2-17. The COC concentration range, frequency of detection, soil background data, MCLs, and representative concentrations are also presented in Table 2-17.

Exposure Assessment

Exposure scenarios were developed for Site 9 based on current military land use and future military, residential, and commercial/industrial land uses. The RME receptor was assumed to be located on the site for all exposure scenarios. Surface-soil-related pathways were evaluated and summed in all cases. Vadose zone contaminants were evaluated for their potential to migrate in the soil. As expected, those with log K_{ow} values greater than 3.0 were generally not detected in groundwater, whereas those with log K_{ow} values below 3.0 were detected in both the vadose zone and groundwater. Fugitive dust was ruled out based on ground cover. Surface-water and sediment pathways may affect biota but do not present complete pathways for the human health risk assessment at Site 9. Groundwater at Site 9 is not used for drinking water. No production (drinking water) wells are located downgradient from Site 9 and no plans have been made for installation of new production wells in this area. However, for future land use, as a conservative measure, groundwater risks were summed with soil-related pathways because groundwater use is hypothesized for future scenarios.

Site 9 was initially evaluated in a screening risk assessment using maximum detected concentrations and a residential exposure scenario. The screening was

conservative because default parameters for the pathway-specific critical receptor were used. Site 9 did not meet the target criteria in this screening and was evaluated further. Instead of maximum concentrations, representative concentrations of the COPCs were used (SWDIV, 1993, Table 6-3). These concentrations were assumed to remain the same over time. For current land use, the military exposure scenario was used based on a 25-year civil servant and a 3-year military person. For future land use, options were evaluated for military (same as current land use), residential, and commercial/industrial development. The most likely receptor was used for each case: adult and child for residential; adult for commercial/industrial and military scenarios.

Toxicity Assessment

Toxicity values for the COPCs were compiled from the integrated risk information system (IRIS [EPA, 1992b]), health effects assessment summary tables (HEAST [EPA, 1992c]), Cal/EPA Criteria for Carcinogens Memorandum (Cal/EPA, 1992a), and the Superfund Health Risk Technical Support Center (EPA, 1994). Cross-route extrapolation was incorporated into the risk evaluations. When only oral toxicity values were available, they were used as inhalation toxicity values as well. Data gaps in toxicity values were identified in the uncertainty evaluation of the risk assessment.

Cancer slope factors (SFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by the EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are

estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

Risk Characterization

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer slope factor. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$ or 1E-06). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance within a single medium or across media.

Lead was evaluated separately using both the Federal (EPA, 1991) and State (Cal/EPA, 1992b) lead models. Evaluation of maximum soil and groundwater concentrations for lead using the Federal and DTSC blood lead models (SWDIV, 1993, Appendix S) indicated blood lead levels of less than 10 µg/l for children, age range 0 to 6 years. This meets the target criteria for health protection specified by the EPA (1991).

The evaluation of maximum concentrations for risk at the point of contamination at Site 9 yielded unacceptable risk relative to the target criteria of 10^{-6} ILCR and

1.0 HI. Representative concentrations were used to calculate chronic daily intakes for risk characterization. Representative concentrations are the mean and 95 percent upper confidence limit (UCL) concentrations of all the samples inside the isopleth containing the borings where any chemical-specific concentration exceeds the target criteria of 10^{-6} ILCR or 1.0 HI. The risk characterization for Site 9 was based on representative concentrations of COCs identified within the designated lateral extent of soil contamination and downgradient groundwater wells.

Arsenic was the major contributor to the total potential groundwater chronic health hazard. Statistical evaluation shows arsenic is within background and is not site-related. Arsenic was detected only sporadically in a few wells, at concentrations considerably below State and Federal MCLs. The risk-based PRG for arsenic is 0.0472 µg/l (SWDIV, 1993), which is well below detection limits. PCE and TCE were the groundwater COCs identified after reevaluation using representative concentrations of five rounds of RI monitoring data.

The groundwater beneath Site 9 is not currently used as a source of drinking water and it is unlikely to be used in the future. However, for future land use it is assumed that the groundwater may be used as drinking water at Site 9. Military personnel are not present on site for long enough periods or on a regular basis to support a chronic exposure to soil. However, it was assumed that the military exposure is a current exposure. There are no current residents on Site 9 are they are unlikely in the future, however, it was assumed they could be present in the future. The civil servant is an upperbound representative of military personnel on site.

The risk characterization for Site 9 indicated that one COC, beryllium in surface soil, may pose a potential human health risk to future residential receptors. Residential exposure to average concentrations of beryllium in soil results in an estimated ILCR of $3x10^{-6}$, and exposure to reasonable maximum concentrations results in an estimated ILCR of $2x10^{-5}$. Incidental ingestion of beryllium in soil contributes most to the risk. Reasonable maximum cancer risk exceeds the target criterion of 10^{-6}.

Use of the future residential scenario is conservative, and the following factors should be considered:

- Beryllium exceeded background levels in only one sampling location, in only one sample.
- Site 9 is densely vegetated.
- According to the Camp Pendleton masterplan (Innis-Tennebaum Architects, Inc., 1990), Site 9 is unlikely to be developed as a residential area.

The COCs identified for the military civil servant and the residential exposure scenarios are presented in Table 2-18 with their associated risk/hazard. Reasonable maximum exposure concentration risks/hazards are presented. Risks/hazards did not exceed $1x10^{-6}/1.0$ for average concentrations. The chronic daily intake (CDI) for ingestion and dermal routes are summed and multiplied by the oral cancer slope factor (SF) for cancer risk. The CDI for inhalation was multiplied by the inhalation SF. The summed CDI, for ingestion and dermal routes and the inhalation route, was divided by the appropriate Federal reference dose (RfD) to calculate the noncarcinogenic hazard (HI). The groundwater pathway and soil pathway are summed separately and then added together for each exposure scenario. The 6 year child and 24 year adult are summed for the residential soil pathway. There is no noncarcinogenic hazard posed by the COCs. For both scenarios the summed HI is less than 1.0. The military scenario cancer risk posed by the current land use (soil pathway only) is $1x10^{-6}$. The future land use scenarios combine groundwater and soil pathways for a total military civil servant cancer risk of $2x10^{-6}$, and a total adult/child resident cancer risk of $2x10^{-5}$.

The occupational exposure scenario was also evaluated for future land use. The results were a cancer risk that did not exceed 1×10^{-6} and a HI below 1.0. The three year military person was also evaluated for current and future land use. The results were similar to that of the occupational exposure scenario.

For current military land use, estimates of total cancer risk and chronic health impact are at or below the target criteria of 10^{-6} and 1.0, respectively. As such, current conditions at Site 9 do not pose an unacceptable risk to either civil

servants or military personnel. However, Site 9 was found to pose potential risk to human receptors for the future residential scenario. Potential risk to future receptors would be caused primarily by exposure to beryllium in soil.

Uncertainty

The results of the risk assessment include both random and systematic error. Random error is believed to be addressed adequately by the design of the sampling, data evaluation, exposure assessment, toxicity assessment, and risk characterization steps. The evaluation of the RME also provides a conservative result to mitigate random error.

Systematic error may result from errors in judgment or protocol that produce bias in the assessment. The risk assessment protocol is intended to be a conservative approach, resulting in an overestimate of risk. The HHRA identified uncertainties that may produce a numerical uncertainty in the risk assessment of as much as an order of magnitude (EPA, 1989).

Future land use presents uncertainty for the HHRA. Risk managers need to know the most likely future land use so that they can incorporate this information into the decision-making process (EPA, 1990, p. 8710). Political and policy decisions cannot be accurately predicted, but MCB Camp Pendleton is expected to remain a military installation for the foreseeable future. Furthermore, the masterplan (Innis-Tennebaum Architects, Inc., 1990) for the base indicates that none of the Group A site areas (including Site 9) are scheduled for residential housing development. As such, the most likely land use for the sites consists of military operations, consistent with the military exposure scenario evaluated in the HHRA.

Data evaluation focusing on comparison of data with laboratory blanks may be a source of uncertainty in risk/hazard. Analytes that are common laboratory contaminants but are detected at concentrations five or ten times that of the blank were retained for evaluation. In such a case, a portion of the risk/hazard may be due to laboratory contamination and a portion may be due to environmental contamination.

Summing of cancer risks may also present a source of uncertainty (EPA, 1993). Evolving changes in cancer risk methodology and incorporation of new understanding of the mechanism(s) of oncogenesis may bring about a different method of assessing total ILCR in the future.

2.6.1.2 Environmental Risks

This section summarizes the results of the baseline ecological risk assessment for Site 9, which is described in detail in the RI report (SWDIV, 1993). The overall purpose of the baseline ecological risk assessment is to provide a qualitative and/or quantitative appraisal of actual or potential effects of contaminants on animals (excluding humans) and plants.

The no action alternative assumes that no corrective actions will take place and no restrictions will be placed on future uses of the area currently occupied by Site 9. The baseline ecological evaluation addresses potential risks from Site 9 under current and reasonable future land uses. The approach for the ecological risk assessment was recommended by the EPA and is described in detail in Section 7.0 of the RI report (SWDIV, 1993).

Contaminants of Ecological Concern

Ecological COCs are not necessarily the same as those listed in the HHRA. Some chemicals that are relatively harmful to humans are less so to other animals and vice versa. If toxicological information on effects to receptors was not identified in the literature, the chemicals were retained as COCs as a conservative measure. A detailed description of the COC selection process is presented in the RI report (SWDIV, 1993).

An evaluation of soil concentrations at Site 9 indicated that barium, beryllium, cadmium, copper, lead, mercury, molybdenum, vanadium, and zinc concentrations exceed background concentrations. These chemicals were retained for further COC screening procedures, and metals with concentrations below background concentrations were eliminated from further consideration. Maximum soil concentrations of organics and those metals exceeding background concentrations were then compared with toxicity criteria (SWDIV, 1993, Section 7.0).

A number of the chemicals detected in Site 9 soils have the potential for bioaccumulation in the environment. Chemical and physical properties of detected chemicals were evaluated, and all chemicals detected in Site 9 soil that could potentially bioaccumulate were retained for further screening. Cadmium, lead, mercury, zinc, and 4,4'-DDT were evaluated for possible impacts to food-chain integrity. Cadmium, lead, mercury, and zinc were retained as COCs because maximum detected soil concentrations exceed the calculated soil criteria based on bioaccumulation through the food chain and adverse effects on birds. Earthworm survival bioassays and lettuce germination and growth bioassays using Site 9 soils were analyzed for bioaccumulative chemicals (SWDIV, 1993, Appendix U).

Exposure Assessment

Site 9 is surrounded by a large berm that prevents storm-water runoff except during prolonged periods of very heavy rainfall. Wind erosion is minimized because vegetation covers most of the site. Groundwater underlying this site does not discharge to surface water. Therefore, chemicals that leach into groundwater are effectively removed or isolated from environmental receptors.

Environmental receptors may be exposed to organic chemicals in soils via dermal contact or ingestion of soil. Exposure via inhalation may occur for the more volatile organics such as toluene, xylenes, and ethylbenzene. Exposure to chemicals in surface waters may result from ingestion of the water.

Exposure to metals in soils may result from ingestion of soils. Animals may be exposed to waterborne chemicals by drinking surface water. Aquatic organisms may also be exposed to waterborne chemicals if surface waters are present in the pond. Concentrations of cadmium, copper, lead, mercury, and zinc at the site are sufficiently high to pose a concern for toxicity or bioaccumulation within food chains.

Ecological Effects Assessment

The bioaccumulative potential for the COCs was of critical concern during the ecological evaluation because bioaccumulation and biomagnification can provide a significant exposure pathway for certain chemicals within the food chain. The biological fate of a chemical in the environment depends on the physical and

chemical characteristics of the chemical, as well as the characteristics of the receiving environment. Critical parameter measures of chemical fate and transport were used to assess qualitatively the bioavailability of chemicals in the environment to exposed receptors. The physical and chemical characteristics of the COCs for Site 9 are presented in Section 2.5.1.

The terrestrial and aquatic toxicities of the COCs were researched and compiled, but relatively little information is available on toxicity to nontarget terrestrial organisms. Therefore, information was often gathered from laboratory investigations. Bioassays were conducted using soils from Site 9 to measure toxicity attributable primarily to metals and/or diesel (depending on specific sample location) in the absence of organochlorine contaminants.

Aquatic toxicities for COCs detected in surface water and sediment were used for toxicity assessment. Toxicity of chemicals to aquatic species depends on the physical and chemical characteristics of the chemicals and the receiving environment. Available toxicological information on fish and invertebrate effects was also compiled. Many of the organic chemicals detected are not water soluble and, therefore, would remain unavailable within the water column. In addition, the availability of many COCs depends on environmental conditions (temperature, dissolved oxygen content, and hardness).

Risk Characterization

The purpose of the risk characterization is to evaluate the evidence linking site contaminants with adverse ecological effects. Such a link was established by demonstrating a pattern of effects between ecological, toxicological, and chemical data. Risks of adverse effects were characterized by comparing the maximum observed concentrations with the assessment levels (effect levels or calculated criteria) judged most appropriate.

As reported, metals and organic chemicals were detected in Site 9 soils. Results of the site characterization indicated adequate habitat within Site 9 for terrestrial plants, terrestrial animals (including raptors and various mammals), and soil invertebrates. The aquatic habitat in the area is minimal. No aquatic life was observed during the site characterization.

Inhalation exposure to the chemicals detected in Site 9 soils may be minimal because many of the chemicals are not volatile. Dermal absorption and toxicity were not addressed for this assessment. The potential for toxicity to terrestrial invertebrates, plants, and animals was addressed quantitatively where possible. Results indicate that several of the metals detected in the site soils are potentially toxic to plants, invertebrates, and terrestrial vertebrates.

Although some native plants are present, Site 9 contains few or no sensitive plant communities. The site is adjacent to an unnamed drainage lined with woody riparian vegetation, between Las Pulgas and Aliso Canyons. Despite the degraded nature of the flora on the site and nearby area, the mosaic of habitats contributes an edge effect that favors the maintenance of wildlife populations. Least Bell's vireo was the only special-status vertebrate species observed at Site 9 during surveys in August and September 1992.

Chemicals exceeding background and/or potential adverse effect levels at Site 9 include barium, cadmium, copper, lead, mercury, vanadium, zinc, and TPH-diesel. Results of toxicity and bioaccumulation testing of plants and earthworms from the bioassays indicate potential toxic effects to animals and plants from surface soils (SWDIV, 1993). High concentrations of metals and TPH-diesel within the waste stabilization pond are in heavily vegetated areas and are within the area in which TPH-diesel concentrations exceed 100 mg/kg.

Toxicity of Site 9 surface soils was assessed using the earthworm survival test and lettuce germination and growth tests. The measured bioassay soil contaminant concentrations were in the low range of concentrations for soil metals and diesel determined by bioassay tests. Toxicity to lettuce growth and earthworm survival was observed at location 9BAS16, representing some risk of exposure to soil for plants and terrestrial animals at Site 9. However, metals and diesel did not appear to be contributing factors to toxicity at that location, and the minimal toxicity observed at the site cannot be ascribed to any particular contaminant on the basis of the test results.

Uncertainty and Limitations

Uncertainties and limitations are associated with the use of literature toxicity information to evaluate site-specific conditions, including direct comparisons with

literature-reported values and comparisons with calculated values for primary receptors.

Uncertainty is also inherent in comparing site-specific conditions with calculated criteria (for both soil and water ingestion). The equations used were derived from basic ingestion principles and from the calculation of risk-based PRGs for noncarcinogens for the protection of human health. Certain limitations must be considered in using the resulting numbers because ingestion rates have been established for many laboratory animals but not for wild species. In addition, the amount of soil that wild species typically ingest varies widely, and only limited information is available.

The use of no observed adverse effect level (NOAEL), lowest observed adverse effect level (LOAEL), median lethal dose (LD_{50}), and LC_{50} values and other effect levels as equivalent values results in additional uncertainty. The difference between a NOAEL and LOAEL and between a LOAEL and an LD_{50} can be as much as an order of magnitude, especially for organic chemicals. Comparisons with LD_{50} and LC_{50} values introduce additional uncertainty because the effects resulting from concentrations or doses lower than the LD_{50} or LC_{50} are unknown.

The use of calculated soil criteria for the evaluation of bioaccumulation also results in some uncertainty. Studies were used that reported no effect levels, accumulation in the liver, or accumulation in eggshells.

Inherent limitations are associated with interpreting the toxicity testing and soil chemistry results for MCB Camp Pendleton soils. Synergistic or additive effects of the potential ecological COCs are unknown, and the toxicity effect levels derived from tests on dilution series cannot be attributed to any single chemical.

2.6.1.3 Conclusions

The cancer risk due to soil and groundwater contamination at Site 9 is within the NCP acceptable range 10^{-4} to 10^{-6}. The noncarcinogenic HI was less than the acceptable 1.0 level. There is no significant risk to the environment. Therefore no remediation is required. However, because PCE and TCE have been detected in the groundwater above MCLs, groundwater monitoring and

institutional controls have been selected to implement the natural attenuation remedy.

2.6.2 Sites 4 and 4A - MCAS Drainage Ditch and Concrete-Lined Surface Impoundment

2.6.2.1 Human Health Risks

Risk characterizations using maximum detected concentrations and RME scenarios for the Group A Sites 4 and 4A are summarized in this section. A conservative estimate of potential risk to human receptors due to COCs was calculated for each media involved in a potentially complete exposure pathway. The risk characterization is based on a hypothetical residential exposure scenario and evaluated potential risks for critical human receptors.

No site-related carcinogens were identified at Site 4. The maximum concentration risk characterization for Site 4 resulted in an estimated HI of less than 0.1. For Site 4A, the estimated site-related ILCR values are $5x10^{-8}$ for exposure to surface soil via incidental ingestion and $2x10^{-7}$ for exposure via dermal absorption. Both values are less than the target risk of 10^{-6}. The estimated HI for both exposure routes is less than 0.1.

The risk characterization for Sites 4 and 4A using maximum concentrations indicated no potential cancer risk or adverse health impact exceeding target criteria for critical receptors exposed to surface soil at the point of contamination via either direct ingestion or dermal absorption. Because adverse health impact above target criteria does not exist based on the primary exposure pathways for residential receptors (the most conservative scenario), adverse impact above target criteria is not expected for either current or future human receptors.

Evaluation of maximum soil and groundwater concentrations using the Federal and DTSC blood lead models resulted in blood lead levels of less than 10 µg/dl for children, age range 0 to 6 years. This meets the target criteria for health protection specified by the EPA (1991).

Groundwater data indicate that groundwater beneath Sites 4, 4A, and 6 may be potentially impacted by common sources. Therefore, evaluation of groundwater at Sites 4 and 4A has been deferred for inclusion in the Site 6 groundwater evaluation and was not conducted as part of this preliminary HHRA.

2.6.2.2 Environmental Risks

Inorganic and organic chemicals were detected in surface-water, sediment, and soil samples from Sites 4 and 4A. Results of the surface-water analyses did not reveal many COCs, but several inorganic and organic chemicals in sediment and soil may pose some risk to exposed aquatic and terrestrial receptors.

Sites 4 and 4A provide adequate habitat for diverse aquatic and terrestrial life. Aquatic organisms may include various invertebrate species; terrestrial organisms may include soil invertebrates, plants, and terrestrial animals (mammals and birds). Potential exposure pathways identified at Sites 4 and 4A based on the results of the exposure analyses include the following:

- Ingestion of soil, surface water, and sediment
- Dermal contact with soil, surface water, and sediment
- Absorption of chemicals from soil by plants.

Most of the chemicals detected in Site 4 and Site 4A soil, surface water, and sediment are not volatile; therefore, the potential for inhalation exposure may be incomplete. Significant routes of exposure contributing most of the risk posed to receptors include dermal and ingestion exposure. In addition, plants at Sites 4 and 4A can become exposed to soil-related contamination through direct absorption.

The assessment of soil ingestion toxicity to invertebrates, plants, and vertebrates revealed that levels of aluminum and barium may pose a risk to exposed organisms. Concentrations of all other metals are below background levels for MCB Camp Pendleton.

Few organic chemicals were detected in Site 4 and Site 4A soils, and many could not be assessed for toxicity potential because of a lack of information in the literature reviewed. However, few organic chemicals were detected in site soils; therefore, the risk to exposed organisms is considered potentially low.

The exposure of terrestrial animals to surface-water contamination was assessed. Results indicate that manganese may pose a potential risk to receptors. The observed concentrations of all other detected chemicals are below toxicity criteria.

The comparison of surface-water and sediment concentrations with criteria for the protection of aquatic life indicated some potential toxicity to organisms exposed to sediment contaminants. Because of the high uncertainty involved in the calculation of sediment criteria, as well as the extrapolation from laboratory toxic effect levels to field scenarios, it is not known whether the site conditions pose significant risk to exposed organisms. However, aquatic sediment toxicity testing indicates no apparent risk from contaminated sediment. Downstream sediments in the Santa Margarita River and sediments with metals concentrations similar to the Site 4 drainage were not toxic to aquatic plants and animals (SWDIV, 1993).

The potential for higher trophic organisms to become exposed to chemicals through bioaccumulation appears to be negligible. Many of the chemicals detected in soil do not bioaccumulate because of their chemical and physical properties. However, some of the metals detected in surface water and sediment may bioconcentrate in aquatic organisms. Although the bioconcentration potential of the metals depends on bioavailability, potential risk to higher trophic organisms could occur. Evidence was found of manganese bioaccumulation in Santa Margarita River filamentous algae immediately downstream from the confluence of the Site 4 drainage ditch, although the algae did not contain toxic levels of manganese.

Based on the analyses of toxicity to aquatic and terrestrial organisms, concentrations of chemicals in soil, sediment, and surface water do not pose ecological risks to terrestrial or aquatic organisms.

Chemicals of potential concern that exceed background levels at Site 4 include aluminum, barium, lead, manganese, mercury, and selenium. However, given the conservative assumptions used in this assessment, lack of observable effects on plants in the field, and low probability of effects related to metals in the bioassays (with Site 3 soils and Site 6 soils and river sediments), it appears that

effects are not likely to occur. In addition, none of the contaminants detected in surface water exceed Federal or State standards. The concentrations of aluminum, barium, iron, and manganese in surface water exceed literature toxic effect levels and may be high enough to cause adverse effects to aquatic organisms. However, available information from the literature and the results of the bioassays (particularly for the Santa Margarita River) do not indicate a need for remediation at Site 4 to protect ecological receptors.

No special-status species were found on Sites 4 or 4A during the August and September 1992 observations. A total of 16 species of birds were identified at Site 4; song sparrows were abundant, and house wrens are likely common. Migram species may include white-crowned sparrow, yellow-rumped warbler, Wilson's warbler, and cedar waxwing. From 10 to 20 species probably occur on Site 4. Western fence lizards and one young gopher snake were observed, and Pacific tree frog, western toad, and coachwhip snake are likely present. An estimated 80 species of birds regularly use the site.

2.6.2.3 Conclusions

The cancer risk at Sites 4 and 4A was below the NCP point of departure of 10^{-6}. The noncarcinogen health HI was less than the acceptable 1.0 level. There is no significant risk to the environment. No remediation is required, and Sites 4 and 4A are recommended for no action.

2.6.3 Site 24 - 26 Area MWR Maintenance Facility

2.6.3.1 Human Health Risks

Risk characterization using maximum detected concentrations and RME scenarios for the Group A Site 24 is summarized in this section. A conservative estimate of potential risk to human receptors due to COCs was calculated for each media involved in a potentially complete exposure pathway. The risk characterizations were based on a hypothetical residential exposure scenario and evaluated potential risks for critical human receptors.

The maximum concentration risk characterization for Site 24 resulted in estimated site-related ILCR values of $6x10^{-8}$ for exposure to surface soil via incidental ingestion and $2x10^{-7}$ for exposure to surface soil via dermal absorption. No site-related carcinogens were identified for groundwater. These estimates were obtained using Federal toxicity values. Estimates obtained using State values were similar. All of the estimated site-related ILCR values are below the target level of 10^{-6}.

The HI for exposure to surface soil via both exposure routes was less than 0.1. The HI for exposure to groundwater was estimated to be 0.1, well below the target criterion of 1.0.

Evaluation of maximum soil and groundwater concentrations using the Federal and DTSC blood lead models resulted in blood lead levels of less than 10 µg/dl for children, age range 0 to 6 years. This meets the target criteria for health protection specified by the EPA (1991).

The risk characterization using maximum concentrations for Site 24 indicated that COCs in surface soil or groundwater pose no potential cancer risk or adverse health impact in excess of target criteria for the critical receptors. Although TPH was detected in soil, the toxic volatiles and semivolatiles usually associated with TPH were not. Because TPH was detected at low concentrations in soil and was not detected on a consistent basis in groundwater, adverse human health impact is not expected.

2.6.3.2 Environmental Risks

Metals and organic compounds were detected in Site 24 soils. Many of the metals detected are below background concentrations for MCB Camp Pendleton. Site characterization results indicate that Site 24 provides adequate habitat for terrestrial plants, terrestrial invertebrates, and a variety of animal species, including mammals, birds, amphibians, and reptiles.

Complete exposure pathways for Site 24 include the following:

- Ingestion of soil
- Inhalation of volatile chemicals from soil
- Dermal absorption of chemicals from soil
- Absorption of chemicals from soil by plants
- Bioaccumulation of chemicals through the food chain.

Several of the organic chemicals detected in Site 24 soils have semivolatile or volatile characteristics and present a potential for inhalation exposure and subsequent risk.

The absorption of chemicals by plants and the soil ingestion exposure were addressed quantitatively in the ecological effects assessment. Results indicate a potential for toxicity to plants, invertebrates, and animals due to soil contamination. Many of the metals detected in Site 24 soils are below background levels and, therefore, were not assessed for potential toxicity.

Semivolatile and volatile chemicals, as well as several chlorinated compounds, were detected in site soils. Although the bioaccumulative potential for the semivolatile and volatile chemicals may be low, chlorinated chemicals may potentially remain within the food chain at Site 24. Subsequent risk to higher trophic organisms may occur because of the presence of these chemicals.

Copper, lead, and zinc were detected in Site 24 soil at levels that may cause effects in some sensitive plants or invertebrates. However, no effects on plants were observed in the small areas where these elevated concentrations occurred, and the disturbance caused by remediation would probably exceed the effects due to these metals. Thus, remediation is not suggested.

The only special-status vertebrate species observed on Site 24 was the orange-throated whiptail. However, the greater mastiff bat may also occur in the area. Up to 20 mammal, 20 to 25 bird, and 6 amphibian and reptile species probably are present in the site vicinity. Wildlife receptors are somewhat limited on the site proper owing to the general lack of favorable habitat.

2.6.3.3 Conclusions

The cancer risk at Site 24 was below the NCP point of departure of 10^{-6}. The noncarcinogen health HI was less than the acceptable 1.0 level. There is no significant risk to the environment. No remediation is required, and Site 24 is recommended for no action.

2.7 Description of Alternatives

The description of alternatives in this section is limited to the alternatives developed during the Feasibility Study process for Operable Unit 1 - Site 9. Remedial alternatives were not developed for Sites 4, 4A, and 24 as these sites were found to be in a protective state.

Under CERCLA, a process has been established to develop, screen, and evaluate appropriate remedial alternatives. A wide range of cleanup options were considered for remedial action at Site 9. Remedial alternatives were not developed for sites other than Site 9 because it is the only site requiring remedial action.

The initial process options considered during the preliminary screening process are presented in Tables 2-19 and 2-20. The process options were evaluated, and retained or eliminated from further consideration on the basis of technical feasibility. Tables 2-19 and 2-20 also present the rationale for eliminating process options.

A second screening step was then performed to evaluate the remaining process options on the basis of implementability, effectiveness, and cost. The result of the screening process was intended to select only the most feasible process options for each technology type for detailed analysis. The secondary screening was a two-step process. First, the process options retained from preliminary screening were ranked according to the previously mentioned three criteria to eliminate those options that were obviously inappropriate. The results of this step are presented in Tables 2-21 and 2-22. The process options that remained after step one, shown in Tables 2-19 and 2-20 were then subjected to a more detailed evaluation based on the three criteria. After this evaluation was completed, the following alternatives were developed for detailed analyses:

- Alternative 1: No Action

- Alternative 2: **Soil** - Excavation and Off-Base Landfill for Hot Spots, Zone I, and Zone II
  Groundwater - Institutional Controls (monitoring and use restrictions)

- Alternative 3: **Soil** - Excavation and Off-Base Landfill for Zone I and Hot Spots; Biological Land Treatment for Zone II
  Groundwater - Extraction, Ultraviolet (UV)/Chemical Oxidation, and Reinjection

- Alternative 4: **Soil** - Excavation and Off-Base Landfill for Zone I; In Situ Bioremediation/Bioventing for Zone II
  Groundwater - Extraction, Carbon Adsorption, and Reinjection

- Alternative 5: **Soil** - Excavation and Off-Base Landfill for Zone I; In Situ Bioremediation/Bioventing for Zone II
  Groundwater - Institutional Controls

- Alternative 6: **Soil** - Excavation and Off-Base Landfill for Zone I and Hot Spots; Biological Land Treatment for Zone II
  Groundwater - Institutional Controls

- Alternative 7: **Soil** - No Action
  Groundwater - Institutional Controls.

Although seven alternatives do not represent every possible combination of soil and groundwater alternatives, professional judgement was used to combine the most feasible soil actions with the most feasible groundwater actions for the site conditions.

These alternatives were developed based on site-specific needs and evaluated using the nine criteria developed by EPA to address CERCLA requirements. These alternatives are described in greater detail in the following sections.

2.7.1 Description of Soil Zones and Hot Spots

The soil component of each alternative was grouped into three types. Zone I soil contains beryllium concentrations exceeding the proposed remedial goal (RG). Zone II soil contains TPH-diesel concentrations exceeding 100 mg/kg (Option 1) or 1,000 mg/kg (Option 2). Volumes of soil with concentrations of metals that potentially exceed State or Federal hazardous waste leaching criteria are designated as hot spots. Figure 2-8 presents a graphic delineation of soil contamination, including Zone I, Zone II, and hot spot soils.

TPH-diesel has been widely detected in the soils at Site 9. The Zone II soil is contaminated with TPH-diesel at concentrations ranging from 100 to 6,700 mg/kg. The lateral extent of the soil with TPH-diesel concentrations exceeding 100 mg/kg at Site 9 covers an area of roughly 92,700 square feet and is referred to as Zone II. The depth of TPH-diesel soil contamination is approximately 9 feet at the north end of the plume, 6 feet in the middle, and 2 feet at the south end. The corresponding volume requiring remediation is estimated at 21,000 cubic yards of in-place soil.

Beryllium was detected at a concentration exceeding the proposed RG in only one sample. For evaluation purposes, beryllium-contaminated soil is assumed to extend 3 feet below ground surface within a radius of 5 feet around this sample. The associated volume of soil is approximately 9 cubic yards. This soil is within the TPH-diesel plume and is referred to as Zone I.

Localized areas of lead- and cadmium-impacted soil, referred to as hot spots, were detected in borings 9B11, 9B16, and 9B17 and are also within the TPH-diesel soil plume. Although concentrations are below the proposed RGs, the detected contamination levels could conceivably exceed soluble threshold limit concentration (STLC) criteria and, thus, could be of concern when these areas are excavated. The STLC for lead is 5 mg/l and the STLC for cadmium is 1 mg/l. Maximum detected concentrations of site-related chemicals were compared against 10 times the STLC values. The multiplicative factors were estimated based on known differences among extraction procedures for the analytical tests. Soil with lead concentrations exceeding 50 mg/kg and cadmium concentrations exceeding 10 mg/kg may potentially exceed the STLC criteria. Soils containing these concentrations would be considered potentially hazardous waste. Detected total concentrations of lead exceed 10 times the STLC in borings 9B16 and 9B11 and cadmium exceeds 10 times the STLC in boring 9B17.

Lead and cadmium contamination is assumed to be limited to approximately the first 3 feet of soil. The volume of hot spot soil is estimated at 30 cubic yards. For purposes of the FS, the volume was estimated by assuming that the lead and cadmium hot spots extend 3 feet below ground surface within a 5-foot radius of borings 9B11, 9B16, and 9B17.

Unlike the individual chemical constituents of petroleum hydrocarbons, cancer risk factors associated with TPH-diesel are not published by either State or Federal regulatory agencies. Guidance concerning recommended maximum concentrations of TPH-diesel in soil is based primarily on the protection of groundwater, and is based on site specific conditions. The overriding consideration is the leachability of hydrocarbons from contaminated soil to the groundwater. According to the guidance provided in the California State Water Resources Control Board publication Leaking Underground Fuel Tank (LUFT) Field Manual (SWRCB, 1989), TPH-diesel concentrations of 1,000 ppm can be allowed to remain in place at Site 9. Depending upon a number of factors (depth to groundwater, annual precipitation, etc.), the concentrations of TPH-diesel which may be left in place varies from 100 ppm to 1,000 ppm. For this reason, two options were developed for consideration by the risk managers in conjunction with the soil remediation alternatives. The two options are as follows:

- Option 1 - Remediate all soils containing TPH-diesel concentrations of 100 ppm or greater, a volume of approximately 21,000 cubic yards of soil
- Option 2 - Remediate soils containing TPH-diesel concentrations of 1,000 ppm or greater, a volume of approximately 6,480 cubic yards.

2.7.2 Alternative 1 - No Action

The no action alternative involves no institutional controls, containment, removal, or treatment.

Overall Protection of Human Health and the Environment

The no action alternative includes no treatment and no control of exposure pathways. Under this alternative, long-term risks will be the same as those calculated in the baseline risk assessment. The target risk criterion of 10^{-6} and HI criterion of 1.0 will be exceeded for the soil exposure pathway for the adult and child residential land use exposure scenario. No site-related risks will result from the groundwater exposure pathway.

This alternative is not expected to meet chemical-specific and action-specific ARARs.

Compliance with ARARs

There are no numerical chemical-specific ARARs for Site 9 soil.

The only location-specific ARAR applicable to Site 9 under the no action alternative is the Migratory Bird Treaty Act of 1972. Although migratory birds have been observed in the vicinity of Site 9 (SWDIV, 1993), they are not known to be affected by current site conditions; therefore, the no action alternative meets this ARAR (Table B-4).

TCE and PCE exceed groundwater protection standards (chemical-specific numerical values included as action-specific ARARs; Appendix B). Although current conditions do not meet these action-specific groundwater criteria (Table B-6), contaminant concentrations only slightly exceed the criteria. The concentrations likely would be reduced to below the proposed RGs through natural attenuation. Because of uncertainties associated with the hydrologic regime and the contaminant source, it is difficult to model or otherwise evaluate the length of time required for on-site groundwater contaminant concentrations to be reduced to below the proposed RGs. However, it is reasonable to expect that concentrations would be reduced to below the proposed RGs within a 10- to 30-year time period. Treatment may not be warranted because groundwater is unlikely to be used in the foreseeable future, (EPA, 1990, pp. 8732-8743). Chemical-specific groundwater ARARs should be met over time. Action-specific ARARs require monitoring until compliance is achieved; therefore, the no action alternative does not comply with action-specific ARARs.

2.7.3 Alternative 2: Soil - Excavation and Off-Base Landfill for Hot Spots, Zone I, and Zone II; Groundwater - Institutional Controls

2.7.3.1 Alternative 2, Option 1

This alternative involves excavation and disposal of contaminated soil and nstitutional control of contaminated groundwater. Contaminated soil in hot spots, Zone I, and Zone II will be disposed of at a RCRA-permitted Class I landfill.

Soil containing beryllium (Zone II) and cadmium and lead (hot spots) will be excavated, segregated, and transported to the disposal facility. The WET

method will be used to determine if metals concentrations exceed levels permitted for land disposal; if so, the soil will require stabilization before disposal. Zone II soil containing TPH-diesel concentrations exceeding 100 mg/kg and heavy metal concentrations below STLC levels will be disposed of at the landfill. The schematics of the soil excavation operation are presented in Figure 2-9.

The boundaries of hot spots and Zone I will be delineated in the field by collecting soil samples and analyzing them in an off-base laboratory. The procedures for segregating and delineating the boundaries of the hot spots and Zone I are described in detail in the FS report.

After hot spot and Zone I soils are removed, Zone II soils will be excavated and the bottom of the excavation will be sampled on a 25- by 25-foot grid. The samples will be analyzed for TPH-diesel either in an on-site mobile laboratory or at an off-base laboratory on a 24-hour turnaround basis. Excavation will continue in any areas that exceed the proposed RG of 100 mg/kg. The excavation will extend laterally beyond the impacted area to provide a 1:1 slope (Figure 2-9).

The institutional controls proposed for contaminated groundwater will involve amending the base masterplan to restrict future access to the groundwater in the immediate vicinity of the site and groundwater monitoring to assess contaminant levels and potential migration. Water levels will be measured and groundwater samples will be collected from the existing site monitoring wells. If downgradient migration of the groundwater plume continues, the plume would discharge into the ocean after migrating about 3,900 feet. This alternative involves no treatment of the groundwater, but relies on dispersion and natural attenuation over time.

Groundwater monitoring will continue for 10 years. The results of groundwater monitoring will be evaluated every 5 years to assess the need for any additional remedial activities. Groundwater monitoring will be conducted on a semiannual basis, except that a compliance monitoring program consisting of eight sampling rounds will be conducted during the seventh year.

Overall Protection of Human Health and the Environment

Implementation of Alternative 2 will reduce potential risks from soil and groundwater exposure pathways. The residual risk for soil will be the same as

the risk level associated with background soils (i.e., background beryllium concentrations exceed the remedial action objective (RAO) of 10^{-6}). Although groundwater contaminants will not be treated under this alternative, exposure pathways will be minimized through institutional controls.

Location- and action-specific ARARs are expected to be attained during implementation of Alternative 2. Although groundwater will not be treated, groundwater modeling has shown that the low concentrations of organics present at the site will disperse and naturally attenuate to levels below proposed RGs before reaching the nearest receptors at the ocean.

Implementation of this alternative will have no significant additional environmental or health impacts.

Compliance with ARARs

There are no numerical chemical-specific ARARs for Site 9 soil.

This alternative is expected to achieve location-specific ARARs (Tables B-4 and B-5). Actions will be coordinated with the U.S. Fish and Wildlife Service and the California Department of Fish and Game, as appropriate. Work plans for site operations will specify that migratory birds and endangered species not be harmed or injured. An on-site archaeologist will monitor excavation activities during remediation to comply with the National Archaeological and Historical Preservation Act.

ARARs identified under Title 22 and Title 23 for waste piles will be addressed through implementation of work plans.

Design and site operations will incorporate requirements, in accordance with the action-specific ARARs (Table B-6). Stockpiled contaminated soil will be placed on liners and run-on and runoff will be controlled. Fugitive dust will be monitored and controlled through the use of suppressants.

TCE and PCE concentrations at the site exceed groundwater protection standards.

Current conditions do not meet Federal action-specific groundwater criteria (Table B-6). However, contaminant concentrations only slightly exceed the criteria. Despite uncertainties concerning the hydrologic regime and contaminant source, natural attenuation should reduce concentrations to below the proposed RGs in less than 10 years. Under this alternative, groundwater contaminant concentrations will be monitored for 10 years and use restrictions will be implemented so that the groundwater is not used for drinking water (EPA, 1990, pp. 8732-8734).

Long-Term Effectiveness and Permanence

The long-term effectiveness of this alternative for soil will be significantly enhanced through the permanent removal of contaminated soil from the site, resulting in the adequate and reliable reduction of potential human health risks at the site. Institutional controls for groundwater will provide some reliability by reducing risks but cannot eliminate risks or achieve significant long-term effectiveness.

The magnitude of residual risk remaining at Site 9 for hypothetical residents in a future land use residential scenario is the risk resulting from background concentrations of beryllium remaining in the soil, or a reasonable maximum exposure (RME) ILCR of $4x10^{-6}$. The upper 95 percent confidence level of background concentrations is 0.69 mg/kg, and the 10^{-6} risk level is 0.15 mg/kg. The risk reduction for soil resulting from implementation of Alternative 2 will be the baseline risk minus the resultant risk: $2x10^{-5}$ (Table 2-23) - $4x10^{-6}$ = $2x10^{-5}$. This alternative will also reduce the health impact. The HI for a beryllium soil concentration of 0.69 mg/kg is less than 0.1. Therefore, because the HI for noncancer effects under the baseline condition is 1.2 (Table 2-23), the risk reduction is also 1.2. The remaining concentrations of TPH-diesel in the soil will present no associated health impacts.

Although the contaminants in the groundwater do not contribute unacceptable site-related incremental risks, this alternative includes groundwater monitoring and use restrictions.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 2 does not entail on-site treatment of contaminated soil or groundwater. Soil contaminant mobility will be reduced by off-base chemical fixation and solidification of soil from Zone I and hot spots prior to disposal at a Class I landfill. This soil accounts for about 39 cubic yards and is not significant in relation to the total volume to be excavated under this alternative. Although the off-base treatment will significantly immobilize the contaminants in the soil, it will also increase the volume of the contaminated soil by 25 to 40 percent due to the addition of chemical reagents. Fixation and solidification are not irreversible; however, depending on the type of soil stabilization used, the contaminants could remain in stasis for thousands of years. Class I landfill disposal of soil will not reduce either toxicity or volume.

The remaining 21,000 cubic yards of soil, designated as Zone II, are of concern because the TPH-diesel concentrations exceed the proposed RG of 100 mg/kg. Zone II soil will be transported and disposed of at the Kettleman Hills landfill. Landfill disposal of soil does not reduce toxicity, mobility, or volume and is primarily a containment remedy. However, the contamination in Zone II is biodegradable and the type and quantity of the remaining residuals will depend on the natural attenuation rate in the landfill.

Institutional controls for groundwater will not reduce toxicity, mobility, or volume of the contaminants. The contaminants at Site 9 will remain in the groundwater and move in the general direction of groundwater flow before discharging to the ocean. However, natural attenuation is expected to reduce PCE and TCE concentrations in on-site wells, and modeling indicates the contaminants will be below MCLs, if not nondetect, before the water reaches the ocean.

Cost

The total cost of Alternative 2, Option 1, is approximately $4.1 million. A summary of the cost estimate is provided in Appendix E, Table E-1 of the FS report, and includes remedial cost by media, contingency allowance, and preconstruction submittals. Soil remediation costs include capital costs only. These costs cover the equipment and labor for site preparation, excavation and loading, laboratory analyses, backfilling, transportation, and disposal. A detailed line item cost breakdown is presented in Table E-2 of the FS report.

The total capital cost for groundwater remediation is approximately $2,500 and includes pumping and associated monitoring equipment. Annual operation and maintenance (O&M) costs for semiannual groundwater monitoring years are approximately $33,000 and include sample collection from each of the 12 wells, sample analysis, maintenance of pumps, labor, and waste disposal. The cost for compliance monitoring during the seventh year is approximately $132,000. An additional cost of $5,200 is included for alternative assessment every 5 years and is part of the O&M costs. The estimated present worth of O&M for 10 years is approximately $336,000. This assumes a 5 percent inflation rate and 10 percent discount rate. The costs associated with Alternative 2 groundwater monitoring are also included in Alternatives 3 to 6. A cost summary is provided in Table E-3 of the FS report, and present worth analysis costs are presented in Table E-4 of the FS report.

2.7.3.2 Alternative 2, Option 2

Option 2 differs from Option 1 in that the volume of TPH-contaminated soil that is excavated and transported off base for disposal is limited to the area where TPH-diesel concentrations exceed 1,000 mg/kg. The criteria assessment for groundwater and soil in Zone I and hot spots is identical to Option 1, as discussed in Section 2.7.3.1. The ARARs, long-term effectiveness, and reduction of contaminant toxicity, mobility, or volume are the same as for Option 1. Option 2 differs from Option 1 in short-term effectiveness, implementability, and cost.

A smaller volume of contaminated soil will be handled in Option 2 than in Option 1, resulting in short-term benefits. A smaller area of the site will be disturbed, and potential environmental impacts will be reduced in the short-term. Fewer trucks will be needed to transport the soil off site, creating less potential for accidents. The time required to achieve site protection is approximately 20 working days. Groundwater monitoring will continue for 10 years.

2.7.4 Alternative 3: Soil - Excavation and Off-Base Landfill for Zone I and Hot Spots, Biological Land Treatment for Zone II; Groundwater - Extraction, UV/Chemical Oxidation, and Reinjection

2.7.4.1 Alternative 3, Option 1

Alternative 3 involves the off-base disposal of contaminated soils from Zone I and the hot spots and on-site biological land treatment of contaminated soil from Zone II. Soils from Zone 1 and the hot spots (approximately 39 cubic yards) will be excavated, screened, segregated, and then transported by truck to a Class I landfill for disposal and stabilization, as required. The contaminated soil in Zone II (approximately 21,000 cubic yards of soil with TPH-diesel concentrations exceeding 100 mg/kg) will be transported to a biological land treatment facility that will be constructed on site, as described in Section 4.1.1.5 of the FS report. The biological land treatment will achieve the remediation criteria of 100 mg/kg for TPH-diesel contamination. A biotreatability study will be conducted during the remedial design phase to optimize the treatment process. Treated soil will be used by the base for development purposes such as in roads or concrete. Clean backfill will be obtained from the 3-mile pit located in the Kilo 2 training area, approximately 15 miles from Site 9.

Groundwater within the Site 9 channel deposits will be extracted and treated using an on-site pump-and-treat system with a UV/chemical oxidation system to destroy TCE and PCE and, thus, meet the proposed RGs. The treated groundwater will then be reinjected into the water-table aquifer on the upgradient edge of the plume to increase the hydraulic head and, in turn, increase the removal rate of the plume from the aquifer. The assumed locations of the extraction and reinjection wells and the schematics of soil excavation operation are shown in Figure 2-10. Figure 2-11 presents a process flow diagram for the groundwater treatment system.

The time required for completion of soil remediation activities is approximately 28 weeks. Under this alternative, UV/chemical oxidation treatment of groundwater will continue for 7 years and monitoring will continue for 10 years.

Overall Protection of Human Health and the Environment

The removal and treatment of groundwater and soil will reduce risks from soil and groundwater exposure pathways. Alternative 3 is expected to attain ARARs. However, residual risk from background beryllium concentrations will still exceed the RAO of 10^{-6}.

Compliance with ARARs

Chemical-specific ARARs for groundwater (Tables B-1 through B-3) are expected to be achieved within the 7-year treatment period as a result of implementing Alternative 3. Reduction of TCE and PCE concentrations in the groundwater is expected to meet proposed RGs. These levels will be achieved at the point-of-compliance.

There are no numerical chemical-specific ARARs for soil at Site 9.

Location-specific ARARs will be attained through coordination with the U.S. Fish and Wildlife Service at the California Department of Fish and Game (Tables B-4 and B-5). Work plans for site operations will specify that migratory birds and endangered species not be disturbed, harmed, or injured during operations. Compliance with the National Archaeological and Historical Preservation Act will be attained by monitoring excavation activities.

Implementation of Alternative 3 is expected to meet RCRA action-specific ARARs (Table B-6). Requirements for closure, container storage, and excavation will be incorporated into design specifications and site operations for Alternative 3. Land treatment unit and stockpile design, construction, operation, and closure requirements will also be attained. The treatment process will adhere to requirements for underground injection of treated groundwater. Monitoring is a component of this alternative. Implementation will adhere to provisions of the Clean Air Act. Low emissions of volatiles into the atmosphere are expected and will be monitored during the equipment start-up phase to check that they are below harmful levels. If necessary, these off-gases can be treated with vapor-phase carbon.

Groundwater treatment is expected to meet State action-specific ARARs (Table B-7). State requirements under Title 23 (CCR) for land treatment units

and stockpiles, including siting, design, construction, operation, closure, and monitoring, will be incorporated into the design and site operations.

Long-Term Effectiveness and Permanence

Like Alternative 2, Alternative 3 includes excavation of approximately 21,000 cubic yards of soil, including Zone I soil, and will reduce the beryllium levels in soil to the existing background concentration of 0.69 mg/kg. Therefore, the residual risk associated with the soil will be the same as for Alternative 2. The resulting noncancer health risk will be an HI of less than 0.1.

Contaminants in the groundwater do not contribute to unacceptable site-related incremental human health risks. Concentrations of site-related contaminants do not pose an unacceptable risk.

In addition to the treatment system, the total present worth O&M cost includes costs associated with groundwater monitoring and alternative assessment, as stated in Alternative 2. Groundwater capital costs are presented in Table E-8 of the FS report, and present worth costs are presented in Table E-9 of the FS report.

2.7.4.2 Alternative 3, Option 2

Option 2 differs from Option 1 in the extent, volume, and TPH-diesel concentrations of the soil that will be excavated and treated. The remedial technologies employed to address the groundwater contamination and the soil contamination in Zone I and hot spots are identical for both options. Therefore, the criteria assessment related to these components is not repeated here.

As discussed in Alternative 2, a smaller volume of contaminated soil will be handled in Option 2 than in Option 1. A smaller area of the site will be disturbed, and potential environmental impacts will be reduced in the short-term. The time required to achieve site protection is approximately 2 months for soil. Groundwater treatment and monitoring continue for 7 and 10 years, respectively.

2.7.5 Alternative 4: Soil - Excavation and Off-Base Landfill for Zone I, In Situ Bioremediation/Bioventing for Zone II; Groundwater - Extraction, Carbon Adsorption, and Reinjection

2.7.5.1 Alternative 4, Option 1

Alternative 4 differs from Alternative 3 in that the TCE and PCE in the extracted groundwater will be removed by adsorption onto a liquid-phase activated carbon bed instead of being destroyed in a UV/chemical oxidation system. Soil remediation includes excavation, screening, and transportation of Zone I soil (containing beryllium) to a Class I landfill. The TPH-diesel contamination in Zone II will be remediated using in situ bioremediation/bioventing. The hot spots will not be excavated because they do not contain levels of contaminants exceeding the proposed RGs and, therefore, do not require remediation.

Because the depth of the soil contamination varies from 2 feet at the south end of the waste stabilization pond to 9 feet at the north end of the pond, a combination of in situ biological treatments will be used for the TPH-diesel contamination in Zone II. In the south end of Zone II, between borings 9B11 and 9B16, the top 2 to 3 feet of surface soil will be bioremediated by regular tilling, supplemented by irrigation, pH adjustment, and nutrient addition, as appropriate. Given the low concentrations of TPH-diesel in this area, the remediation could be complete within a few months.

Bioventing will be used to remediate TPH-diesel contamination in the rest of Zone II. Bioventing may use either wells or trenches for air injection or extraction depending on site conditions. One configuration for placement of air injection trenches at Site 9 is shown in Figure 2-12.

2.7.5.2 Alternative 4, Option 1

Overall Protection of Human Health and the Environment

Implementation of Alternative 4, Option 1, will reduce risk due to soil and groundwater exposure pathways and provide for the overall protection of human health and the environment.

Implementation of Alternative 4 is also expected to attain ARARs and to pose no significant additional impact to the environment or human health.

Compliance with ARARs

As with Alternative 3, chemical-specific ARARs for groundwater are expected to be achieved within the 7-year treatment period. There are no numerical chemical-specific ARARs for Site 9 soil.

The discussion of location-specific ARARs for Alternative 3 applies to Alternative 4 as well.

Action-specific ARARs for Alternative 4 include groundwater treatment design and operation. These requirements will be incorporated into the design and site operations for this alternative. Requirements pertaining to underground injection of treated groundwater and air emissions are the same as discussed for Alternative 3 (Section 2.7.4.1) and will be attained for Alternative 4.

Groundwater treatment is expected to achieve State action-specific ARARs.

2.7.5.3 Alternative 4, Option 2

Option 2 differs from Option 1 in that the volume of soil requiring treatment is limited to approximately 6,480 cubic yards. This volume includes soil with TPH-diesel concentrations exceeding 1,000 mg/kg. The bioventing system will be designed to treat a smaller area than for Option 1. In addition, only the shallow areas of contamination around 9B16 and 9B11 will be remediated by in situ bioremediation because the shallow depth of contamination (1 to 3 feet) makes implementation of bioventing difficult.

The long-term effectiveness and overall protection will be about the same for both options because the area of high TPH-diesel contamination that presents the greatest potential for leaching into the groundwater will be equally remediated in both options. Because the area of the site that is disturbed during implementation of Option 2 will be smaller, potential environmental impacts will be reduced in the short-term.

2.7.6 Alternative 5: Soil - Excavation and Off-Base Landfill for Zone I, In Situ Bioremediation/Bioventing for Zone II; Groundwater - Institutional Controls

2.7.6.1 Alternative 5, Option 1

The soil remediation component of Alternative 5 is identical to that of Alternative 4 (Section 2.7.5.1), and the groundwater component is identical to that of Alternative 2 (Section 2.7.3.1). A schematic of the soil remediation is presented in Figure 2-13.

This alternative is intended to manage risks associated with soil and groundwater contamination by limiting access to the groundwater for beneficial use and by remediating Zone II soil via in situ treatment.

This alternative will require about 2 years or longer for soil remediation, and groundwater monitoring will continue for 10 years.

2.7.6.2 Alternative 5, Option 2

The soil remediation component for Option 2 of this alternative is identical to that of Option 2 for Alternative 4, as described in Section 2.7.5.2. The groundwater component is the same as discussed under Option 1. The duration for completion of soil remediation is estimated at just over 1 year.

2.7.7 Alternative 6: Soil - Excavation and Off-Base Landfill for Zone I and Hot Spots, Biological Land Treatment for Zone II; Groundwater - Institutional Controls

2.7.7.1 Alternative 6, Option 1

The soil component of Alternative 6 is identical to that of Alternative 3 (Section 2.7.4.1), and the groundwater component is identical to that of Alternative 2 (Section 2.7.3.1). A schematic of the soil excavation operation is shown in Figure 2-14.

Under Alternative 6, Option 1, soil remediation will require about 2 years or longer and groundwater monitoring will continue for 10 years.

2.7.7.2 Alternative 6, Option 2

The soil component of this alternative is identical to that described for soil in Alternative 3, Option 2 (Section 2.7.4.2). The groundwater institutional controls are identical to those described in Alternative 2 (Section 2.7.3.1).

2.7.8 Alternative 7: Soil - No Action; Groundwater - Institutional Controls

Alternative 7 consists of no action for soil and institutional controls for groundwater. The soil component of the alternative involves no institutional controls, containment, removal, or treatment. The groundwater component involves risk management through an amendment of the base masterplan to restrict future access to the groundwater in the immediate vicinity of the site and monitoring of contaminant concentrations and migration. Monitoring will consist of semiannual groundwater sampling for 10 years, with compliance monitoring consisting of eight sampling events to be conducted during the seventh year. An alternative evaluation will be performed once every 5 years to assess the effectiveness and document the progress of the alternative. Samples will be analyzed for TPH by modified EPA Method 8015 and for volatile organics by EPA Method 8240, using Contract Laboratory Program (CLP) protocol.

The no action soil alternative would include no treatment and no control of exposure pathways. Long-term risks would be the same as those calculated in the baseline risk assessment. The target risk criterion of 10^{-6} and the hazard index (HI) of 1.0 would be exceeded for the soil exposure pathway for the adult and child residential land use exposure scenario.

Additional sampling and analysis using the WET analysis indicate that the metals in the soils at the site are not likely to leach into groundwater. Analytical results were nondetect for all samples collected. Based on the results of these tests, TPH was excluded as a contaminant requiring action at Site 9.

Groundwater modeling indicates that the currently low concentrations of organics would be reduced to levels below the proposed RGs, if not to nondetectable levels, by dispersion and natural attenuation before reaching the nearest receptors at the ocean. In spite of the uncertainties associated with using an uncalibrated model, natural attenuation is expected to reduce concentrations of contaminants in site groundwater to below MCLs within a 7-year period.

There are no chemical-specific ARARs for Site 9 soil.

The only location-specific ARAR applicable to the no action alternative at Site 9 is the Migratory Bird Treaty Act of 1972. Although migratory birds have been observed in the vicinity of Site 9 (SWDIV, 1993), they are not known to be affected by current site conditions. Therefore, this alternative complies with this ARAR (Table B-4).

TCE and PCE concentrations in site groundwater exceed groundwater protection standards. Under current conditions, action-specific groundwater criteria are not attained (Table B-6). However, contaminant concentrations are only slightly above the criteria in two wells, and the concentrations likely would be reduced to levels below the proposed RGs through natural attenuation in less than 10 years. Concentrations would be monitored under this alternative and land use restrictions would be applied.

2.8 Summary of Comparative Analysis of Alternatives

The last phase of the evaluation of remedial action alternatives involves a comparison of the alternatives. The relative advantages and disadvantages are discussed with respect to the nine evaluation criteria required by the NCP and CERCLA Section 121. The comparative evaluation for Site 9 - Stuart Mesa Waste Stabilization Pond is presented in the following sections and is summarized in Table 2-24. As previously mentioned, Site 9 is the only site in OU1.

2.8.1 Overall Protection of Human Health and the Environment

Each of the alternatives would provide adequate protection of human health and the environment with the exception of Alternative 1 - No Action.

Alternative 2 would achieve protection by preventing exposure to soil via removal and disposal in an approved landfill. Potential groundwater exposure risks would be reduced through access restrictions and natural attenuation. Alternatives 3 and 4 would reduce risks from soil and groundwater through treatment. Alternatives 5 and 6 combine treatment of the soil with access restrictions and natural attenuation of the groundwater.

In Alternative 7, the target risk criterion of 10^{-6} would be exceeded for the soil exposure pathway for the adult/child residential land use exposure scenario. However, the future use for Site 9 is not likely to be residential, and leachability testing of the soils indicates that the metals and the constituents of the petroleum hydrocarbons would not leach to groundwater. Combining these two factors, Alternative 7 also appears to provide for adequate overall protection of human health and the environment.

2.8.2 Compliance with ARARs

Alternatives 3 and 4 would meet the respective ARARs. Alternatives 2, 5, 6, and 7 would meet location-specific and action-specific ARARs; chemical-specific ARARs would be attained over time through groundwater attenuation. Alternative 1 would not meet ARARs. The ARARs are listed in Appendix B.

2.8.3 Long-Term Effectiveness and Permanence

Alternatives 3 and 4 would afford the highest degrees of long-term effectiveness and permanence because they involve treatment to reduce hazards posed by both the soil and groundwater at Site 9. Alternatives 3 and 4 differ only in the technology used to treat the chlorinated hydrocarbons in groundwater. Transport of spent carbon off site would pose potential transportation risks for Alternative 4. Both UV/chemical oxidation (Alternative 3) and carbon adsorption (Alternative 4) can reduce TCE and PCE concentrations in groundwater to levels below proposed RGs. Alternatives 3 and 4 would require maintenance of the groundwater pump-and-treat system in addition to continued groundwater monitoring. Soil treatment, as part of both of these alternatives, would reduce contaminant concentrations to below proposed RGs.

Alternatives 5 and 6 employ the same soil technologies as Alternatives 3 and 4 but provide no active groundwater treatment. Bioventing in Alternatives 5 and 6 may potentially remove some contamination from groundwater through the subsurface movement of air, which in turn could enhance volatilization of contaminants. However, this impact is expected to be minimal because the effective bioventing zone would be a considerable distance from the groundwater plume. No incremental human health risks are attributable to groundwater contaminants; therefore, all four alternatives are comparable with respect to long-term effectiveness and permanence for the groundwater component.

Alternatives 2 and 7 are similar in that less than 1 percent of the soil is not treated in Alternative 2 and none of the soil is treated in Alternative 7. Both alternatives rely on use restrictions to minimize exposures from the groundwater pathway. As with Alternatives 5 and 6, institutional controls would minimize potential risk from the groundwater by removing the receptor even though no incremental human health risks are attributable to groundwater contaminants.

With the exception of the no action alternative, all of the alternatives involve long-term groundwater monitoring and maintenance requirements. Monitoring is assumed to continue for 10 years or until groundwater concentrations meet the proposed RGs. Reviews would be required every 5 years to verify whether goals have been met or further action is required.

2.8.4 Reduction of Mobility, Toxicity, or Volume Through Treatment

Alternatives 3, 4, 5, and 6 use treatment to address the principal threats posed by soil and, thus, would satisfy the statutory preference for treatment as a principal element. For all four alternatives, TPH-diesel concentrations in soil from Zone II would be reduced, through biological treatment, to less than 100 mg/kg for Option 1 and less than 1,000 mg/kg for Option 2. For Alternatives 3 and 6, the mobility of contaminants in Zone I and the hot spots would be reduced through chemical fixation and stabilization. For Alternatives 4 and 5, the mobility of contaminants in Zone I soil would be reduced through chemical fixation and stabilization. The soil volume would be increased by approximately 25 to 40 percent.

Alternative 2 (Option 1 and Option 2) does not provide for on-site treatment of contaminated soil or groundwater. About 40 cubic yards of the soil excavated under this alternative is expected to require chemical fixation off base before disposal in a Class I landfill. Chemical fixation would reduce contaminant mobility but would also increase the volume of the soil. The remaining 21,000 cubic yards of soil would not be treated.

Although no treatment is proposed for the soil component in Alternative 7, the volume of soil is significantly smaller than for Alternatives 1 through 6 (approximately 9 cubic yards compared with 21,000 cubic yards). This large difference is due to the change in the proposed RG evaluated in Alternative 7 compared with the other alternatives. Leachability testing results indicate that concentrations of diesel in the soil are not likely to leach. As a result, only soils with metals contamination that might pose a potential human health risk are addressed by this alternative, thus eliminating the large volume of soils containing only petroleum hydrocarbons.

In Alternatives 3 and 4, toxicity of contaminants in groundwater would be reduced through treatment. Alternative 3 uses UV/chemical oxidation to treat TCE and PCE, and Alternative 4 uses carbon adsorption to treat PCE and TCE. Carbon adsorption can effectively remove PCE and TCE to levels below the proposed RG.

No treatment of the groundwater is provided under Alternatives 2, 5, 6, and 7.

2.8.5 Short-Term Effectiveness

The criterion is not applicable to Alternatives 1 and 7 because these alternatives involve no actions that would disturb the site. The short-term effectiveness of Alternatives 4 and 5 is expected to be the greatest. Alternatives 4 and 5 would pose the least potential risk to workers, the community, and the environment. Because these alternatives incorporate in situ soil treatment technologies, only a small amount of soil would be excavated compared with the other alternatives, thus significantly reducing the fugitive dust emissions. Also, because the smallest area is disturbed under these alternatives, environmental impacts would be minimized.

Short-term protection is expected to be achieved under Alternative 2 in approximately 1 month through removal of soils and restrictions on groundwater use. Soil protection would be achieved in approximately 6 months for Alternatives 3 and 6 and in approximately 2 years for Alternatives 4 and 5. Groundwater protection would be achieved in approximately 7 years for Alternatives 3 and 4.

2.8.6 Implementability

This criterion is not applicable to Alternative 1. Because Alternative 7 includes only institutional controls for groundwater and no action for the soil, it is considered the easiest alternative to implement.

Alternative 2 ranks second under this criterion. Technologies included in this alternative include groundwater monitoring and excavation and disposal for soil in Zone I, Zone II, and hot spots. These technologies are straightforward. If the planned operations require expansion, adequate area is available in the vicinity of Site 9 and would require minimal site preparation. Groundwater monitoring will track the effectiveness of the soil removal and any attenuation of contaminant concentrations in groundwater.

Alternatives 4 and 5 employ the same soil treatment technologies: excavation and off-base disposal of Zone I soils (as with Alternative 2) and bioventing of the Zone II soils. Because of the added treatment technologies, Alternatives 4 and 5 are slightly more complex and have more operational requirements than Alternative 2. The implementability of off-base disposal for Zone I soils is straightforward. Although bioventing is fairly innovative, this process has been instituted at several sites and should be implementable at Site 9. Bioventing technology treatment levels are limited. These limitations would be evaluated by conducting a treatability study prior to implementation. If lower treatment levels are required for Alternatives 4 and 5, the treatment process could easily be continued until the required levels are attained (provided that the levels are not beyond the capability of this technology). Adequate monitoring and proper maintenance would be required for the operation of the in situ bioremediation/bioventing systems.

Alternatives 3 and 6 are similar in complexity to Alternatives 4 and 5 with respect to soil treatment but include biological land treatment and require more excavation and the construction of an on-site landfarming facility. Monthly monitoring would be required to evaluate the progress of the system. This remedial technology is proven and reliable for treatment of TPH-diesel-contaminated soil.

Alternatives 3 and 4 also include treatment processes for the groundwater, making operations more complex than those of Alternatives 2, 5, and 6. Alternatives 3 and 4 both include treatment for organics in the groundwater. The systems can be sized to handle larger volumes of water, if necessary. Carbon adsorption is more established than UV/chemical oxidation, and UV/chemical oxidation requires greater maintenance. However, both technologies are readily obtainable as skid-mounted units. The effectiveness of these technologies would be evaluated by monitoring effluent streams and the groundwater. Additional hydrogeologic studies and treatability studies would help ensure the success of these alternatives.

2.8.7 Cost

With the exception of Alternative 1, Alternative 7 has the lowest capital, O&M, and present worth costs at $354,500. Alternative 5 has the second lowest cost, with a total cost of $680,000 for Option 1 and $523,000 for Option 2. Alternative 4 has the third lowest cost, with a total cost of $1.3 million for Option 1 and $1.1 million for Option 2. Alternative 5 does not include groundwater treatment, thus resulting in lower O&M and groundwater present worth costs than Alternative 4. Alternative 6 costs $1.8 million for Option 1 and $816,000 for Option 2. The total cost for Alternative 3, Option 1, is $2.4 million, and Option 2 costs $1.4 million. Again, the slightly higher cost for Alternative 3 is attributed to the treatment of PCE and TCE in groundwater. Alternative 2 has the highest capital and overall costs, due to off-base landfilling, with a total cost of $4.1 million for Option 1 and $1.5 million for Option 2.

2.8.8 State Acceptance

The State of California has reviewed the OU1 FS and proposed plan and concurs with the preferred and selected option (Alternative 7) for Site 9.

2.8.9 Community Acceptance

No comments were received from the public during the public comment period for the OU1 proposed plan. In addition, a public meeting was held on 4 January 1995 for the purpose of presenting the preferred alternative to the public and no one outside the project team attended the meeting. Therefore, it is assumed that base residents and members of the surrounding communities have no objection to the preferred alternative (Alternative 7) specified in the proposed plan.

2.9 The Selected Remedy

The selected remedy for Sites 4, 4A, and 24 is No Action.

The selected remedy for Operable Unit 1 - Site 9, Stuart Mesa Waste Stabilization Pond is Alternative 7: Soil - No Action; Groundwater - Institutional Controls. The specific components of this alternative are presented in Section 2.7.8 and are further described in this section.

2.9.1 Major Components of the Selected Remedy

2.9.1.1 Site 9 Soil

No action is the selected remedy for soil at Site 9. Soils will be left at the site as they presently exist. There will be no containment, excavation, removal, treatment, or institutional controls.

2.9.1.2 Site 9 Groundwater

The groundwater component of the selected remedy involves risk management through an amendment to the base masterplan restricting future access to the

groundwater in the immediate vicinity of the site and monitoring of contaminant concentrations and migration. Monitoring will consist of semiannual groundwater sampling and analysis of 12 wells for 10 years, with compliance monitoring consisting of eight sampling events to be conducted during the seventh year, as required by 23 CCR 2250.10(g)(2). An alternative evaluation will be performed once every 5 years to assess the effectiveness and document the progress of the alternative, as required by CERCLA Section 121. Groundwater samples will be analyzed for TPH by modified EPA Method 8015 and for volatile organics by EPA Method 8240, using EPA Contract Laboratory Program (CLP) protocol. Results of the semiannual groundwater monitoring will be provided to the appropriate regulatory agencies by the Navy.

2.9.2 Estimated Cost of the Selected Remedy

Estimated capital costs are limited to $2,200, representing a dedicated groundwater sampling pump and miscellaneous support equipment. Net annual operating and maintenance (O&M) costs are $32,970 per year, including analytical costs, maintenance, labor, and disposal of purged water. The seventh year compliance monitoring costs are estimated at $131,680 which also includes analytical costs, labor, and disposal. The 5 year alternative reevaluation costs are estimated at $5,200. Assuming an annual inflation rate of 5 percent, and applying a discount rate of 10 percent, a cumulative total cost of $338,595 is estimated after 10 years of monitoring. A detailed cost analysis is provided in Table 2-25.

There are no costs associated with the No Action remedy for Sites 4, 4A, and 24.

2.9.3 Basis for Remedy Selection

The basis for the No Action remedy selection at Sites 4, 4A, and 24 is that these sites are currently in a protective state and pose no threat to human health or the environment.

The basis for remedy selection for soil and groundwater at OU1 - Site 9 is described in the following sections.

2.9.3.1 Site 9 Soil

The human health risk associated with the beryllium in the soil, utilizing the future residential land use scenario, is an ILCR of $2x10^{-5}$, which is within the acceptable range determined by the EPA of $1x10^{-6}$ to $1x10^{-4}$. The future residential land use scenario represents the most conservative approach when conducting a health risk assessment.

The probability that Site 9 will ever be used for anything other than training is extremely low. In addition, beryllium was detected in only one boring in the Site 9 impoundment at levels that exceeded the area background concentrations of beryllium. The single sample found to contain 1.9 ppm of beryllium was from a depth of 1 foot below the surface at one specific location. In the unlikely event that the impoundment is utilized for residential purposes at some time in the future, considerable grading and import of clean fill would be required. Thus, site preparation would in all probability result in a lesser likelihood for dermal contact or ingestion of soil containing elevated levels of beryllium because such beryllium containing soil would be at depths estimated to be between 5 and 6 feet after site grading.

The primary concern for the TPH-diesel concentrations in soil at Site 9 is that these hydrocarbons as well as beryllium present in the soil, could leach to the groundwater and degrade the quality of the groundwater. In order to assess the potential for such leaching, soil samples were collected from the locations and depths containing maximum concentrations of beryllium and TPH-diesel and submitted to the laboratory for analysis using the *synthetic precipitation leaching procedure* (SPLP; U.S. EPA Method 1312) for volatile organics, and the waste extraction test (WET) for beryllium, cadmium, and lead. Chromium and lead were present in the soil in concentrations below risk-based levels, but greater than 10 times the STLC. The test results showed that these compounds were not detected in the extract solution. Based on the results of these leachability test, TPH-diesel, beryllium, cadmium, and lead are not expected to leach to, or degrade, the groundwater.

2.9.3.2 Site 9 Groundwater

As previously mentioned, concentrations of PCE and TCE do not pose a significant risk to human health using either the maximum or average concentration of those chemicals, and utilizing the current military use scenario in the risk calculations. Although these compounds do not pose a significant health risk, both have been detected in individual samples at concentrations which exceed the State and Federal maximum contaminant levels (MCLs). As shown in the FS Report, there are several treatment alternatives which can effectively remove these constituents from groundwater. The difficulty does not lie in the ability to successfully treat the groundwater, but in the ability to pump sufficient quantities of groundwater from the aquifer. It was determined during the remedial investigation that much of Site 9 is underlain by highly impermeable marine terrace deposits. Wells installed in these deposits could not be tested using conventional pumping techniques because these wells yielded extremely small quantities of groundwater. Based on the results of the RI, it is not likely that wells completed in these deposits would be considered suitable as a source of municipal or domestic water supply. Wells completed in the marine terrace deposits do not produce sufficient water to support any form of residential structure. In addition, implementability of any groundwater treatment alternatives which involve groundwater extraction will necessarily be hampered by the low permeability of the marine terrace deposits, and consequently the low yield of wells completed in those deposits.

Computer modeling suggests that the low concentrations of contaminants in Site 9 groundwater will not reach the ocean. The computer model used was not extensively calibrated to the hydrogeologic conditions at Site 9. For these reasons, results of computer modeling performed for this site should not be considered definitive, but a best estimate based upon available information. However, the computer modeling results suggest that an impact on marine receptors is highly unlikely. There are no users of groundwater downgradient between Site 9 and the ocean, and the groundwater flow path is through the nonbeneficial zone which is located approximately one-quarter mile west of Site 9 (parallel to Interstate 5). Although levels of PCE and TCE above MCLs were detected in groundwater beneath the Waste Stabilization Pond, the groundwater fate and transport model indicates that concentrations of contaminants will be

reduced to below maximum contaminant levels by dispersion and natural attenuation within 7 years. As indicated in the preamble to the National Oil and Hazardous Pollution Contingency Plan, the use of natural attenuation as a remediation technique is consistent with EPA's groundwater protection policy when active restoration is not practical or warranted due to site conditions, and groundwater is unlikely to be used in the foreseeable future. Alternative 7 specifies that groundwater will be sampled and analyzed semiannually for 10 years to ensure that dispersion and natural attenuation is occurring, and that contaminant levels are not increasing as a result of some unknown source. During the long-term monitoring period, and until contaminants in the groundwater at the site are at or below maximum contamination levels (MCLs), the base masterplan will be amended to restrict future access to the groundwater for any purpose in the immediate vicinity of Site 9. As required by current regulations, a compliance monitoring program consisting of eight rounds of groundwater sampling will be conducted after 7 years to assess the effectiveness of the dispersion and natural attenuation of the low concentrations of PCE and TCE in the groundwater. Compliance with applicable or relevant and appropriate requirements (ARARs) will be achieved over time through natural groundwater attenuation. Compliance with water quality objectives and the need for further action will be reevaluated periodically during the groundwater monitoring period.

2.10 Statutory Determinations

This section discusses how the selected remedy for Site 9 meets statutory requirements of CERCLA Section 121. Under Section 121 of CERCLA the selected remedy at a Superfund site must undertake remedial actions that achieve adequate protection of human health and the environment. In addition, section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy must also be cost effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

2.10.1 Protection of Human Health and the Environment

The human health risk is within the NCP criteria of $1x10^{-4}$ to $1x10^{-6}$ range and the hazard index is less than 1.0. The results of the ecological risk assessment indicate no significant risk to the environment. The selected remedy was chosen because of the exceedance of MCLs for PCE and TCE in 2 wells. The selected remedy will control the potential risk posed by the site by limiting access, restricting the land use and monitoring of the groundwater during natural attenuation.

2.10.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all Federal and any more stringent State ARARs. No waivers are required. The ARARs for Site 9 are presented in Appendix B. The tables specify chemical-, location-, and action-specific designations as well as State or Federal ARAR status. Changes to ARARs determinations from the Draft Final Feasibility Study for Site 9 (SWDIV, 1994) are discussed in Appendix B.

2.10.3 Cost-Effectiveness

The selected remedy was evaluated for cost effectiveness against the other 6 alternatives. The only alternative less expensive is the no action alternative that would not comply with ARARs. Even though the selected remedy is not an active treatment, it must be monitored to comply with ARARs. The selected remedy is the least expensive that will comply with ARARs and be protective of human health and the environment.

2.10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for Site 9. An active treatment is not required because the risk is within the NCP acceptable range of 10^{-4} to 10^{-6}, the HI is less than 1.0, and there is no significant

risk to the environment. The practicality of implementing an active treatment for groundwater would entail pumping sufficient quantities of groundwater. It was determined during the RI that Site 9 is underlain by highly impermeable marine terrace deposits. As indicated in the preamble to the NCP (EPA, 1990, p. 8734), the use of natural attenuation as a remediation technique is consistent with EPA's groundwater protection policy when active restoration is not practical or warranted due to site conditions and groundwater is unlikely to be used in the foreseeable future.

2.10.5 Preference for Treatment as a Principal Element

The requirement that treatment be a principal element of the remedy is not satisfied for the selected remedy for Site 9. Active remediation is not required as a result of the risk assessment. The selected remedy was chosen because of the exceedance of MCLs by groundwater contaminants PCE and TCE. The treatment alternatives involved pumping of sufficient quantities of groundwater which was determined to be impractical based on the impermeable marine terrace deposits underlying the site. Natural attenuation is consistent with EPA's groundwater protection policy when active restoration is not practical and groundwater is not used in the foreseeable future.

TABLE 2-1
MCB CAMP PENDLETON RI/FS GROUPS

Group A (Sites with Limited Previous Investigation)
- Site 3 - Pest Control Wash Rack
- Sites 4 and 4A - MCAS Drainage Ditch and Concrete-Lined Surface Impoundment
- Site 5 - Firefighter Drill Field
- Site 6 - DPDO (DRMO) Scrap Yard and Building 2241
- Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
- Site 24 - 26 Area MWR Maintenance Facility

Group B (Landfills and Surface Impoundments)
- Site 7 - Box Canyon Landfill
- Sites 8 and 8A - Las Pulgas Landfill and Las Flores Creek
- Site 14 - San Onofre Landfill
- Site 19 - 31 Area ACU-5 (LCAC) Surface Impoundments
- Site 20 - 43 Area Las Pulgas Vehicle Wash Rack
- Site 22 - 23 Area Unlined Surface Impoundment

Group C (Remaining Sites in the Santa Margarita Basin [SMB])
- Site 1 - Refuse Burning Grounds in SMB (2 locations)
- Site 2 - Grease Disposal Pits in SMB (2 locations)
- Site 10 - 26 Area Sewage Sludge Composting Yard
- Site 16 - 22 Area Buildings 22151 and 22187 Ditch Confluence and Ditch
- Site 17 - 22 Area Building 22187 Marsh and Ditch
- Site 27 - 22 Area Ditches Behind Building 22210
- Site 28 - 26 Area Trash Hauler's Maintenance Area
- Site 29 - 25 Area Skeet Range
- Site 30 - Firing Range Soil Fill in 31 Area
- Site 31 - Building 210801 Transformer (no sampling)
- Site 35 - Former Sewage Treatment Plant Facility in 25 Area
- SMB Groundwater Study
- SMB Surface Water and Sediment Study
- Santa Margarita Coastal Wetland Study

Group D (Remaining Sites outside the SMB)
- Site 1 - Refuse Burning Grounds outside SMB (7 locations)
- Site 2 - Grease Disposal Pits outside SMB (4 locations)
- Site 18 - 13/16 Area Building 1687 Spill and Ditch
- Site 32 - Drum Storage Area and Drainage Between Buildings 41303 and 41366
- Site 33 - 52 Area Armory (Building 520452) and Drainage to Southeast
- Site 34 - Combat Engineers Maintenance Facility, Buildings 62580-62583
- Site 36 - Debris Pile Area Behind Ponds at Sewage Treatment Plant 11
- Site 37 - Pesticide- and POL-Handling Areas at San Clemente Ranch
- Site 38 - 52 Area Sewer Line, Building 52188
- Site 39 - 41 Area Sewer Line, Buildings 41300 and 41346
- Site 40 - 13 Area Sewer Line, Building 13103
- Site 41 - 13 Area Sewer Line, Building 13128
- Site 42 - 13 Area Sewer Line, Building 13129
- Groundwater Study outside SMB
- Surface Water and Sediment Study outside SMB
- Coastal Wetland Study outside SMB.

SMB - Santa Margarita Basin

TABLE 2-2
Range of Background Values (Validated Data)
Santa Margarita Basin Alluvium

Analyte	Range of Background Values (mg/kg)	
	Minimum	Maximum
Aluminum	2,950	38,200
Antimony	ND<2.3	9.2BN
Arsenic	ND<0.16	12
Barium	8.4B	424
Beryllium	ND<0.09	1.2
Cadmium	ND<0.22	2.3
Calcium	1,750	44,800
Chromium	3.0	64
Cobalt	ND<1.7	16
Copper	ND<1.5	41
Iron	3,070	45,900
Lead	ND<0.7	45
Magnesium	865B	12,400
Manganese	16	1,060
Mercury	ND<0.02	0.08
Molybdenum	ND<0.10	3.3[a]
Nickel	ND<1.7	42
Potassium	351B	8,320
Selenium	ND<0.08	0.53B
Silver	ND<0.27	0.63B
Sodium	ND<112	5,590
Thallium	ND<0.17	1.5B
Vanadium	5.3B	96
Zinc	ND<13	441

Background population is specific to lithology and geography. Background values are from all depths. Data base is presented in Appendix N. Borings in this data base were selected based on the absence of site contaminants. Values have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Duplicate analysis exceeds control limits.

Contract Laboratory Program (CLP) Qualifiers:
B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).
N - Spiked sample recovery not within control limits.

mg/kg - Milligrams per kilogram.
ND - Not detected.

TABLE 2-3
Range of Background Values (Validated Data)
Marine Terrace Deposits

Analyte	Range of Background Values (mg/kg)	
	Minimum	Maximum
Aluminum	3,120	33,000
Arsenic	ND<1.3	4.9
Barium	ND<2.2	665
Beryllium	ND<0.10	1.1B
Cadmium	ND<1.20	4.7
Calcium	ND<139	15,400
Chromium	ND<3.2	71
Cobalt	ND<1.4	41
Copper	ND<2.6	87
Iron	2,680	37,900
Lead	ND<1.0	27
Magnesium	ND<335	12,300
Manganese	32	1,550
Mercury	ND<0.12	0.11
Molybdenum	ND<2.0	2.2B
Nickel	ND<4.5	50
Potassium	ND<441	6,940
Silver	ND<1.6	3.6
Sodium	ND<554	1,720
Thallium	ND<1.3	3.0B
Vanadium	7.8B	81
Zinc	ND<6.0	114

Background population is specific to lithology and geography. Background values are from all depths. Data base is presented in Appendix N. Borings in this data base were selected based on the absence of site contaminants. Values have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

Contract Laboratory Program (CLP) Qualifiers:
B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).

mg/kg - Milligrams per kilogram.
ND - Not detected.

TABLE 2-4
Site 9 - Validated Organic Concentrations in Soil

Analyte	Range of Concentrations (µg/kg)		Risk-Based PRG (µg/kg)
	Minimum	Maximum	
Acetone	ND	110	27,000,000
2-Butanone	ND	16	13,500,000
4,4'-DDT	ND	34J	1,900
Diethylphthalate	ND	1,400J	216,000,000
Endosulfan sulfate	ND	30J	
Ethylbenzene	ND	190	27,000,000
bis(2-Ethylhexyl)phthalate	ND	240	46,000
Fluorene	ND	2,600J	10,800,000
Methylene chloride	ND	6	85,000
2-Methylnaphthalene	ND	22,000	
Naphthalene	ND	4,500	10,800,000
di-n-Octylphthalate	ND	210J	5,400,000
Phenanthrene	ND	5,700	
Toluene	ND	1,100	54,000,000
Total xylenes	ND	1,100	540,000,000
2,4,5-Trichlorophenol	ND	820	27,000,000
Diesel	ND	6,700,000	
Gasoline	ND	11,000	

Summary of validated soil analytical results from all depths for all organic compounds detected at Site 9. Validated analytical data are presented in Appendices X and Z. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

Contract Laboratory Program (CLP) Qualifiers:

J - Estimated valued. Mass spectral data indicate the presence of a compound below the stated practical quantitation limit (PQL).

ND - Not detected.

PRG - Preliminary remediation goal, as calculated for the human health risk assessment.

µg/kg - Micrograms per liter.

TABLE 2-5
Site 9 - Validated Metals Concentrations in Soil[a]
(Sheet 1 of 2)

Analyte	Range of Concentrations (mg/kg)		Range of Background Values (mg/kg)[b]		Risk-Based PRG (mg/kg)
	Minimum	Maximum	Minimum	Maximum	
Aluminum	3,230	30,400	3,120	33,000	
Arsenic	ND	4.3	ND<1.3	4.9	0.36
Barium	ND	349	ND<2.2	665	18,900
Beryllium	ND	1.9	ND<0.10	1.1B	0.15
Cadmium	ND	13	ND<1.2	4.7	270
Calcium	ND	5,770	ND<139	15,400	
Cation exchange capacity[c]	1.4	2.6	NA	NA	
Chromium	ND	53	ND<3.2	71	1,350
Cobalt	ND	27	ND<1.4	41	1,160
Copper	ND	205	ND<2.6	87	
Electrical conductivity[d]	0.14	0.21	NA	NA	
Iron	3,430	37,900	2,680	37,900	
Lead	ND	207	ND<1	27	
Magnesium	1,000B	8,320	ND<335	12,300	
Manganese	31	721	32	1,550	27,000
Mercury	ND	1.3	ND<0.12	0.11	81
Molybdenum	ND	15	ND<2.0	2.2B	1,350
Nickel	ND	46	ND<4.5	50	5,400
pH[e]	7.4	7.6	NA	NA	
Potassium	ND	3,740	ND<441	6,940	
Selenium	ND	3.1B	ND	ND	1,350
Silver	ND	3.4	ND<1.6	3.6	1,350
Sodium	ND	630B	ND<554	1,720	
Total organic carbon	7,440	22,800	NA	NA	
Total phosphorus	392	663	NA	NA	
Vanadium	8.4B	125	7.8B	81	2,430
Zinc	ND	598	ND<6	114	54,000

TABLE 2-5
Site 9 - Validated Metals Concentrations in Soil[a]
(Sheet 2 of 2)

Summary of validated soil analytical results from all depths for all metals detected at Sites 4 ands 4A. Data base for background values is presented in Appendix N. Validated analytical data are presented in Appendices X and Z. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Includes inorganics and general chemistry analytes.
[b]Range of background concentrations for the marine terrace deposits; validated analytical results.
[c]Cation exchange capacity units are milliequivalents per 100 grams (meq/Hg).
[d]Electrical conductivity units are millimhos (mmhos).
[e]pH in units.

Contract Laboratory Program (CLP) Qualifiers:
B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).

mg/kg - Milligrams per kilogram.
ND - Not detected.
PRG - Preliminary remediation goal, as calculated for the human health risk assessment.

TABLE 2-6
Site 9 - Comparison of Validated Groundwater Concentrations to MCLs
(Sheet 1 of 2)

Analyte	Range of Concentrations (µg/l)		Federal MCL (µg/l)	CA MCL (µg/l)
	Minimum	Maximum		
Alkalinity, bicarbonate	118	400		
Aluminum	ND	2,780		
Antimony	ND	19B	6.0[a]	
Arsenic	ND	14	50	50
Barium	ND	292	1,000	1,000
Beryllium	ND	0.2B	4.0[a]	
Boron	ND	296		
2-Butanone	ND	5.0		
Cadmium	ND	13	5.0	10
Calcium	37,400	227,000		
Chloride	115,000	731,000		
Chromium	ND	76	100	50
Cobalt	ND	10B		
Copper	ND	6.5B		
Dalapon	ND	0.5	200	
1,2-Dichloroethane	ND	2.0	5.0	0.50
1,2-Dichloroethene	ND	5.0	70	6.0
Iron	ND	3,410		
Magnesium	32,200	154,000		
Manganese	ND	779		
Mercury[b]	ND	66	2.0	2.0
Molybdenum	ND	11B		
Nickel	ND	1,100	100[a]	
Nitrate	ND	18,000	10,000 (as N)	45,000 (as NO_3)
pH[c]	5.40	7.8		
Potassium	ND	16,300		
Selenium	ND	2.6B	50	10
Silver	ND	6.1B		
Sodium	108,000	309,000		
Sulfate	76,000	372,000		
Tetrachloroethene	ND	10	5.0	5.0
Thallium	ND	1.1BW	2.0[a]	
Toluene	ND	0.9J	1,000	
Total dissolved solids	600,000	2,030,000		

TABLE 2-6
Site 9 - Comparison of Validated Groundwater Concentrations to MCLs
(Sheet 2 of 2)

Analyte	Range of Concentrations (µg/l)		Federal MCL (µg/l)	CA MCL (µg/l)
	Minimum	Maximum		
Trichloroethene	ND	15	5.0	5.0
Vanadium	ND	9.6B		
Zinc	ND	183		
Diesel	ND	470		

Summary of validated analytical results for compounds detected during third and fourth quarter 1992 and first quarter 1993 sampling. Validated analytical data are presented in Appendices W and Y. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Promulgated MCL, but not in effect until January 1994.
[b]Maximum concentration detected during third quarter 1992, within a few days of 15 µg/l concentration of mercury in a field blank. Suspect contamination in the sample bottle. Mercury was not detected during the subsequent sampling rounds.
[c]pH in units.

Contract Laboratory Program (CLP) Qualifiers:

B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).
J - Estimated value. Mass spectral data indicate the presence of a compound below the stated practical quantitation limit (PQL).
W - Postdigestion spike for graphite furnace atomic absorption analysis exceeds control limits, while sample absorption is less than 50 percent of spike absorption.

CA - California.
MCL - Maximum contaminant level.
ND - Not detected.
µg/l - Micrograms per liter.

TABLE 2-7
Site 9 - Comparison of Validated Surface-Water Concentrations to Standards

Analyte	Range of Concentrations (µg/l)		Aquatic Life Standards (µg/l)			
			California (SWRCB, 1992)		Federal (EPA, 1992c)	
	Minimum	Maximum	Acute	Chronic	Acute	Chronic
Aluminum	342	355	--	--	750	87
Arsenic	1.3B	1.4B	360	190	360	190
Barium	26BE	28BE	--	--	--	--
Calcium	9,090	9,680	--	--	--	--
Copper[a]	23B	25	8.4	6.0	8.4	6.0
Iron	638	758	--	--	--	1,000
Magnesium	5,300	5,460	--	--	--	--
Manganese	20	53	--	--	--	--
Nickel[a]	ND	8.1B	722	80	722	80
Potassium	3,780B	3,830B	--	--	--	--
Sodium	11,800	12,300	--	--	--	--
Vanadium	3.0B	3.0B	--	--	--	--
Zinc[a]	3.7B	9.2B	59.5	54	59.5	54

Summary of validated analytical results for compounds detected during third and fourth quarter 1992 and first quarter 1993 sampling. Validated analytical data are presented in Appendices W and Y. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Standards are hardness-dependent; standards developed using calculated hardness (as $CaCO_3$) value of 45 mg/l for Site 9 surface water.

Contract Laboratory Program (CLP) Qualifiers:
B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).
E - Reported value is estimated because of interference.

ND - Not detected.
µg/l - Micrograms per liter.
-- No standard.

TABLE 2-8
Sites 4 and 4A - Validated Organic Concentrations in Soil

Analyte	Range of Concentrations (µg/kg)		Risk-Based PRG (µg/kg)
	Minimum	Maximum	
Acetone	ND	7.0J	27,000,000
di-n-Butylphthalate	ND	430J	27,000,000
4,4'-DDD	ND	100	2,700
4,4'-DDE	ND	170	1,900
4,4'-DDT	ND	75JX	1,900
Dieldrin	ND	5.6J	40
bis(2-Ethylhexyl) phthalate	ND	720J	46,000
Hexachloroethane	ND	750J	45,700
Toluene	ND	33	54,000,000
Trichloroethene	ND	6.0	58,000
Diesel	ND	68,000	
Gasoline	ND	3,700	

Summary of validated soil analytical results from all depths for all organic compounds detected at Sites 4 and 4A. Validated analytical data are presented in Appendices X and Z. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

Contract Laboratory Program (CLP) Qualifiers:
J - Estimated valued. Mass spectral data indicate the presence of a compound below the stated practical quantitation limit (PQL).
JX - Value is less than the sample quantitation limit that would have been displayed for U.

ND - Not detected.
PRG - Preliminary remediation goal, as calculated for the human health risk assessment.
µg/kg - Micrograms per kilogram.

TABLE 2-9
Sites 4 and 4A - Validated Metals Concentrations in Soil[a]
(Sheet 1 of 2)

Analyte	Range of Concentrations (mg/kg)		Range of Background Values[b] (mg/kg)		Risk-Based PRG (mg/kg)
	Minimum	Maximum	Minimum	Maximum	
Aluminum	5,940	29,400	2,950	38,200	
Antimony	ND	4.1BN	ND<2.3	9.2BN	108
Arsenic	ND	4.4B	ND<0.16	12	0.36
Barium	68	268	8.4B	424	18,900
Beryllium	ND	0.82B	ND<0.09	1.2	0.15
Cadmium	ND	1.7	ND<0.22	2.3	270
Calcium	2,090	16,400	1,750	44,800	
Chromium	8.3	33	3.0	64	1,350
Cobalt	ND	12B	ND<1.7	16	1,080
Copper	ND	32	ND<1.5	41	
Cyanide	ND	1.3	ND	ND	5,400
Iron	8,760[c]	32,200	3,070	45,900	
Lead	ND	41	ND<0.7	45	
Magnesium	2,630	10,400	865B	1,060	
Manganese	119N	576	16	576	27,000
Mercury	ND	0.12	ND<0.02	0.08	81
Nickel	ND	16	ND<1.7	42	5,400
Potassium	2,520	9,030	351B	8,320	
Silver	ND	2.0B	ND<0.27	0.63B	1,350
Sodium	ND	1,160	ND<112	5,590	
Thallium	ND	1.7B	ND<0.17	1.5B	21.6
Total organic carbon	485	7,610	NA	NA	
Vanadium	25	84	5.3B	96	2,430
Zinc	24E	138	ND<13	441	54,000

TABLE 2-9
Sites 4 and 4A - Validated Metals Concentrations in Soil[a]
(Sheet 2 of 2)

Summary of validated soil analytical results from all depths for all metals detected at Sites 4 and 4A. Data base for background values is presented in Appendix N. Validated analytical data are presented in Appendices X and Z. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Includes inorganics and total organic carbon.
[b]Range of background concentrations for the Santa Margarita basin; validated analytical results.
[c]Duplicate analysis exceeds control limits.

Contract Laboratory Program (CLP) Qualifiers:
B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).
E - Reported value is estimated because of interference.
N - Spiked sample recovery not within control limits.

mg/kg - Milligrams per kilogram.
NA - Not analyzed.
ND - Not detected.
PRG - Preliminary remediation goal, as calculated for the human health risk assessment.

TABLE 2-10
Sites 4 and 4A - Comparison of Validated Groundwater Concentrations to MCLs[a]
(Sheet 1 of 2)

Analyte	Range of Concentrations (µg/l)		Federal MCL (µg/l)	CA MCL (µg/l)
	Minimum	Maximum		
Alkalinity, bicarbonate	186,000	728,000		
Aluminum	ND	230		
Antimony	ND	15B	6.0[b]	
Arsenic	ND	6.6B	50	50
Barium	ND	216	1,000	1,000
Boron	147	473		
Bromomethane	ND	2.0		
2-Butanone	ND	30		
Calcium	63,700	130,000		
Carbon disulfide	ND	2.0		
Chloride	120,000	348,000		
Chloromethane	ND	21		
Chromium	ND	30	100	50
Cobalt	ND	2.6B		
Copper	ND	10.2B		
Cyanide	ND	14	200	
1,1-Dichloroethane	ND	11		5.0
1,1-Dichloroethene	ND	5.0	7.0	6.0
1,2-Dichloroethene	ND	6.0	70	6.0
1,3-Dichlorobenzene	ND	2.0J	600	
bis(2-Ethylhexyl) phthalate	ND	6.0J	6.0[b]	4.0
Iron	ND	1,630		
Lead	ND	2.7B	50	50
Magnesium	12,200	54,000		
Manganese	ND	1,250		
Mercury	ND	12	2.0	2.0
Methylene chloride	ND	1.0	5.0[b]	
4-Methyl-2-pentanone	ND	1.0J		
Molybdenum	ND	96		
Nickel	ND	268	100[b]	
Nitrate	ND	14,000	10,000 (as N)	45,000 (as NO_3)

TABLE 2-10
Sites 4 and 4A - Comparison of Validated Groundwater Concentrations to MCLs[a]
(Sheet 2 of 2)

Analyte	Range of Concentrations (µg/l)		Federal MCL (µg/l)	CA MCL (µg/l)
	Minimum	Maximum		
pH[c]	5.30	9.0		
Potassium	ND	5,070		
Selenium	ND	8.0	50	10
Silver	ND	5.9B		
Sodium	99,500	488,000		
Sulfate	61,000	302,000		
Thallium	ND	0.6B	2.0[b]	
Toluene	ND	1.0J	1,000	
Total dissolved solids	525,000	1,790,000		
Trichloroethene	ND	27	5.0	5.0
Vanadium	ND	67		
Vinyl chloride	ND	1.0J	2.0	0.50
Zinc	ND	444		
Diesel	ND	150		

Summary of validated analytical results for compounds detected during third and fourth quarter 1992 and first quarter 1993 sampling. Validated analytical results are presented in Appendices W and Y. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Site 4 groundwater contamination is being investigated futher as part of Site 6 Phase 2 RI.
[b]Promulgated MCL, but not in effect until January 1994.
[c]pH in units.

Contract Laboratory Program (CLP) Qualifiers:
B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).
J - Estimated value. Mass spectral data indicate the presence of a compound below the stated practical quantitation limit (PQL).

CA - California.
MCL - Maximum contaminant level.
ND - Not detected.
µg/l - Micrograms per liter.

TABLE 2-11
Site 4 - Comparison of Validated Surface-Water Concentrations to Standards
(Sheet 1 of 2)

Analyte	Range of Concentrations (µg/l)		Aquatic Life Standards (µg/l)			
			California (SWRCB, 1992)		Federal (EPA, 1992c)	
	Minimum	Maximum	Acute	Chronic	Acute	Chronic
Acetone	ND	5.0				
Alkalinity, bicarbonate	ND	664,000				
Alkalinity, carbonate	ND	80,000				
Alkalinity, total	ND	664,000				
Aluminum	ND	34,600			750	87
Arsenic	ND	34	360	190	360	190
Barium	ND	394				
Boron	ND	645				
di-n-Butylphthalate	ND	2.1				
Calcium	ND	129,000				
Chloride	ND	493,000			860,000	230,000
Chloromethane	ND	30				
Chromium[a]	ND	34	6,329	754	6,329	754
Copper[a]	ND	40	78	46	78	46
Diethylphthalate	ND	2.5				
Iron	ND	46,700				1,000
Lead[a]	ND	20	609	24	609	24
Magnesium	ND	59,300				
Manganese	ND	3,720				
4-Methylphenol	ND	790				
Molybdenum	ND	155				
Nitrogen, NO_2+NO_3	ND	5,890				
pH[b]	NA	8.2				
Potassium	ND	12,900				
Sodium	ND	494,000				
Sulfate	ND	297,000				
TDS	ND	1,820,000				
Toluene	ND	9			17,500[b]	
Vanadium	ND	115				
Zinc[a]	ND	140	446	404	446	404
Gasoline	ND	130				

TABLE 2-11
Site 4 - Comparison of Validated Surface-Water Concentrations to Standards
(Sheet 2 of 2)

Summary of validated analytical results for compounds detected during third and fourth quarter 1992 and first quarter 1993 sampling. Validated analytical data are presented in Appendices W and Y. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Standards are hardness-dependent; standards were developed using a calculated hardness (as $CaCO_3$) value of 485 mg/kg for Site 4 surface water.
[b]pH in units, not µg/kg.

NA - Not analyzed.
ND - Not detected.
µg/l - Micrograms per liter.

TABLE 2-12
Field-Collected Filamentous Algae
Santa Margarita River Sites
Tissue Contaminant Concentrations
(Sheet 1 of 2)

Inorganics (mg/kg dry weight)	6BAS1 Downstream of Site 4 Drainage		6BAS2 Upstream of Site 4 Drainage	
Silver	0.37	B	0.36	U
Aluminum	398	*	170	*
Arsenic	0.72	B	0.74	B
Barium	125		32.6	B
Beryllium	0.1	U	0.1	U
Calcium	18,100	*	32,300	*
Cadmium	0.14	U	0.14	U
Cobalt	1	U	1	U
Chromium	0.56	U	0.56	U
Copper	2.1	B	1.1	B
Iron	676	*	225	*
Mercury	0.03	U	0.03	U
Potassium	1,340		1,220	
Magnesium	802	B	1,230	
Manganese	3,630		98.4	
Molybdenum	0.72	U	0.72	U
Sodium	388	B	392	B
Nickel	1.5	U	1.5	U
Lead	0.54	BWN	0.1	UWN
Antimony	2.5	U	2.5	U
Selenium	0.14	U	0.14	U
Thallium	0.14	U	0.14	U
Vanadium	4	B	2.1	B
Zinc	9.1	E	4.6	E

TABLE 2-12
Field-Collected Filamentous Algae
Santa Margarita River Sites
Tissue Contaminant Concentrations
(Sheet 2 of 2)

Contract Laboratory Program (CLP) Qualifiers:

B - Reported value is greater than or equal to instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).
E - Reported value is estimated because of interference.
N - Spiked sample recovery not within control limits.
U - Value is less than the IDL or was not detected.
W - Postdigestion spike for graphite furnace atomic absorption is out of control limits, while sample absorption is less than 50 percent of spike absorption.
* - Duplicate analysis not within control limits.

TABLE 2-13
Site 24 - Validated Organic Concentrations in Soil

Analyte	Range of Concentrations (µg/kg)		Risk-Based PRG (µg/kg)
	Minimum	Maximum	
Acetone	ND	37	27,000,000
Aroclor-1254	ND	480	
Benzene	ND	3.0J	22,000
Benzoic acid	ND	110J	1,080,000,000
BHC (gamma) (Lindane)	ND	3.0	490
2-Butanone	ND	5.0J	13,500,000
Butylbenzylphthalate	ND	300J	54,000,000
di-n-Butylphthalate	ND	85J	27,000,000
Chlordane (alpha)	ND	7.5JX	490
Chlordane (gamma)	ND	4.3JX	490
Chloroform	ND	7.0J	105,000
Chloromethane	ND	4.0J	49,200
Chrysene	ND	77J	
4,4'-DDD	ND	200	2,700
4,4'-DDE	ND	72	1,900
4,4'-DDT	ND	140	1,900
Dieldrin	ND	2.2	40
Diethylphthalate	ND	59J	216,000,000
bis(2-Ethylhexyl) phthalate	ND	1,600J	46,000
Fluoranthene	ND	550J	10,800,000
Methylene Chloride	ND	538	85,000
n-Nitrosodiphenylamine	ND	97J	130,000
Nitrobenzene	ND	180J	135,000
Pyrene	ND	470J	8,100,000
Toluene	ND	350D	54,000,000
Diesel	ND	180,000	
Gasoline	ND	2,400	

Summary of validated soil analytical results from all depths for all organic compounds detected at Site 24. Validated analytical data are presented in Appendices X and Z. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

Contract Laboratory Program (CLP) Qualifiers:
J - Estimated valued. Mass spectral data indicate the presence of a compound below the stated practical quantitation limit (PQL).
JX - Value is less than the sample quantitation limit that would have been displayed for U.
D - Identifies compound in an analysis that has been run at a dilution to bring the concentration of that compound within the linear range of the instrument. D qualifiers are only placed on samples that have been run initially with results above acceptable ranges.

ND - Not detected.
PRG - Preliminary remediation goal, as calculated for the human health risk assessment.
µg/kg - Micrograms per kilogram.

TABLE 2-14
Site 24 - Validated Metals Concentrations in Soil[a]
(Sheet 1 of 2)

Analyte	Range of Concentrations (mg/kg)		Range of Background Values (mg/kg)[b]		Risk-Based PRG (mg/kg)
	Minimum	Maximum	Minimum	Maximum	
Aluminum	ND	19,500	2,950	38,200	
Antimony	ND	16N	ND<2.3	9.2BN	108
Arsenic	ND	3.0	ND<0.16	12	0.36
Barium	ND	105	8.4B	424	18,900
Beryllium	ND	0.69B	ND<0.09	1.2	0.15
Cadmium	ND	4.0	ND<0.22	2.3	270
Calcium	ND	8,210	1,750	44,800	
Chromium	ND	50	3.0	64	1,350
Cobalt	ND	10B	ND<1.7	16	1,080
Copper	1.8B	216	ND<1.5	41	
Iron	0.03B	26,900	3,070	45,900	
Lead	ND	295N[c]	ND<0.70	45	
Magnesium	0.01B	8,380	865B	12,400	
Manganese	ND	251	16	1,060	27,000
Mercury	ND	0.31	ND<0.02	0.08	81
Molybdenum	ND	0.82[c]	ND<0.1	3.3[c]	1,350
Nickel	ND	19	ND<1.7	42	5,400
Potassium	ND	6,500	351B	8,320	
Silver	ND	0.53B	ND<0.27	0.63B	1,350

TABLE 2-14
Site 24 - Validated Metals Concentrations in Soil[a]
(Sheet 2 of 2)

Analyte	Range of Concentrations (mg/kg)		Range of Background Values (mg/kg)[b]		Risk-Based PRG (mg/kg)
	Minimum	Maximum	Minimum	Maximum	
Sodium	ND	1,700E	ND<112	5,590	
Thallium	ND	0.49B	ND<0.17	1.5B	21.6
Total organic carbon	8,410	8,410	NA	NA	
Vanadium	ND	46	5.3B	96	2,430
Zinc	ND	254	ND<12.6	441	54,000

Summary of validated soil analytical results from all depths for all metals detected at Site 24. Data base for background values is presented in Appendix N. Validated analytical data are presented in Appendices X and Z. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Includes inorganics and total organic carbon.
[b]Range of background concentrations for the Santa Margarita basin; validated analytical results.
[c]Duplicate analysis not within control limits.

Contract Laboratory Program (CLP) Qualifiers:
B - Reported value greater than or equal to the instrument detection limit (IDL) but less than the contract-required detection limit (CRDL).
E - Reported value is estimated because of interference.
N - Spiked sample recovery not within control limits.

mg/kg - Milligrams per kilogram.
NA - Not analyzed.
ND - Not detected.
PRG - Preliminary remediation goal, as calculated for the human health risk assessment.

TABLE 2-15
Site 24 - Comparison of Validated Groundwater Concentrations to MCLs

Analyte	Range of Concentrations (µg/l)		EPA MCL (µg/l)	CA MCL (µg/l)
	Minimum	Maximum		
Alkalinity, bicarbonate	ND	475,000		
Alkalinity, total	ND	475,000		
Aluminum	ND	14,800		
Antimony	ND	49	6.0[a]	
Arsenic	ND	9.5	50	50
Barium	ND	9.5	1,000	1,000
bis(2-Ethylhexyl)phthalate	ND	1.4	6.0[a]	4.0
Boron	ND	881		
Calcium	39,000	596,000		
Chloride	ND	2,243,000		
Chloromethane	ND	17	100	
Chromium[b]	ND	137	100	50
Copper	ND	13		
di-n-Butylphthalate	ND	3.0		
Iron	ND	13,000		
Lead	ND	3.5	50	50
Magnesium	4,290	120,000		
Manganese	28	501		
Molybdenum	ND	39		
Nickel	ND	633	100[a]	
Nitrogen, NO_2+NO_3	ND	3,930	10,000 (as N)	45,000 (as NO_3)
Potassium	ND	17,300		
Total dissolved solids	646,000	4,740,000		
Selenium	ND	21	50	10
Sodium	156,000	667,000		
Sulfate	80,000	437,000		
Vanadium	ND	60		
Zinc	ND	696		
Diesel	ND	720		

Summary of validated analytical results for compounds detected during third and fourth quarter 1992 and first quarter 1993 sampling. Validated analytical results are presented in Appendices W and Y. Concentrations have been rounded off to whole numbers for values exceeding 10, to one decimal place for values less than 10, and to two decimal places for values less than 1.0.

[a]Promulgated MCL, but not in effect until January 1994.
[b]Only detected above the MCL in one well during the first quarter of sampling. Two subsequent quarters of sampling at this well showed concentrations considerably below the Federal or State MCL (approximately 10 times lower).

MCL - Maximum contaminant level.
ND - Not detected.
µg/l - Micrograms per liter.

TABLE 2-16
Pertinent Chemical and Physical Parameters of Chemicals Detected at Group A Sites
(Sheet 1 of 6)

Chemical	CAS No.	Mol Wt	Henry's Law Constant (atm-m^3/ mol)	Log K_{ow}	K_{oc} (ml/g)[a]	K_d	Solub (mg/l)	SW Half- Life Low (days)[b]	SW Half-Life High (days)[b]	Soil Half-Life Low (days)[b]	Soil Half-Life High (days)[b]
Acenaphthene	83-32-9	154	9.20E-05[a]	4[a]	4,600	3,082	390[f]	0.13	12.5	12.3	102
Acenaphthylene	208-96-8	152.2	11.4-146.9i (Pa m^3/mol)	3.72-4.08[h]	2,511-6,760[h]	28.4-729[f]	3.88-16.1[h]	42.5	60	42.5	60
Acetone	67-64-1	58.09	3.67E-05[c]	0.24[c]	2.2	1.474	1,000,000 (miscible)[c]	1	7	1	7
Aldrin	309-00-2	364.93	1.60E-05[a]	6.5[a]	407-229,087[a]	1,460-37,300[f]	0.02[a]	21	591.66	21	591.66
Aluminum	7429-90-5	26.98					insoluble[k]				
Anthracene	120-12-7	178	1.02E-03[a]	4.45[a]	14,000	9,380	0.03-0.399[j]	0.02	0.07	50	460
Atrazine	1912-24-9	215.72		2.68[j]	149[m]					3.21[j]	
Azinphos-methyl	86-50-0	317.34	1.50E-10[a]	2.75[a]	404[a]		20.9[a]	2.7[a]	3.3[a]	12[a]	28[a]
Aroclor-1254	11097-69-1	327	2.80-3.20E-04[j]	6.47[j]	1.0E+0_-1.0E+09[a]		0.0027-0.91[j]	0.42[h]		15[h]	>50[h]
Aroclor-1260	11096-82-5	378	2.80-3.20E-04[j]	5.3-9.3[j]	6,700,000	4,489,000	0.0027-0.08[h]	0.42[h]	52[h]		
Arsenic	7440-38-2	74.92				200[f]	676[f]				
Barium	7440-39-3	137.34				60[f]	871[f]				
Benzene	71-43-2	78.11	5.43E-03[c]	2.13[c]	83	55.61	1791[c]	5	16	5	16
Benzo(a)anthracene	56-55-3	228	1.16E-06[a]	5.6[a]	1,380,000	924,600	0.0142[n]	0.04	0.13	102	680
Benzo(a)pyrene	50-32-8	252	1.55E-06[a]	4.05-8.5[h]	5,500,000	152,000-3,900,000[f]	0.000172-0.0078[h]	0.015	0.046	57	530
Benzo(b)fluoranthene	205-99-2	252	1.19E-05[a]	5.78-6.57[h]	550,000		0.0015-0.014[h]	0.36	30	360	610
Benzo(g,h,i)perylene	191-24-2	276	5.34E-08[a]	6.51[a]	1,600,000	1,072,000	0.00022-0.00083[h]	590	650	590	650

TABLE 2-16
Pertinent Chemical and Physical Parameters of Chemicals Detected at Group A Sites
(Sheet 2 of 6)

Chemical	CAS No.	Mol Wt	Henry's Law Constant (atm-m^3/ mol)	Log K_{ow}	K_{oc} (ml/g)[a]	K_d	Solub (mg/l)	SW Half- Life Low (days)[b]	SW Half-Life High (days)[b]	Soil Half-Life Low (days)[b]	Soil Half-Life High (days)[b]
Benzo(k)fluoranthene	207-08-9	252	3.94E-05[a]	6.06-7.20[h]	550,000	1,530-39,300[f]	0.0007-0.00081[h]	0.16	20.79	910	2,140
Benzoic acid	65-85-0	122.13	7.00E-08[d]	1.87[d]	54.4	36.448	2,700[d]	0.20[d]	3.6[d]		7[d]
Beryllium	7440-41-7	9.01				650[f]	426[f]				
Boron	7440-42-8	10.81				3[f]	19,300[f]				
Bromomethane	74-83-9	94.95	6.24E-03[d]	1.19[d]	169[d]	3.18-81.6[f]	17,500[d]	20[d]	26.7[d]	7	28
2-Butanone	78-93-3	72.1	1.05E-05[c]	0.29[c]	4.5	3.015	239,000[c]	1	7	1	7
Butylbenzylphthalate	85-68-7	312.39	1.03E-06[d]	4.91[d]	17,000	11390	2.69[d]	1	7	1	7
di-n-Butylphthalate	84-74-2	278.38	5.30E-05[g]	4.72[d]	3,280	113,900	11.2[d]	1	14	2	23
Cadmium	7440-43-9	112.40				6.5[f]	469[f]				
Carbon disulfide	75-15-0	76.13	1.40E-03[c]	1.7[c]	54	36.18	2,100[c]	0.108[c]			
alpha-Chlordane	5103-71-9	409.8	4.85E-05[j]	5.54[j]	3,090-43,651[j]		0.056[j]	<10[j]		2-3[j]	154[j]
beta-Chlordane	5103-74-2	409.8	8.31E-05[j]	5.54[j]	1,995,262[j]		0.056[j]	<10[j]		2-3[j]	210[j]
Chloroform	67-66-3	119.39	4.35E-03[c]	1.97[c]	31	20.77	7,950[c]	28	180	28	180
bis(2-Chloroisopropyl)ether	108-60-1	171.08						18	180	18	180
Chloromethane	74-87-3	50.49	2.40E-02[d]	0.91[d]	4.3	2.881	3,960,000	7	28	7	28
Chromium (Total)	7440-47-3	52				850[f]	21.7[f]				
Chrysene	218-01-9	228.3	0.1064-218[h] (Pa m^3/mol)	5.61[a]	200,000	134,000	0.002[a]	0.18	0.54	371	1,000
Cobalt	7440-48-4	58.93				45[f]	0.368[f]				
Copper	7440-50-8	63.54				35[f]	96.4[f]				
Coumaphos	56-72-4	362.78									

TABLE 2-16
Pertinent Chemical and Physical Parameters of Chemicals Detected at Group A Sites
(Sheet 3 of 6)

Chemical	CAS No.	Mol Wt	Henry's Law Constant (atm-m^3/ mol)	Log K_{ow}	K_{oc} (ml/g)[a]	K_d	Solub (mg/l)	SW Half- Life Low (days)[b]	SW Half-Life High (days)[b]	Soil Half-Life Low (days)[b]	Soil Half-Life High (days)[b]
Cyanide	57-12-5	26.02					99.1[f]				
Dalapon	75-99-0	142.97	6.43E-08[e]	0.78[f]			502,000[e]	14	60	14	60
Diazinon	333-41-5	304.38	1.13E-07[e]	3.81[e]	132-570[e]		68.8[e]	31[e]	85[e]	6[e]	87[e]
Dibenz(a,h,)anthracene	53-70-3	278	7.33E-08[a]		3,300,000	60,900-1,560,000[f]	2,490,000[f]	0.25	32.58	361	940
Dicamba	1918-00-9	221.04	9.00E-07[e]	2.21[e]	470[m]	0	5,600[e]				
1,2-Dichlorobenzene	95-50-1	147	1.20E-03[d]	3.38[d]	170,000	113,900	156[d]	28	180	28	180
3,3-Dichorobenzidine	91-94-1	253.14	4.50E-08[d]	3.51[d]	190,000[f]	5,700-146,000[f]	3.1d	0.001[d]	0.003	28	180
1,2-Dichloroethene (Total)	156-59-2(cis) 156-60-5(trans)	96.95	6.56E-03[a]	1.86[c] (cis), 2.06[c] (trans)	59	39.53	6,300[c]	0.125 (cis/trans)[c]			
4,4'-DDD	72-54-8	320	7.96E-06[a]	6.2[a]	770,000	515,900	0.09[f]	730	5,694	730	5,694
4,4'-DDE	72-55-9	318	6.80E-05[a]	7[a]	4,400,000	2,948,000	0.12[f]	0.63	6.1	730	5,694
4,4'-DDT	50-29-3	355	5.13E-04[a]	6.19[a]	243,000	162,810	0.025[f]	7	350	730	5,694
2,4-Dinitrotoluene	121-14-2	182	5.09E-06[a]	1.98[d]	45	2.7-69.3[f]	300[d]	0.11[d]	1.7[d]	28	180
Diuron	330-54-1	233.11	2.70E-06[e]	2.77[e]	382.6[e]		37.3ppm[e]			330[e]	780[f]
Delta-BHC	319-86-8	291	2.07E-07[a]	4.1[a]	6,600	4,422	31.4[a]	13.8	100	13.8	100
Dibenzofuran	132-64-9	168.19	9.73E-05[o]	3.91-4.33[i]	5,475	0	1.0-10.3[h]	7	28	7	28
Dibromomethane(Methylene Br)	74-95-3	187.88						7	28	7	28
Dichloropropene	542-75-6	110.97	1.20E-03-8.0E-04[p]	1.6[p]	26[f]	0.78-20[f]	2,800[f]	5.54	11.29	5.54	11.29
Dieldrin	60-57-1	380.93	5.80E-05[e]	4.32[e]	1700	1,139	0.17[e]	175	1,080	175	1,080
Diesel #2											

TABLE 2-16
Pertinent Chemical and Physical Parameters of Chemicals Detected at Group A Sites
(Sheet 4 of 6)

Chemical	CAS No.	Mol Wt	Henry's Law Constant (atm-m^3/ mol)	Log K_{ow}	K_{oc} (ml/g)[a]	K_d	Solub (mg/l)	SW Half- Life Low (days)[b]	SW Half-Life High (days)[b]	Soil Half-Life Low (days)[b]	Soil Half-Life High (days)[b]
Diethylphthalate	84-66-2	222.26	4.80E-07[d]	2.47[d]	142	95.14	1,080[d]	3	56	3	56
Dimethylphthalate	131-11-3	194.20	1.10E-07[d]	1.56[d]	160[d]		4,000[d]	0.2[d]	11[d]	1	7
Endosulfan	115-29-7	406.95	1.12E-05[e]	3.55-3.62[q]	3,162[q]	0.15-0.16[q]	0.51[q]	0.19	9.08	0.19	9.08
Endosulfan I	959-98-8	406.91	1.0E-05[p]	3.83-3.55[q]		0.26-0.53q	0.45[q]				
Endosulfan II	33213-65-9	406.9	1.91E-05[p]	3.52[q]		0	0.10-0.33[q]	0.19	9.1	0.19	9.1
Endosulfan sulfate	1031-07-8	422.91	2.60E-05[p]	3.66[q]			0.117-0.22[q]				
Endrin	72-20-8	380.9	7.52E-06[e]	4.56[e]	34,000[e]	0	0.25[e]	9.6[e]	14 YEARS[e]	7[e]	14 YEARS[e]
Endrin ketone						0					
Ethylbenzene	100-41-4	106.16	8.44E-03[d]	3.15[d]	1,100	737	161[d]	3	10	3	10
bis(2-Ethylhexyl)phthalate	117-81-7	390.54	1.10E-05[d]	5.11[d]	1.2	58,558	0.3[d]	5	23	5	23
Fensulfothion	115-90-2	308.37	1.38E-10[e]	2.23[e]	67-130[e]		2,000[e]	58[e]	87[e]	<7[e]	168[e]
Fluometuron	2164-17-2	232.23		1.34[l]	175[m]						
Fluoranthene	206-44-0	202	6.46E-06[a]	4.9[a]	38,000	25,460	0.21[a]	0.88	2.6	140	440
Fluorene	86-73-7	166.23	6.42E-05[a]	4.2[a]	7,300	4,891	1.69[a]	32	60	32	60
Heptachlor	76-44-8	374	8.19E-04[a]	5.27[e]	12,000	8,040	0.18[e]	0.96	5.4	0.96	5.4
Heptachlor epoxide	1024-57-3	389.4	3.20E-05[e]	5.4[e]	220	147.4	0.2[e]	33	552	33	552
Heptachloroethane											
Ideno(1,2,3-c,d)pyrene	193-39-5	276.34						125	250	600	730
Iron	7439-89-6	55.85				25[f]	4.64[f]				
Lead	7439-92-1	207.19				900[f]	93.6[f]				
Manganese	7439-96-5	54.94				65[f]	18,300[f]				
Mercury	7439-97-6	200.59				10[f]	5.60E-02[r]				

TABLE 2-16
Pertinent Chemical and Physical Parameters of Chemicals Detected at Group A Sites
(Sheet 5 of 6)

Chemical	CAS No.	Mol Wt	Henry's Law Constant (atm-m^3/ mol)	Log K_{ow}	K_{oc} (ml/g)[a]	K_d	Solub (mg/l)	SW Half- Life Low (days)[b]	SW Half-Life High (days)[b]	Soil Half-Life Low (days)[b]	Soil Half-Life High (days)[b]
Methoxychlor	72-43-5	345.65	1.58E-05[e]	4.68[l]	9,700-100,000[e]		0.045[e]	0.09	0.225	180	365
Methylene chloride	75-09-2	84.94	4.40E-02[a]	1.25[c]	8.8	5.896	1,300[c]	0.09	0.23	365	180
2-Methylnaphthalene	91-57-6	142.21	2.60E-04[g]	4.11	7,940	5319.8	25.4	2.25[h]	410[h]		
2-Methyl-2-pentanone		100.16									
2-Methylphenol	95-48-7	108.15	1.60E-06[d]	1.95[d]	14.8	9.916	30,800[d]	1	7	1	7
4-Methylphenol	106-44-5	108.13	9.60E-07[d]	1.94[d]	17	11.39	22,600[d]	0.04	0.67	0.04	0.67
Molybdenum	7439-98-7	95.94									
Monuron	150-68-5	198.67			100[m]						
n-Nitroaniline											
n-Nitrophenol											
n-Nitrosodiphenylamine	86-30-6	198.24	6.60E-04[a]	2.57-3.13[a]	832-1,820[a]	0	40[a]	10	34	10	34
Naphthalene	91-20-3	128.16	4.83E-04[d]	3.3[d]	940	629.8	31.7[d]	0.5	20	16.6	48
Neburon	555-37-3	275-20			2,300[m]						
Nickel	7440-02-0	58.71				150[f]	1,210[f]				
Nitrobenzene	98-95-3	123.12	2.44E-05[d]	1.79[l]	56.2-270[d]	6.87-176[f]	1,900[d]	13.41	197	13.41	197
Pensulfothion											
Pentachlorophenol	87-86-5	266.32	2.75E-06[e]	5.12[e]	53,000	35,510	14[e]	0.04	4.6	23	178
Phenanthrene	85-01-8	178	1.59E-04[a]	4.46[a]	14,000	9,380	1[a]	0.13	1.04	16	200
Phenol	108-95-2	94.11	3.97E-07[d]	1.46[d]	14.2	9.514	87,000[d]	0.22	2.4	1	10
Prometon	1610-18-0	225.34			350[m]						
Propham	122-42-9	179.24									

TABLE 2-16
Pertinent Chemical and Physical Parameters of Chemicals Detected at Group A Sites
(Sheet 6 of 6)

Chemical	CAS No.	Mol Wt	Henry's Law Constant ($atm\text{-}m^3/mol$)	Log K_{ow}	K_{oc} (ml/g)[a]	K_d	Solub (mg/l)	SW Half- Life Low (days)[b]	SW Half-Life High (days)[b]	Soil Half-Life Low (days)[b]	Soil Half-Life High (days)[b]
Pyrene	129-00-0	202	5.04E-06[a]	4.88[a]	38,000	25,460	0.13[a]	0.03	0.09	210	1,900
Selenium	7782-49-2	78.96				300[f]	27,100[f]				
Silver	7440-22-4	107.87				45[f]	158[f]				
Simazine	122-34-9	201.69			135[m]					130[q]	
Stirophos											
Thallium	7440-28-0	204.37				1,500[f]	0.687[f]				
Toluene	108-88-3	92.13	5.94E-03[c]	2.73[c]	300	201	534.8[c]	4	22	4	22
Total xylenes	1330-20-7	106.17	7.04E-03[a]	3.26[a]	240	160.8	198[a]	7	28	7	28
1,1,1-Trichloroethane	71-55-6	133.42	8.00E-03[c]	2.49[c]	152	101.84	347[c]	140	273	140	273
Trichloroethene	79-01-6	131.4	1.03E-02[c]	2 42[c]	126	84.42	1,100[c]	180	365	180	365
2,4,5-TP	93-72-1	269.51	1.31E-08[e]	3.41[e]	5,250	3517.5	140[e]			12[e]	17[e]
Vanadium	7440-62-2	50.94				1,000[f]	4,480[f]				
Zinc	7440-66-6	65.37				40[l]	951[f]				
TPH-Diesel											
TPH-Gasoline											

"Half-life" is defined as the expected time for the concentration of a chemical to decrease by one-half when present in water or soil.
SW - Surface water.
mg/l - Milligrams per liter.

[a]EPA, 1987a.
[b]Howard et al., 1991.
[c]Howard et al., 1990.
[d]Howard, 1989.
[e]Howard, 1991.
[f]HRSD, 1991.
[g]HSDB, 1992.
[h]Mackay et al., 1992.
[i]Tinsley, 1979.
[j]ATSDR, 1993a.
[k]ATSDR, 1992a.
[l]Calculated using method from Lyman et al., 1991.
[m]Jeng et al., 1992.
[n]AQUIRE, 1992.
[o]Connell and Miller, 1984.
[p]ATSDR, 1991a.
[q]ATSDR, 1991b.
[r]ATSDR, 1993b.
[s]ATSDR, 1992b.
[t]BEIA, 1989.

Table 2-17
Site 9 Chemicals of Concern[a] in Groundwater and Soil, Concentrations, Frequency of Detection, Soil Background Data, and Maximum Contaminant Levels (MCLs)

Soil Chemical of Concern	Frequency of Detection	Concentration Range Min - Max (mg/kg)	Background Range Min - Max (mg/kg)	Background Frequency of Detection	Background 95% UCL (mg/kg)	Average Concentration (mg/l)	RME Concentration[b] (mg/l)
Beryllium (Be)	7/7	0.15 1.9	<0.1 - 1.1	40/71	0.69	0.42	1.9[c]

Groundwater Chemical of Concern	Frequency of Detection	Concentration[d] Range Min - Max (mg/l)	Maximum Contaminant Level (MCL)[e] (mg/l)	Average Concentration (mg/l)	RME Concentration[b] (mg/l)
Trichloroethene (TCE)	6/66	0.0007 - 0.015	0.005	0.0014	0.0022
Tetrachloroethene (PCE)	14/66	0.004 - 0.018	0.005	0.0013	0.0019

[a]Chemicals of concern were evaluated in the risk assessment and determined to pose a risk. Data presented is from the RI for Site 9.
[b]The reasonable maximum concentration is the calculated 95% UCL. One-half the detection limit was used for nondetected values.
[c]The maximum detected concentration was used because the 95% UCL exceeded it.
[d]The groundwater concentrations are from 5 rounds of groundwater monitoring from the third quarter of 1992 to the first quarter of 1994.
[e]The Federal and State MCLs are the same.

Note: PCE exceeded its MCL in only one well, 9W-07A. TCE exceeded its MCL in only one well, MW-04D.

Table 2-18
Summary of Site 9 Carcinogenic Risk and Noncarcinogenic Hazard

Exposure Scenario	Exposure Pathway	Chemical of Concern	Cancer			Noncancer		
			Chronic Daily Intake (CDI) (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Risk (CDI x SF)	Chronic Daily Intake (mg/kg-day)	RfD (mg/kg-day)	Hazard Index (CDI/RfD)
Military Civil Servant	Groundwater (Ingestion and Dermal)	PCE	9.7E-06	5.2E-02	SE-07	2.7-05	1.0E-02	<1.0
		TCE	7.5E-06	1.1E-02	8E-08	2.2E-05	6.0E-03	<1.0
		Route Total			1E-06			<1.0
	Groundwater (Inhalation)	PCE	5.5E-06	2.0E-03	1E-08	1.5E-05	1.0E-02	<1.0
		TCE	4.7E-06	6.0E-03	3E-08	1.3E-05	6.0E-03	<1.0
		Route Total			4E-08			<1.0
		Pathway Total			6E-07			<1.0
	Soil (Ingestion and Dermal)	Beryllium	2.6E-07	4.3E+00	1E-06	7.3E-07	5.0E-03	<1.0
		Pathway Total			1E-06			<1.0
		Total for Military Civil Servant			**2E-06**			**<1.0**
Adult Resident	Groundwater (Ingestion and Dermal)	PCE	3.0E-05	5.2E-02	1E-06	6.8E-05	1.0E-02	<1.0
		TCE	2.4E-05	1.1E-02	3E-07	5.6E-05	6.0E-03	<1.0
		Route Total			1E-06			<1.0
	Groundwater (Inhalation)	PCE	9.6E-06	2.0E-03	2E-08	2.3E-05	1.0E-02	<1.0
		TCE	8.4E-06	6.0E-03	5E-08	2. JE-05	6.0E-03	<1.0
		Route Total			7E-08			<1.0
		Pathway Total			2E-06			<1.0
Child Resident	Soil (Ingestion and Dermal)	Beryllium	2.7E-06	4.3E+00	1E-05	3.2E-05	5.0E-03	<1.0
Adult Resident		Beryllium	1.7E-06	4.3E+00	7E-06	4.9E-06	5.0E-03	<1.0
		Pathway Total			2E-05			<1.0
		Total for Resident Adult/Child			**2E-05**			**<1.0**

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TABLE 2-19

INITIAL SCREENING OF TECHNOLOGIES FOR SOIL
GROUP A, SITE 9
MCB CAMP PENDLETON, CALIFORNIA
PROJECT NO. 243166

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS
No Action	Not Applicable	Not Applicable	No action is taken.	Required for consideration by the National Contingency Plan
Removal, Disposal	Excavation	Mechanical Excavation	Contaminated soil is excavated by heavy equipment.	Potentially applicable
	Landfill	Off-Base	Contaminated soil is transported to an off-base landfill.	Potentially applicable
		On-Base	Contaminated soil is transported to an on-base landfill.	Not applicable
Removal, Ex Situ Treatment, Disposal	Excavation	See "Removal" above		
	Chemical	Acid Extraction	Metals are solubilized and removed from the soil.	Potentially applicable for metals
		Fixation/Solidification	Reagents are added to the soil matrix to reduce the mobility of contaminants and improve waste handling.	Potentially applicable for metals
	Physical	Soil Washing	Contaminants that physically adhere to soil are removed by washing with water and reagents under mechanical action.	Potentially applicable
		Solvent Extraction	Organic contaminants are removed via a liquid-solid extraction process using a fluid solvent.	Potentially applicable for total petroleum hydrocarbons (TPH)
	Biological	Bioreactor (slurry phase)	Excavated soil is mixed with water and nutrients to form a slurry, mechanically agitated, and dewatered.	Potentially applicable for TPH
		Solid Phase	Excavated soil is mixed with nutrients and contained; water is provided by a sprayer or a sprinkler system.	Potentially applicable for TPH
	Thermal	Thermal Desorption	Organic contaminants are volatilized at high temperatures and removed from the gas phase in a controlled environment.	Potentially applicable for TPH
		Slagging	Contaminants are either volatilized and treated or liquified into a slag.	Potentially applicable
		Incineration	Contaminated soil is burned in air in a controlled environment to remove organic contaminants.	Potentially applicable for TPH
	Landfill	On-Base	Treated soil is transported to an on-base landfill.	Not applicable
		Off-Base	Treated soil is transported to an approved, engineered off-base disposal facility.	Potentially applicable
	Backfilling	Backfilling	Treated soil is used as a backfill for the excavated area.	Potentially applicable
In Situ Treatment	Biological	Bioventing	Indigenous microbial degradation of organics is enhanced by inducing a low air flow in subsurface soil.	Potentially applicable for TPH
		Bioremediation	Nutrients and an oxygen source (and possibly microbes) are injected into the soil via injection wells to enhance biodegradation. Indigenous microbes may be utilized.	Potentially applicable for TPH
	Physical	Soil Vapor Extraction (SVE)	Volatile organics are removed by inducing an air flow in subsurface soils and collecting the vapors through extraction wells.	Not applicable for metal constituents or TPH-diesel
		Thermally Enhanced SVE	Heat is used to enhance the volatilization of organic contaminants in a modified soil vapor extraction process.	Potentially applicable for TPH
		Vitrification	Electrical power is used to melt contaminated soil to form a stable glass and crystalline structure.	Potentially applicable
	Chemical	Fixation/Solidification	Similar to the ex situ process option, except that soil is not excavated.	Not applicable because it requires a cap/cover, which does not meet remedial action objectives

LEGEND:

Technologies eliminated during screening process

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APPROVED BY
DRAWING NUMBER 243166-B299

TABLE 2-20
INITIAL SCREENING OF TECHNOLOGIES FOR GROUNDWATER
GROUP A, SITE 9
MCB CAMP PENDLETON, CALIFORNIA
PROJECT NO. 243166
(SHEET 1 of 2)

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS
No Action	Not Applicable	Not Applicable	No action is taken.	Required for consideration by the National Contingency Plan
Institutional Actions	Access Restrictions	Use Restrictions	Use of groundwater in the area of influence is restricted by amending base masterplan.	Potentially applicable
	Alternate Water Supply	Off-Site Water Supply	New wells are installed in uncontaminated areas or existing water-supply systems are extended.	Not applicable
	Monitoring	Groundwater Monitoring	Ongoing monitoring of wells is conducted.	Potentially applicable
Containment	Vertical Barriers	Slurry Wall	Trenches around areas of contamination are filled with a soil (or cement) bentonite slurry.	Not applicable for the site conditions
		Grout Curtain	Grout is pressure injected in a regular pattern of drilled holes.	Not applicable for the site conditions
		Sheet Piling	Steel sheets are permanently driven into the ground to create a wall to retard the flow of the groundwater plume.	Not applicable for the site conditions
	Horizontal Barriers	Grout Injection	Grout is pressure injected at depth through closely spaced drilled holes to fill soil pores.	Not applicable for the site conditions
Removal	Extraction	Extraction Wells	Groundwater is extracted from a series of extraction wells.	Potentially applicable
		Extraction/Injection Wells	Uncontaminated water is injected via injection wells to hydraulically increase the flow to extraction wells.	Potentially applicable
	Subsurface Drains	Interceptor Trenches	Perforated pipes in trenches are backfilled with porous material to collect contaminated water.	Not applicable given the depth of groundwater
Discharge	On-Base Discharge	Surface Discharge	Extracted untreated water is discharged to a nearby stream.	Not applicable
		Treatment Plant	Extracted water is discharged to a wastewater treatment plant.	Not applicable
		Deep Well Injection	Extracted water is discharged to a deep well injection system.	Not applicable
	Off-Base Discharge	POTW	Extracted water is discharged to a publicly owned treatment works (POTW) facility for treatment.	Not applicable
		Surface Discharge	Extracted water is discharged to a stream or into the ocean.	Not applicable
In Situ Treatment	Biological	Bioremediation	Oxygen and nutrients are injected into groundwater to promote biodegradation of contaminants by indigenous microorganisms.	Not applicable to tetrachloroethene (PCE) because biodegradation of (PCE) is extremely slow
	Physical	Air Sparging	Air or nitrogen is injected into the groundwater plume to volatilize, collect, and treat volatile and semivolatile organic compounds.	Potentially applicable
		Permeable Treatment Bed	A buried bed of adsorbents is used to intercept a moving plume and remove contaminants from groundwater.	Potentially applicable
	Chemical	Chemical Treatment	Chemical reagents are used to destroy or render contaminants insoluble and immobile.	Not applicable

LEGEND:

Technologies eliminated during screening process

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TABLE 2-20 (continued)
INITIAL SCREENING OF TECHNOLOGIES FOR GROUNDWATER
GROUP A, SITE 9
MCB CAMP PENDLETON, CALIFORNIA
PROJECT NO. 243166
(SHEET 2 of 2)

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS
Removal Ex Situ Treatment Discharge	See "Removal" above			
	Biological	Fixed-Film Bioreactor	A mat of biomass attached to an inert support media is used to degrade organics in an aqueous waste.	Not applicable
		Suspended Growth Bioreactor	A suspension of bacteria in an aqueous waste is aerated to degrade the organics and create new bacteria.	Not applicable
	Physical	Air Stripping	Volatile contaminants are stripped off by contacting groundwater with air in a high interfacial area system.	Potentially applicable for organics
		Adsorption	Contaminants adhere to a solid-phase medium placed in contact with groundwater.	Potentially applicable for organics
		Membrane Separation	Small molecules pass through a porous membrane under elevated pressure; larger molecules are prevented from passing through membrane.	Not applicable
	Chemical	Ion-Exchange	Ions on a solid-phase medium selectively swap with ionic contaminants in the water, facilitating removal.	Not applicable for organics
		Chemical Precipitation	Contaminants are transformed into a less soluble state via chemical reaction, facilitating precipitation and eventual removal of contaminants.	Not applicable
		Coagulation/Flocculation	Reagents are added to neutralize surface charges of fine contaminant particles and to entrap them, facilitating precipitation.	Applicable only as a support technology
		Coprecipitation	Ionic contaminants are removed via adsorption onto or coagulation/enmeshment with another precipitating solid.	Not applicable for organics
		UV/Oxidation	Simultaneous application of a strong chemical oxydizer and an ultraviolet (UV) light source destroys certain organic contaminants in groundwater.	Potentially applicable for organics
	On-Base Discharge	Reinjection	Treated groundwater is reinjected into the same aquifer.	Potentially applicable
		Surface Discharge	Treated groundwater is discharged to a nearby stream.	Potentially applicable
	Off-Base Discharge	POTW	Treated groundwater is discharged to a POTW.	Not applicable
		Surface Discharge	Treated groundwater is discharged to a stream or the ocean.	Potentially applicable

LEGEND:

Technologies eliminated during screening process

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TABLE 2-21
EVALUATION OF PROCESS OPTIONS FOR CONTAMINATED SOIL
GROUP A, SITE 9
MCB CAMP PENDLETON, CALIFORNIA
PROJECT NO. 243166
(SHEET 1 of 2)

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST*
No Action	Not Applicable	Not Applicable	Potentially achieves remedial action objectives and proposed remediation goals (RGs), as discussed in Appendix H.	Not applicable.	None
Removal / Disposal	Excavation	Mechanical Excavation	High; effective and reliable in meeting proposed RGs. Dust emissions may pose a health risk to on-site personnel.	High; easy to implement; excavation equipment is standard and readily available.	Low
Removal / Disposal	Landfill	Off-Base	High; effective and reliable in handling excavated soil. Transportation of soil may pose a potential health risk to the public.	High; uses conventional technology; sufficient capacity is available.	Moderate to high
Removal / Ex Situ Treatment / Disposal	Excavation	See "Removal" above			
Removal / Ex Situ Treatment / Disposal	Chemical	Acid Extraction	Moderate; effective and reliable in meeting proposed RGs for metals but ineffective for total petroleum hydrocarbons (TPH). Potential exposure during implementation.	High; readily available; no permits are required.	Low to moderate
Removal / Ex Situ Treatment / Disposal	Chemical	Fixation/Solidification	Moderate; effective and reliable in meeting proposed RGs for metals and partially effective for TPH. Dust and chemicals used may pose health risks to on-site personnel. Process is subject to leaching.	High; readily implementable; uses commonly available technology.	Low to moderate
Removal / Ex Situ Treatment / Disposal	Physical	Soil Washing	High; effective and reliable in meeting proposed RGs for metals and TPH. Soil clay content may impact the effectiveness of treatment.	High; readily implementable; mobile commercial units are available; no permits are required.	Moderate
Removal / Ex Situ Treatment / Disposal	Physical	Solvent Extraction	Moderate; effective and reliable in meeting proposed RGs for TPH but ineffective for metals. Dust emissions and potential spills may pose health and environmental risks during implementation.	High; readily implementable; mobile commercial units are available; no permits are required.	Moderate
Removal / Ex Situ Treatment / Disposal	Biological	Bioreactor (slurry phase)	Moderate; effective and reliable in meeting proposed RGs for TPH but ineffective for metals. Air emissions may pose a health or safety risk during implementation.	High; mobile bioreactors are commercially available; no permits are required.	Moderate to high
Removal / Ex Situ Treatment / Disposal	Biological	Solid Phase	Moderate; effective and reliable in meeting proposed RGs for TPH but ineffective for metals. Air emissions may pose a health or safety risk during implementation.	High; uses conventional practices; adequate on-site area is available.	Low
Removal / Ex Situ Treatment / Disposal	Thermal	Thermal Desorption	Moderate; effective and reliable in meeting proposed RGs for TPH but ineffective for metals. Air emissions may pose a health risk if an uncontrolled release occurs.	High; readily implementable; systems are commercially available; no permits are required.	Low to moderate
Removal / Ex Situ Treatment / Disposal	Thermal	Slagging	Moderate; potentially effective in meeting proposed RGs for TPH and metals. Air emissions may pose a health risk if an uncontrolled release occurs.	Moderate; equipment is commercially available.	High
Removal / Ex Situ Treatment / Disposal	Thermal	Incineration	Moderate; effective and reliable in meeting proposed RGs for TPH but ineffective for metals. Air emissions may pose a health risk if an uncontolled release occurs.	Low; not permitted in California.	High
Removal / Ex Situ Treatment / Disposal	Landfill	Off-Base	High; effective and reliable, dependent on continued maintenance; potential exposure during transportation.	High; uses conventional technology; capacity is available.	Moderate to high
Removal / Ex Situ Treatment / Disposal	Backfill	Backfill	High; effective in handling estimated volume and meeting remedial objectives.	High; readily implementable; uses conventional earthmoving equipment.	Low

LEGEND:

- ▭ Selected as representative process option for incorporation into remedial action alternatives based on effectiveness, implementability, and cost.
- ▨ Process options that will not be incorporated into remedial action alternatives.
- * Relative to other process options in the same technology type.

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TABLE 2-21 (continued)
EVALUATION OF PROCESS OPTIONS FOR CONTAMINATED SOIL
GROUP A, SITE 9
MCB CAMP PENDLETON, CALIFORNIA
PROJECT NO. 243166
(SHEET 2 of 2)

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST*
In Situ Treatment	Physical	Vitrification	High; effective and reliable in meeting proposed PRGs for TPH and metals. The generation of nigh volumes of gases and vapors may pose health and safety risks during implementation.	Low; technology has recently been taken off the market for refinement.	High
		Thermally Enhanced Soil Vapor Extraction	Moderate; effective for removal of TPH from soil, but poses potential risks to groundwater.	Moderate; readily implementable; risks associated with the higher mobility of contaminants must be addressed.	Moderate
	Biological	Bioventing	Moderate; effective for meeting proposed RGs for TPH but ineffective for metals. No significant risk to human health or the environment.	High; readily implementable; components and services are commercially available.	Low
		Bioremediation	Moderate; effective for meeting proposed RGs for TPH but ineffective for metals. May pose risk to groundwater.	Moderate; readily implementable (technically); risks associated with the introduction of nutrients, pH adjustment, and other factors must be addressed.	Moderate to high

LEGEND:

- ▭ Selected as representative process option for incorporation into remedial action alternatives based on effectiveness, implementability, and cost.
- ▨ Process options that will not be incorporated into remedial action alternatives.
- * Relative to other process options in the same technology type.

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TABLE 2-22
EVALUATION OF PROCESS OPTIONS FOR GROUNDWATER
GROUP A, SITE 9
MCB CAMP PENDLETON, CALIFORNIA
PROJECT NO. 243166
(SHEET 1 of 2)

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST
No Action	Not Applicable	Not Applicable	Low; does not achieve remedial action objectives or proposed remediation goals (RGs).	Not applicable.	None
Institutional Actions	Access Restrictions	Use Restrictions	Moderate; although contamination is not reduced, the effectiveness of reducing risks depends on continued future implementation.	High; readily implementable.	None
	Monitoring	Groundwater Monitoring	Moderate; does not achieve proposed RGs. Method is reliable and proven.	High; additional wells can be easily installed; potentially acceptable to agencies because of low contaminant concentrations and absence of current receptors.	Low
Removal	Extraction	Extraction Wells	Moderate; effective and reliable for removal of contaminated groundwater.	High; readily implementable.	Low
		Reinjection Wells	High; effective and reliable for removal of contaminated groundwater.	High; readily implementable; water supply required for injection.	Moderate
	Discharge	None retained from initial screening.			
In Situ Treatment	Physical	Air Sparging	Low; complex site hydrogeology would hinder the effectiveness of this option.	High; materials and equipment are readily available.	Moderate
		Permeable Treatment Bed	Moderate; effective and reliable in achieving proposed RGs, although groundwater brackishness may interfere with the effectiveness. Groundwater flow rates may render the technology ineffective. Performance is difficult to monitor.	Low; shoring may be required during excavation; slow rate of collection is controlled by groundwater movement; adsorbent material may require frequent replacement.	High

LEGEND:

▨ Technologies eliminated during screening process

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TABLE 2-22 (continued)
EVALUATION OF PROCESS OPTIONS FOR GROUNDWATER
GROUP A, SITE 9
MCB CAMP PENDLETON, CALIFORNIA
PROJECT NO. 243166
(SHEET 2 of 2)

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST
Removal Ex Situ Treatment Discharge	See "Removal" above				
	Physical	Air Stripping	High; effective and reliable in achieving proposed RGs for volatile organic compounds. Air emissions may pose a health risk.	High; commercially available technology; skilled workers not required; air emissions approval required.	Low to moderate
		Adsorption	High; effective and reliable in achieving proposed RGs. Spent adsorbent may pose a health risk.	High; spent adsorbent will require regeneration or disposal; commonly used technology.	Moderate
	Chemical	UV/Chemical Oxidation	Moderate; proven effective for similar contaminants. Relatively new process. No health impact expected.	Moderate; materials and equipment are readily available; skilled workers are required; residuals require disposal.	High
	On-Base Discharge	Reinjection	High; minimal health risks. Does not address reduction of contaminants, but is used in conjunction with treatment.	High; readily implementable if cleanup goals are met through treatment.	Low
		Surface Discharge	High; meets remedial action objectives. Dependent on effectiveness of treatment process. No impact to human health or the environment.	High; associated equipment and methods well established; no construction problems expected; discharge permit is required.	Low
	Off-Base Discharge	Surface Discharge	High; meets remedial action objectives. No impact to human health or the environment.	High; associated equipment and methods well established; no construction problems expected; discharge permit is required.	Moderate

TABLE 2-23
Site 9 - Compilation of Baseline Scenario-Specific Summed Risks and Health Indices[a]
MCB Camp Pendleton

Current: Military								
Civil Servant								
Soil	1E-7	1E-6	<0.1	<0.1	1E-7	1E-6	<0.1	<0.1
Groundwater	NA	NA	NA	NA	NA	NA	NA	NA
Military Personnel								
Soil	3E-8	2E-7	<0.1	<0.1	3E-8	2E-7	<0.1	<0.1
Groundwater	NA	NA	NA	NA	NA	NA	NA	NA
Future: Residential								
Adult - Soil (24 yrs)	2E-7	9E-6	<0.1	0.2	2E-7	9E-6	<0.1	0.2
Child - Soil (6 yrs)	3E-6	1E-5	0.2	1.0	3E-6	1E-5	0.2	1.0
Adult & Child (30 yrs)								
Soil	3E-6[b]	2E-5[b]	0.2[b]	1.2[b]	3E-6[b]	2E-5[b]	0.2[b]	1.2[b]
Groundwater								
Future: Occupational								
Workers								
Soil	1E-7[b]	1E-6[b]	<0.1[b]	<0.1[b]	1E-7[b]	1E-6[b]	<0.1[b]	<0.1[b]
Groundwater								
Future: Military								
Civil Servant								
Soil	1E-7[b]	1E-6[b]	<0.1[b]	<0.1[b]	1E-7[b]	1E-6[b]	<0.1[b]	<0.1[b]
Groundwater								
Military								
Soil	3E-8[b]	2E-7[b]	<0.1[b]	<0.1[b]	3E-8[b]	2E-7[b]	<0.1[b]	<0.1[b]
Groundwater								

[a]Compare vs. target criteria: ILCR of E-6 (Point of Departure), ILCR of E-6 to E-4, and ΣHQs of 1.0 or less. Data are summed from ILCRs and HQs in Table R-12 of the Draft Final RI Report for Group A Sites (SWDIV, 1993).
[b]No ILCR or health hazard results from site-related groundwater contaminants. At the time of preparation of the Draft Final RI Report for Group A Sites (SWDIV, 1993), only two rounds of groundwater data were available for evaluation in the baseline risk assessment. Five rounds of groundwater have been evaluated for inclusion in the feasibility study. As a result, arsenic, which was the major contributor to the groundwater RME ILCR, has been quantified as non-site-related and variances in upgradient wells versus downgradient wells are statistically insignificant.

ILCR - Incremental lifetime cancer risk.
NA - Not applicable.
RME - Reasonable maximum exposure.
SWDIV - Southwest Division Naval Facilities Engineering Command.
ΣHQs - Sum of chemical-specific hazard quotients for exposure scenario, often called hazard index (HI).

TABLE 2-24
Summary of Comparative Analysis
MCB Camp Pendleton

Criteria	Alternatives						
	1	2	3	4	5	6	7
Overall Protection of Human Health and the Environment	No	Yes	Yes	Yes	Yes	Yes	Yes
Compliance with ARARs	No	Yes[a]	Yes	Yes	Yes[a]	Yes[a]	Yes[a]
Long-Term Effectiveness and Permanence	NA	Low	High	High	Mod	Mod	Low
Reduction of Toxicity, Mobility, or Volume	No	Low	High	High	High	High	Low
Short-Term Effectiveness	NA	Mod	Mod	High	High	Mod	NA
Inplementability	NA	High	Mod	High	High	Mod	High
Cost ($ millions) Option 1 Option 2	 0 0	 4.1 1.5	 2.4 1.4	 1.3 1.1	 0.7 0.5	 1.8 0.8	 0.4

[a]ARARs achieved over time through natural groundwater attenuation.

Alternative 2: Soil - Excavation and Off-Base Landfill for Hot Spots, Zone I, and Zone II.
Groundwater - Institutional Controls (monitoring and use restrictions).

Alternative 3: Soil - Excavation and Off-Base Landfill for Zone I and Hot Spots; Biological Land Treatment for Zone II.
Groundwater - Extraction, UV/Chemical Oxidation, and Reinjection.

Alternative 4: Soil - Excavation and Off-Base Landfill for Zone I; In Situ Bioremediation/Bioventing for Zone II.
Groundwater - Extraction, Carbon Adsorption, and Reinjection.

Alternative 5: Soil - Excavation and Off-Base Landfill for Zone I; In Situ Bioremediation/Bioventing for Zone II.
Groundwater - Institutional Controls.

Alternative 6: Soil - Excavation and Off-Base Landfill for Zone I and Hot Spots; Biological Land Treatment for Zone II.
Groundwater - Institutional Controls.

Alternative 7: Soil - No Action.
Groundwater - Institutional Controls.

ARARs - Applicable or relevant and appropriate requirements.
Mod - Moderate.
NA - Not applicable.

TABLE 2-25
Cost Analysis for Groundwater
Remedial Action - Alternative 7

1	2	3	4	5	6	7	8	9	10
Year	Treatment Unit Operation[a,b] ($)	Monitoring[a,c] ($)	Maintenance[a,d] ($)	Annual Operations and Maintenance (O&M) Cost[e] ($)	Inflation Rate at 5%[f]	Discount Rate at 10%[g]	Capital Cost[a] ($)	Present Worth of O&M Cost[h] ($)	Cumulative Total Cost[i] ($)
0	0	0	0	0	0.00	0.00	2,500	0	2,500
1	0	32,920	50	32,970	1.0500	0.9091	0	31,471	33,971
2	0	32,920	50	32,970	1.1025	0.8264	0	30,039	64,010
3	0	32,920	50	32,970	1.1576	0.7513	0	28,674	92,684
4	0	32,920	50	32,970	1.2155	0.6830	0	27,371	129,055
5	5,200	32,920	50	38,170	1.2763	0.6209	0	30,248	150,303
6	0	32,920	50	32,970	1.3401	0.5645	0	24,941	175,244
7	0	131,680	50	131,730	1.4071	0.5132	0	95,125	270,369
8	0	32,920	50	32,970	1.4774	0.4665	0	22,723	293,092
9	0	32,920	50	32,970	1.5513	0.4241	0	21,691	314,783
10	5,200	32,920	50	38,170	1.6289	0.3855	0	23,969	338,752
10	Salvage Value at 10 percent of Monitoring Equipment Capital ($2,500)				1.6289	0.3855	(157)[j]	0	338,595
Total	**10,400**	**427,960**	**500**	**438,860**			**2,343**	**336,252**	**338,595**

[a]Refer to Table H-2.
[b]Cost of annual treatment includes system evaluation every 5 years.
[c]Annual estimated monitoring costs, including semiannual monitoring and seventh year compliance monitoring (eight times in 1 year).
[d]Annual estimated maintenance costs.
[e]Equal to column 2 + column 3 + column 4.
[f]Inflation factor = $(1 + \text{inflation rate}/100)^n$ where n = year.
[g]Discount rate factor = $1/([1 \text{ discount rate}/100]^n)$ where n = year.
[h]Present worth of O&M cost = column 5 x column 6 x column 7.
[i]Cumulative total cost for year n = $\sum_{i=0}^{n}$ (column 8 + column 9)$_i$.
[j]Salvage value = Capital cost x column 6 x column 7 x 0.10.

166rodw.225

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CHECKED BY	JPC	10/12/93	DRAWING NUMBER 243166-B189
APPROVED BY	TMD	10-12-93	

SCALE: 0 175 350 FEET

9B-17 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)
1.75	35	.51 B
3.25	350	0.27 B
5.75	6,700	0.61 B
9.25	1.3	0.24 B
12.50	ND	ND
18.30	7.4	ND

9B-16 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)
1.00	350	0.28 B
6.00	ND	0.33 B
13.00	ND	0.22 B
17.00	ND	0.59 B

9B-14 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)
1.00	81	1.9
5.75	ND	ND
9.50	ND	ND
17.00	ND	ND

9B-10 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)
0.75	210	0.44 B
1.50	570	0.15 B
5.00	180	0.21 B
7.75	ND	0.14 B
15.50	ND	0.64 B
19.80	ND	0.52 B

9B-11 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)
1.00	1,600	0.34 B
1.75	54	0.36 B
4.25	ND	0.21 B
10.0	60	0.23 B
12.00	53	0.31 B

GREASE DISPOSAL PIT

FORMER EFFLUENT LAGOON

9W-02A, 9W-02B, 9W-05A, 9W-05B, 9W-06A, 9W-06B, 9W-06C, 9W-07A, 9W-07B, 9W-07C, 9W-10, 9W-22, MW-01, MW-03S, MW-03D, MW-04D, MW-04S, SW1S, SW1N, 9B1, 9B3, 9B4, 9B8, 9B9, 9B10, 9B11, 9B12, 9B13, 9B14, 9B15, 9B16, 9B17, 9B18, 9B19, 9B20, 9B21, 9B22, 9B23, 9SD1

3930-T, 3931-T, 3932-T, 3933-T, 3934-T, 4019-T

LEGEND:

- 9B1 / 9SD1 — BOREHOLE OR SURFACE SEDIMENT SAMPLE LOCATION
- MW-04D — MONITORING WELL LOCATION
- SW1S — SURFACE-WATER SAMPLING LOCATION
- DENOTES EXTENT OF CONTAMINATION WHERE AT LEAST ONE CONTAMINANT EXCEEDS THE RISK-BASED PRELIMINARY REMEDIATION GOAL (PRG) OR TOTAL PETROLEUM HYDROCARBON CONCENTRATIONS >100 PPM; QUERIED WHERE INFERRED
- LOW CONCENTRATIONS OF BERYLLIUM OUTSIDE THE DELINEATED AREA OF CONTAMINATION WITH B QUALIFIERS ARE NOT PLOTTED, ALTHOUGH ABOVE THE PRG. REFER TO SECTION 6.3 FOR EVALUATION OF METALS WITH B QUALIFIERS.
- TPH-D — TOTAL PETROLEUM HYDROCARBONS ANALYZED BY METHOD m8015 WITH A DIESEL CALIBRATION STANDARD
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- 9B 9B' — GEOLOGIC CROSS-SECTION LOCATION SHOWING APPROXIMATE VERTICAL EXTENT OF SOIL CONTAMINATION
- ND — NOT DETECTED
- mg/kg — MILLIGRAMS PER KILOGRAM

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 13B, 13D, AND 14C
DATE: DECEMBER 1987

FIGURE 2-1

SITE 9
41 AREA STUART MESA
WASTE STABILIZATION POND
SUMMARY OF SOIL ANALYTICAL RESULTS AND LOCATION OF GEOLOGIC CROSS-SECTION 9B-9B'
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-89-D-9296
CLE-101-01F186-B7-0027

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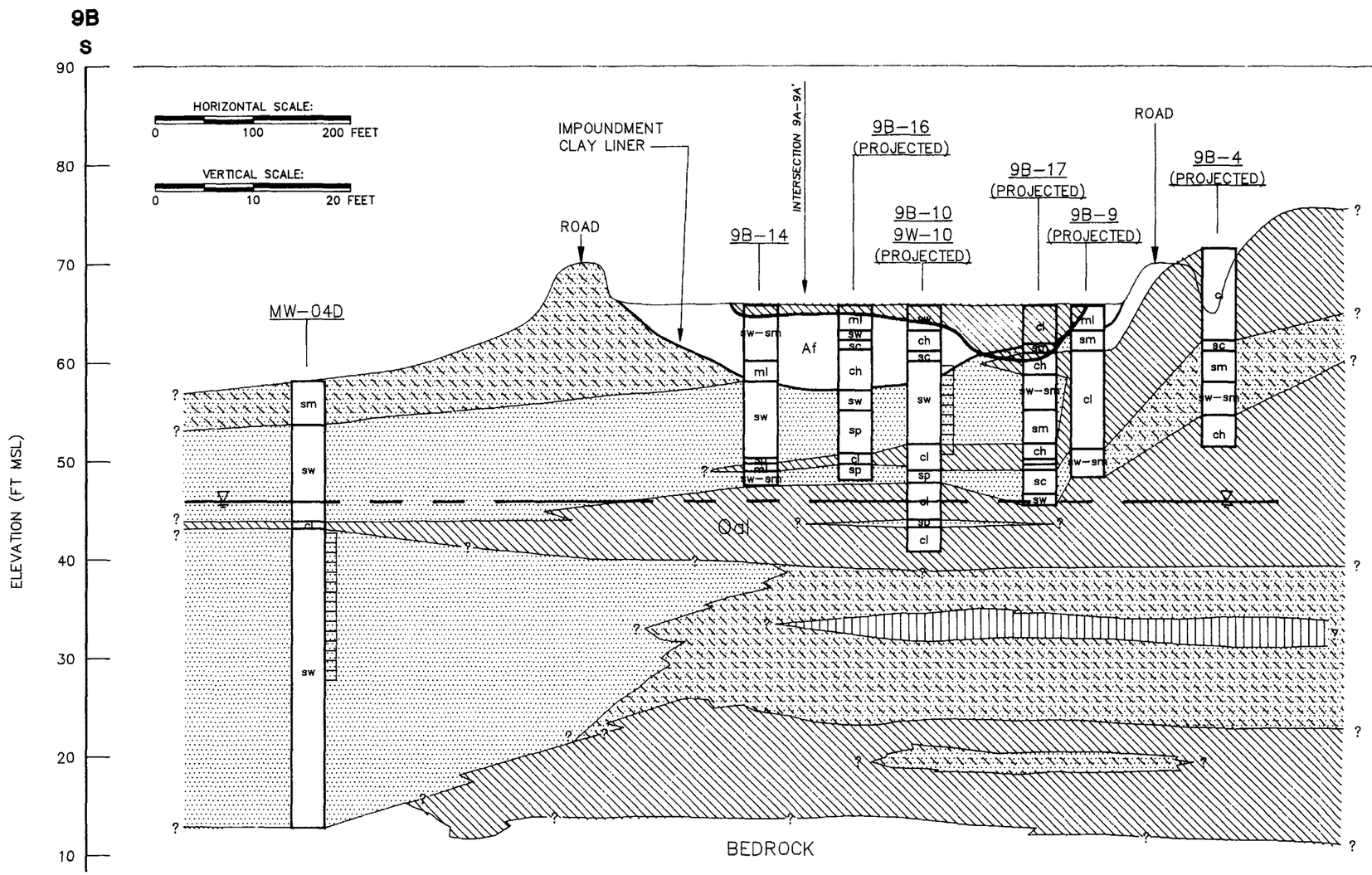
APPROVED BY		
DRAWING NUMBER	243166-B104	

9B S — 9B' N



LEGEND:

- APPROXIMATE WATER TABLE
- B — SCREENED INTERVAL AND LETTER DESIGNATION FOR PARTICULAR WELL IN THAT CLUSTER
- SOIL CONTACT, QUERIED WHERE UNCERTAIN.
- LITHOLOGIC CONTACT, QUERIED WHERE UNCERTAIN

LITHOLOGIC UNITS:

- Af — ARTIFICIAL FILL; BOUNDARIES DEFINED BY SURFACE IMPOUNDMENT; SOIL TYPES PRESENTED IN BORING LOGS

QUATERNARY ALLUVIUM (Qal):

- Qal — PREDOMINANTLY CLAY, HIGH AND LOW PLASTICITY
- Qa — PREDOMINANTLY SILT OR SILT WITH CLAY
- Qal — PREDOMINANTLY SAND, POORLY AND WELL GRADED
- Qal — PREDOMINANTLY SILTY SAND, SAND WITH SILT, CLAYEY SAND

BEDROCK UNIT:

- Tc — BEDROCK OF THE CAPISTRANO FORMATION; SILTSTONES AND CLAYSTONES
- SOIL EXHIBITING CONTAMINANT CONCENTRATIONS THAT MAY POSE A THREAT TO HUMAN HEALTH (i.e., >PRGs FOR SOIL) OR CONCENTRATIONS OF TOTAL PETROLEUM HYDROCARBONS >100 PPM

NOTES:

1. LITHOLOGIES REPRESENT THE PREDOMINANT SOIL TYPE.
2. REFER TO FIGURE 4-7 FOR LOCATION OF GEOLOGIC CROSS-SECTION 9B-9B'.
3. WATER-LEVEL ELEVATIONS MEASURED ON 28 AUGUST 1992. REFER TO APPENDIX B.
4. FT MSL DENOTES FEET ABOVE MEAN SEA LEVEL.

FIGURE 2-2

SITE 9 - 41 AREA STUART MESA
WASTE STABILIZATION POND
GEOLOGIC CROSS-SECTION 9B-9B'
SHOWING APPROXIMATE VERTICAL EXTENT OF SOIL CONTAMINATION
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
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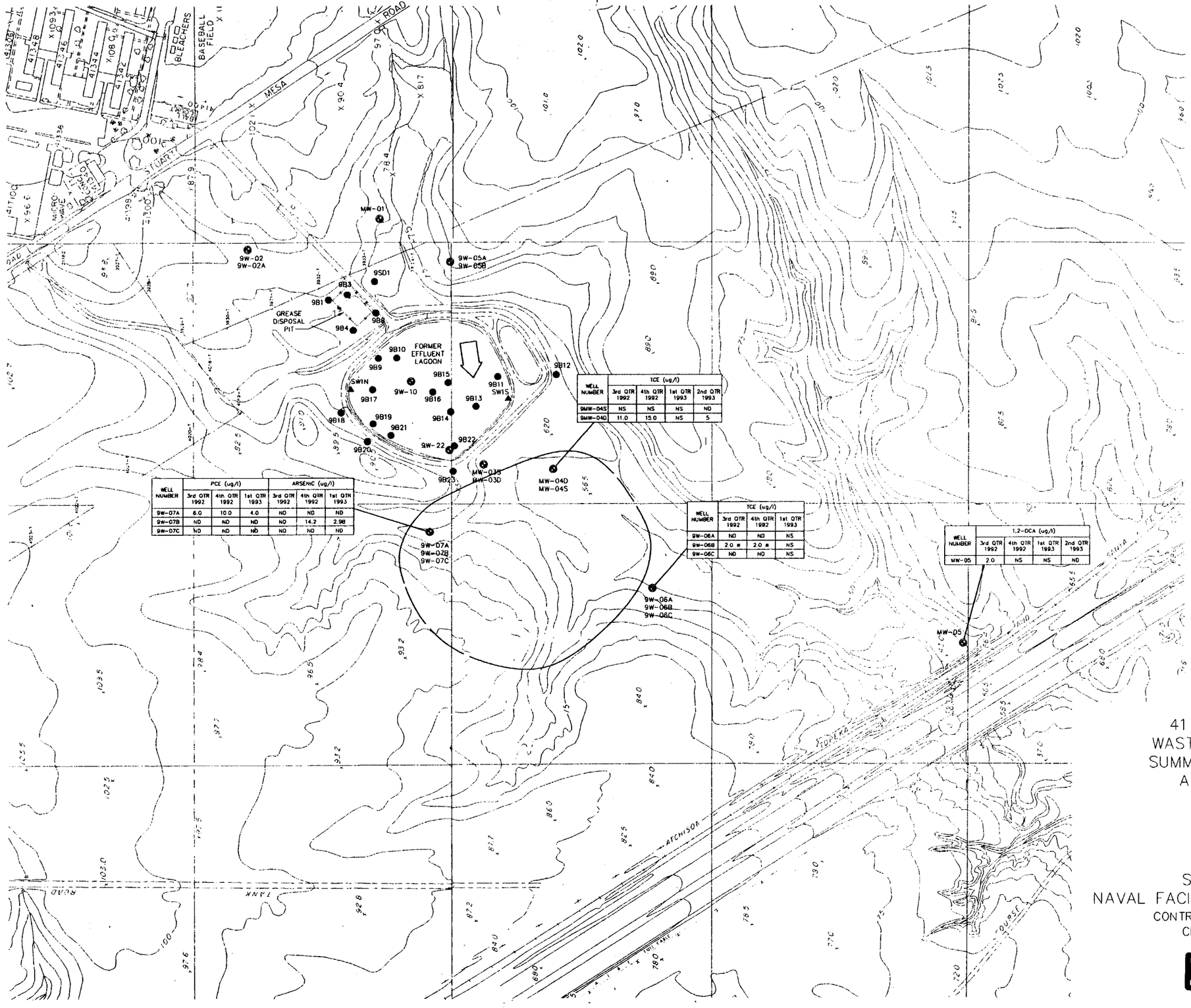
CHECKED BY	DMN	10-13-93	DRAWING NUMBER 243166-E101
APPROVED BY	WZM	10-13-93	



WELL NUMBER	PCE (ug/l)			ARSENIC (ug/l)		
	3rd QTR 1992	4th QTR 1992	1st QTR 1993	3rd QTR 1992	4th QTR 1992	1st QTR 1993
9W-07A	6.0	10.0	4.0	ND	ND	ND
9W-07B	ND	ND	ND	ND	14.2	2.98
9W-07C	ND	ND	ND	ND	ND	ND

WELL NUMBER	TCE (ug/l)			
	3rd QTR 1992	4th QTR 1992	1st QTR 1993	2nd QTR 1993
9MW-04S	NS	NS	NS	ND
9MW-04D	11.0	15.0	NS	5

WELL NUMBER	TCE (ug/l)			
	3rd QTR 1992	4th QTR 1992	1st QTR 1993	
9W-06A	ND	ND	NS	
9W-06B	2.0 *	2.0 *	NS	
9W-06C	ND	ND	NS	

WELL NUMBER	1,2-DCA (ug/l)			
	3rd QTR 1992	4th QTR 1992	1st QTR 1993	2nd QTR 1993
MW-05	2.0	NS	NS	ND

LEGEND:

- SW1S ▲ — SURFACE-WATER SAMPLE LOCATION
- 9B1 ● / 9SD1 — BOREHOLE OR SURFACE SEDIMENT SAMPLE LOCATION
- 9MW-07A ⊕ — MONITORING WELL LOCATION
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- DENOTES EXTENT OF CONTAMINATION WHERE THE CONCENTRATION OF AT LEAST ONE CONTAMINANT EXCEEDS THE MAXIMUM CONTAMINANT LEVEL (MCL) OR PRELIMINARY REMEDIATION GOAL (PRG) FOR DRINKING WATER, DASHED WHERE INFERRED
- ADDITIONAL CONTROL FOR THE EXTENT OF CONTAMINATION CONTOUR LINE COMES FROM PHASE 2 RI AT SITE 9 AND WILL BE DISCUSSED IN THE FEASIBILITY STUDY REPORT
- ARSENIC CONCENTRATIONS AT SITE 9 ARE BELOW THE MCL BUT ABOVE THE RISK-BASED PRG. DETECTED ARSENIC CONCENTRATIONS WITHIN THE EXTENT OF CONTAMINATION CONTOUR LINE ARE SHOWN. LOW CONCENTRATIONS OF ARSENIC WITH B QUALIFIERS OUTSIDE THE CONTOUR LINE ARE NOT PLOTTED. REFER TO SECTION 6.3 FOR EVALUATION OF METALS WITH B QUALIFIERS. OTHER METALS ABOVE MCLs ARE CONSIDERED BACKGROUND. REFER TO APPENDIX O.
- 3rd QTR. — RESULTS FROM 3rd QUARTER 1992 (FIRST SAMPLING ROUND)
- 4th QTR. — RESULTS FROM 4th QUARTER 1992 (SECOND SAMPLING ROUND)
- 1ST QTR. — RESULTS FROM 1ST QUARTER 1993 (THIRD SAMPLING ROUND)
- 2ND QTR. — RESULTS FROM 2ND QUARTER 1993 (INCLUDED FOR WELLS WHERE MCLS WERE PREVIOUSLY EXCEEDED AND SAMPLING WAS NOT POSSIBLE DURING THE THIRD ROUND DUE TO FLOODING.
- * — DENOTES CONCENTRATION ABOVE DETECTION LIMIT BUT BELOW MCL
- DCA — DICHLOROETHANE
- PCE — TETRACHLOROETHENE
- TCE — TRICHLOROETHENE
- ND — NOT DETECTED
- NS — NOT SAMPLED
- ug/l — MICROGRAMS PER LITER

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 13B, 13D, 14A AND 14C
DATE: DECEMBER 1987

SCALE: 0 175 350 FEET

FIGURE 2-3
SITE 9
41 AREA STUART MESA
WASTE STABILIZATION POND
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-89-D-9296
CLE-101-01F166-B7-0027

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CHECKED BY	SMP	10-13-93
APPROVED BY	GLM	10-13-93
DRAWING NUMBER	243166-E99	

4SD1 [1] DEPTH (ft)	HEXACHLOROETHANE (ug/kg) (< PRG)
0.25	750 J

4A2 [1] DEPTH (ft)	TRICHLOROETHENE (ug/kg) (< PRG)
12.0	6 J

FIGURE 2-4

SITES 4 and 4A
MCAS DRAINAGE DITCH AND CONCRETE-LINED SURFACE IMPOUNDMENT
WELL, BOREHOLE, AND SAMPLE LOCATION MAP
MCB CAMP PENDLETON
CALIFORNIA

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NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-89-D-9296
CLE-101-01F166-B7-0027

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SCALE:
0 300 600 FEET

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 15D, 16C, 22B AND 23A
DATE: DECEMBER 1987

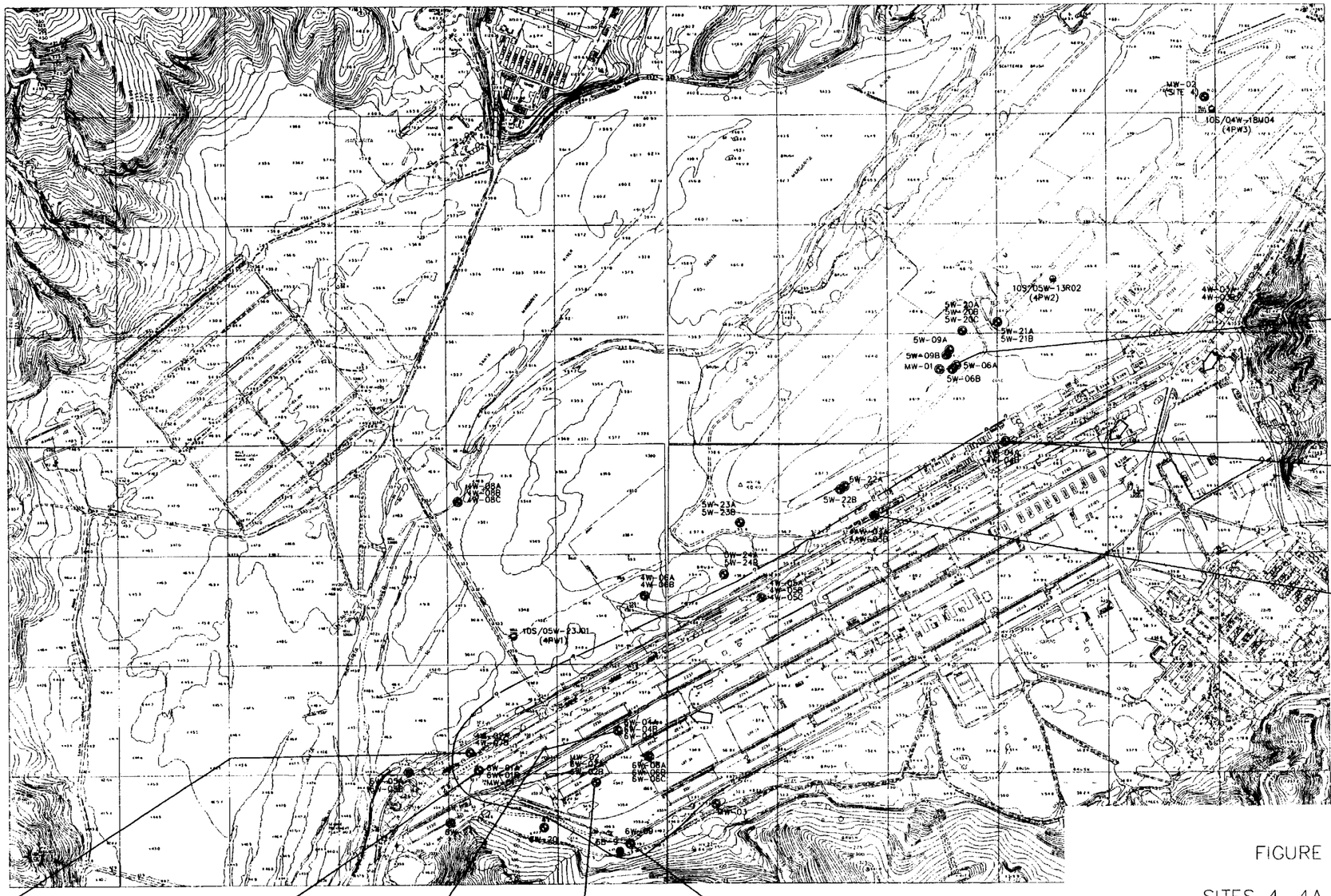
LEGEND:

- 4SW02 ▲ SURFACE-WATER SAMPLE LOCATION
- 4A1 ● 4SD1 BOREHOLE OR SURFACE SEDIMENT SAMPLE LOCATION
- 4W-06A ⊗ MONITORING WELL LOCATION
- 10S/05W-23J01 (4PW1) ⊖ BASE PRODUCTION WELL; USGS WELL NO. (IT WELL NUMBER)

[1] NO COMPOUNDS DETECTED IN THE SOIL ABOVE RISK BASED PRELIMINARY REMEDIATION GOALS (PRGs) OR AT CONCENTRATIONS GREATER THAN 100 PPM OF TOTAL PETROLEUM HYDROCARBONS. EXCEPT FOR BERYLLIUM. CONCENTRATIONS OF BERYLLIUM (ALTHOUGH ABOVE THE PRG) ARE CONSIDERED BACKGROUND, SO ARE NOT PLOTTED. REFER TO APPENDIX N FOR DETAILS.

ug/kg MICROGRAMS PER KILOGRAM

DRAWN BY	msf	10-13-93	DRAWING NUMBER 243166-E100
CHECKED BY	9-30-93	11-19-93	
APPROVED BY			



WELL NUMBER	1,2-DCA (ug/l)				BENZENE (ug/l)			
	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993	2nd QTR. 1993	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993	2nd QTR. 1993
5W-06A	ND	ND	3.0	0.6	ND	ND	4.0	ND

WELL NUMBER	TCE (ug/l)			
	3rd QTR. 1992	4th QTR. 1992	1ST QTR. 1993	
4W-04A	19.0	17.0	ND	

WELL NUMBER	TCE (ug/l)		
	3rd QTR. 1992	4th QTR. 1992	1ST QTR. 1993
4W-03A	1.0	5.0	ND

WELL NUMBER	1,1-DCA (ug/l)			VINYL CHLORIDE (ug/l)			1,1-DCA (ug/l)		
	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993
4W-07A	ND	11.0	7.0	ND	ND	ND			
4W-07B	9.0	ND	ND	1.0	ND	ND			
6W-01A	4.0	7.0	8.0	ND	1.0	ND	3.0	5.0	6.0

WELL NUMBER	1,1-DCE (ug/l)			1,1-DCA (ug/l)		
	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993
6W-04A	22.0	20.0	50.0	3.0	3.0	6.0

WELL NUMBER	1,2-DCE (ug/l)		
	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993
6W-02	65.0	99.0	4.0

WELL NUMBER	TCE (ug/l)			1,2-DCE (ug/l)		
	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993	3rd QTR. 1992	4th QTR. 1992	1st QTR. 1993
6W-09	18.0	15.0	13.0	6.0	7.0	4.0

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 15D, 16C, 22B AND 23A
DATE: DECEMBER 1987

SCALE:
0 500 1000 FEET

6W-20 MONITORING WELL LOCATION

10S/05W-23J01 (4PW1) BASE PRODUCTION WELL; USGS WELL NUMBER (IT WELL NUMBER)

1,1-DCE	
3rd QTR.	4th QTR.
22.0	20.0

3rd QTR. = RESULTS FROM 3rd QUARTER 1992 (FIRST SAMPLING ROUND)
4th QTR. = RESULTS FROM 4th QUARTER 1992 (SECOND SAMPLING ROUND)
1st QTR. = RESULTS FROM 1st QUARTER 1993 (THIRD SAMPLING ROUND)
2nd QTR. = RESULTS FROM 2nd QUARTER 1993 (INCLUDED FOR ONE SITE 5 WELL WHERE MCLs WERE EXCEEDED)

APPROXIMATE GROUNDWATER FLOW DIRECTION

LEGEND:

ug/l MICROGRAMS PER LITER
DCA DICHLOROETHANE
DCE DICHLOROETHENE
TCE TRICHLOROETHENE
ND NOT DETECTED

COMPOUNDS GREATER THAN OR EQUAL TO MCLs ARE SHOWN; CONCENTRATIONS LESS THAN THE MCL (OR NONDETECT) ARE SHOWN IF THE MCL IS EXCEEDED IN ONE OF THE SAMPLING ROUNDS.

DENOTES AREA WHERE THE CONCENTRATION OF AT LEAST ONE CONTAMINANT EXCEEDS THE MAXIMUM CONTAMINANT LEVEL (MCL), QUERIED WHERE INFERRED.

NOTE:
RESULTS FROM SITE 6 GROUNDWATER SAMPLING INCLUDED DUE TO PROXIMITY TO SITE 4. CONTAMINANTS IN SITE 4 WELLS WILL BE INVESTIGATED AS PART OF THE PHASE 2 RI FOR SITE 6.

FIGURE 2-5

SITES 4, 4A, 5, AND 6
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
MCB CAMP PENDLETON
CALIFORNIA

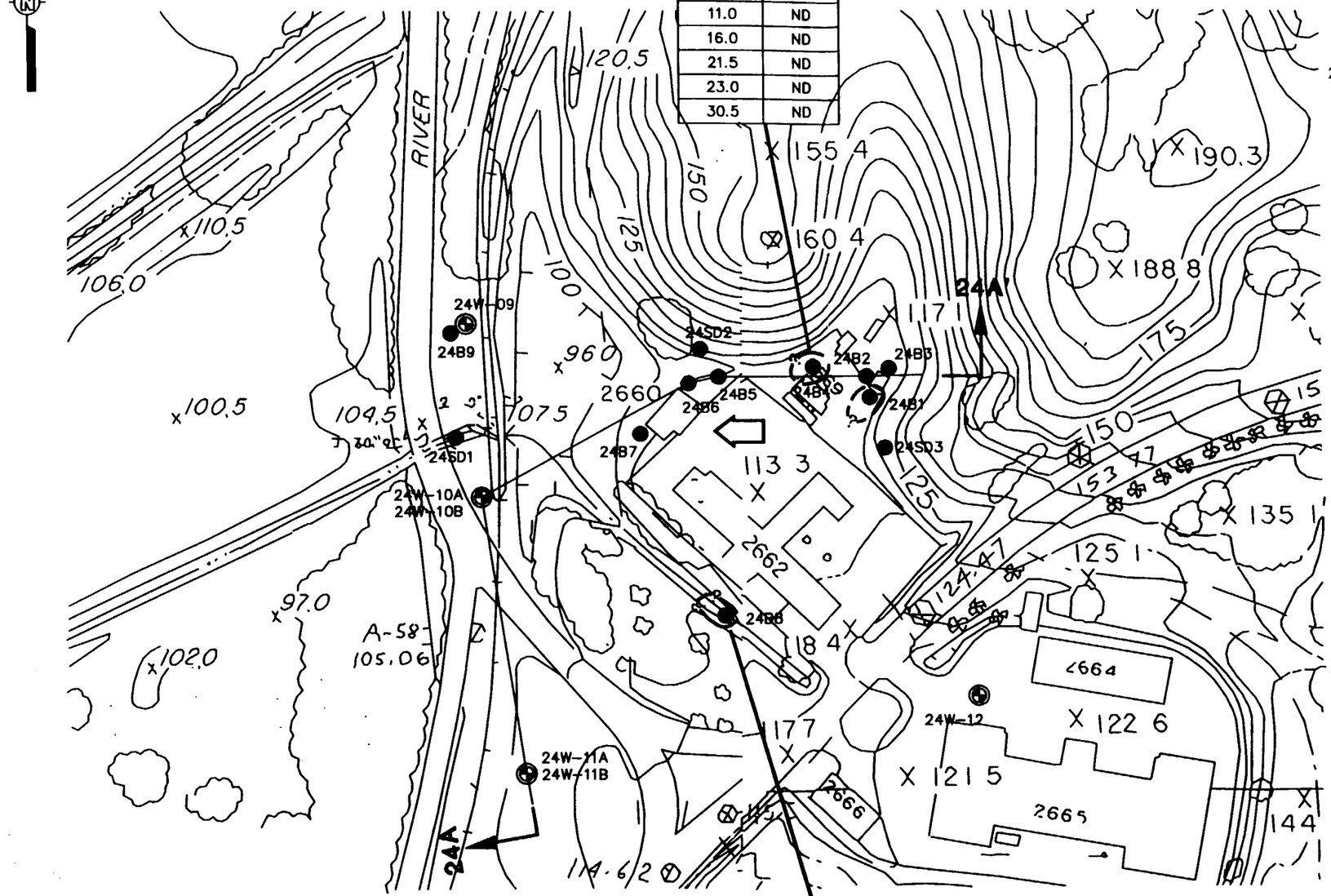
PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-89-D-9296
CLE-101-01F166-B7-0027

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE	DRAWING NUMBER
SDJF	5-24-93				10-13-93	243166-B90

24B4 DEPTH (ft)	AROCLOR 1254 (ug/kg)
1.0	480
4.0	ND
7.5	ND
11.0	ND
16.0	ND
21.5	ND
23.0	ND
30.5	ND



24B8 DEPTH (ft)	TPH-D (mg/kg)
1.0	ND
3.0	180

TOPOGRAPHIC REFERENCE:

MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 30B AND 31A
DATE: DECEMBER 1987

SCALE:
0 150 300 FEET

LEGEND:

- 24B1 / 24SD1 ● — BOREHOLE OR SURFACE SEDIMENT SAMPLE LOCATION
- 24W-12 ⊕ — MONITORING WELL LOCATION
- TPH-D — TOTAL PETROLEUM HYDROCARBONS, ANALYZED BY METHOD m8015 WITH A DIESEL CALIBRATION STANDARD
- ND — NOT DETECTED
- mg/kg — MILLIGRAMS PER KILOGRAM
- ug/kg — MICROGRAMS PER KILOGRAM
- DENOTES EXTENT OF CONTAMINATION WHERE THE CONCENTRATION OF AT LEAST ONE CONTAMINANT EXCEEDS THE RISK-BASED PRELIMINARY REMEDIATION GOAL (PRG) OR TOTAL PETROLEUM HYDROCARBON (TPH) CONCENTRATIONS >100 PPM; QUERIED WHERE INFERRED
- BERYLLIUM (ALTHOUGH ABOVE THE PRG) IS AT BACKGROUND CONCENTRATIONS, SO IS NOT SHOWN. REFER TO APPENDIX N FOR DETAILS.
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- 24A 24A' — LOCATION OF GEOLOGIC CROSS-SECTION SHOWING APPROXIMATE VERTICAL EXTENT OF SOIL CONTAMINATION

FIGURE 2-6

SITE 24
26 AREA MWR MAINTENANCE FACILITY
SUMMARY OF SOIL ANALYTICAL RESULTS
AND LOCATION OF GEOLOGIC
CROSS-SECTION 24A-24A'
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N68711-89-D-9296
CLE-101-01F166-B7-0027

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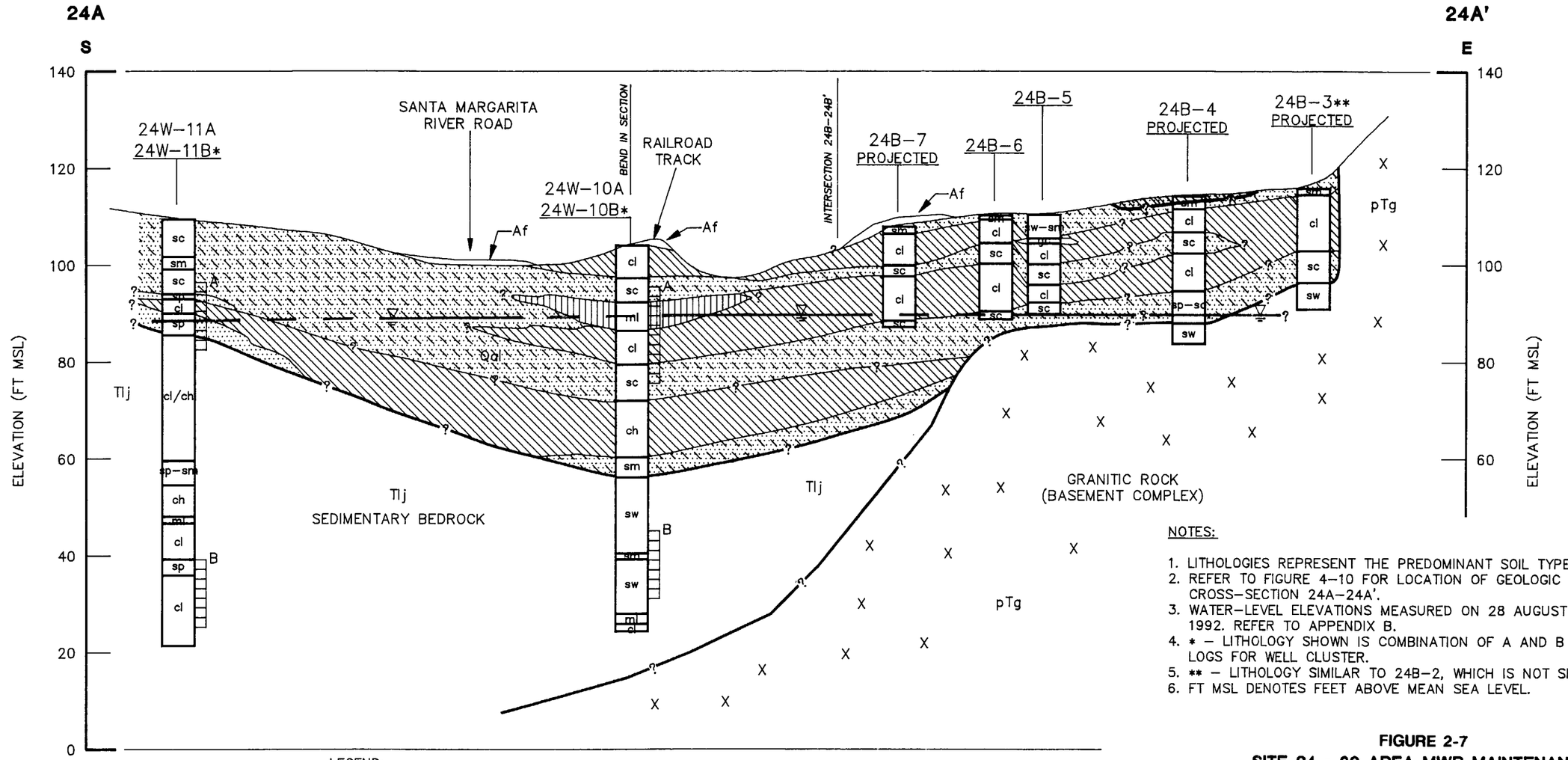
		APPROVED BY	10-2-93

DRAWING NUMBER 243166-B105



NOTES:

1. LITHOLOGIES REPRESENT THE PREDOMINANT SOIL TYPE.
2. REFER TO FIGURE 4-10 FOR LOCATION OF GEOLOGIC CROSS-SECTION 24A-24A'.
3. WATER-LEVEL ELEVATIONS MEASURED ON 28 AUGUST 1992. REFER TO APPENDIX B.
4. * - LITHOLOGY SHOWN IS COMBINATION OF A AND B LOGS FOR WELL CLUSTER.
5. ** - LITHOLOGY SIMILAR TO 24B-2, WHICH IS NOT SHOWN.
6. FT MSL DENOTES FEET ABOVE MEAN SEA LEVEL.

LEGEND:

- APPROXIMATE WATER TABLE
- B — SCREENED INTERVAL AND LETTER DESIGNATION FOR PARTICULAR WELL IN THAT CLUSTER
- SOIL CONTACT, QUERIED WHERE UNCERTAIN
- LITHOLOGIC CONTACT, QUERIED WHERE UNCERTAIN

LITHOLOGIC UNITS:

QUATERNARY ALLUVIUM (Qal):

- Qal — PREDOMINANTLY CLAY, HIGH AND LOW PLASTICITY
- Qal — PREDOMINANTLY SILT OR SILT WITH CLAY MIXTURES
- Qal — PREDOMINANTLY SAND, POORLY AND WELL GRADED
- Qal — PREDOMINANTLY SILTY SAND AND CLAYEY SAND

BEDROCK UNITS:

- Tlj — BEDROCK OF THE LA JOLLA GROUP, EOCENE NONMARINE AND MARINE SANDSTONE, SILTSTONE, CLAYSTONE, AND CONGLOMERATE
- pTg — PRE-TERTIARY GRANITIC BASEMENT
- SOIL EXHIBITING CONTAMINANT CONCENTRATIONS THAT MAY POSE A THREAT TO HUMAN HEALTH (i.e., >PRGs FOR SOIL) OR CONCENTRATIONS OF TOTAL PETROLEUM HYDROCARBONS >100 PPM

APPROXIMATE HORIZONTAL SCALE:
0 70 140 FEET

VERTICAL SCALE:
0 20 40 FEET

FIGURE 2-7
SITE 24 - 26 AREA MWR MAINTENANCE FACILITY
GEOLOGIC CROSS-SECTION 24A-24A'
SHOWING APPROXIMATE VERTICAL EXTENT OF SOIL CONTAMINATION
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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SCALE:
0 175 350 FEET

9B-17 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)	Cd (mg/kg)
1.75	350	0.51 B	1.2
3.25	35	0.27 B	13.4
5.75	6,700	0.61 B	1.4
9.25	1.3	0.24 B	ND
12.50	ND	ND	ND
18.30	7.4	ND	ND

9B-16 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)	Pb (mg/kg)
1.00	1,200	0.28 B	207
6.00	ND	0.33 B	9.5
13.00	ND	0.22 B	1.7
17.00	ND	0.59 B	6.8

9B-14 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)
1.00	81	1.9
5.75	ND	ND
9.50	ND	ND
17.00	ND	ND

9B-10 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)
0.75	210	0.44 B
1.50	570	0.15 B
5.00	180	0.21 B
7.75	ND	0.14 B
15.50	ND	0.64 B
19.80	ND	0.52 B

9B-11 DEPTH (ft)	TPH-D (mg/kg)	Be (mg/kg)	Pb (mg/kg)
1.00	1,600	0.34 B	84.4
1.75	54	0.36 B	8.1
4.25	ND	0.21 B	3.7
10.0	60	0.23 B	25.3
12.00	53	0.31 B	3.2

LEGEND:

- 9B1 / 9SD1 / 9BAS11 ● — BOREHOLE OR SURFACE SEDIMENT SAMPLE LOCATION
- MW-04D ⊕ — MONITORING WELL LOCATION
- SW1S ▲ — SURFACE-WATER SAMPLING LOCATION
- DENOTES AREA WHERE THE TOTAL PETROLEUM HYDROCARBON CONCENTRATION EXCEEDS 100 mg/kg OR BERYLLIUM EXCEEDS THE BACKGROUND CONCENTRATION; QUERIED WHERE INFERRED
- 0.005 ft/ft — APPROXIMATE GROUNDWATER FLOW DIRECTION AND GRADIENT IN SHALLOW (UNCONFINED) AQUIFER MEASURED 28 AUGUST 1992 (3rd QTR. 1992)
- Be — BERYLLIUM
- Cd — CADMIUM
- Pb — LEAD
- ft — FEET
- TPH-D — TOTAL PETROLEUM HYDROCARBONS ANALYZED BY METHOD m8015 WITH A DIESEL CALIBRATION STANDARD
- EXTENT OF TPH-D CONTAMINATION TO A DEPTH OF APPROXIMATELY 9 FEET
- EXTENT OF TPH-D CONTAMINATION TO A DEPTH OF APPROXIMATELY 6 FEET
- EXTENT OF BERYLLIUM CONTAMINATION TO A DEPTH OF APPROXIMATELY 3 FEET
- EXTENT OF TPH-D CONTAMINATION TO A DEPTH OF APPROXIMATELY 2 FEET
- ND — NOT DETECTED
- mg/kg — MILLIGRAMS PER KILOGRAM
- B — EPA QUALIFIER FOR REPORTED VALUE LESS THAN THE CONTRACT REQUIRED-DETECTION LIMIT BUT GREATER THAN OR EQUAL TO THE INSTRUMENT DETECTION LIMIT

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 13B, 13D, AND 14C
DATE: DECEMBER 1987

FIGURE 2-8
SITE 9
DELINEATION OF SOIL CONTAMINATION, INCLUDING ZONE I, ZONE II, AND HOT SPOTS
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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CLE-101-01F166-B7-0029

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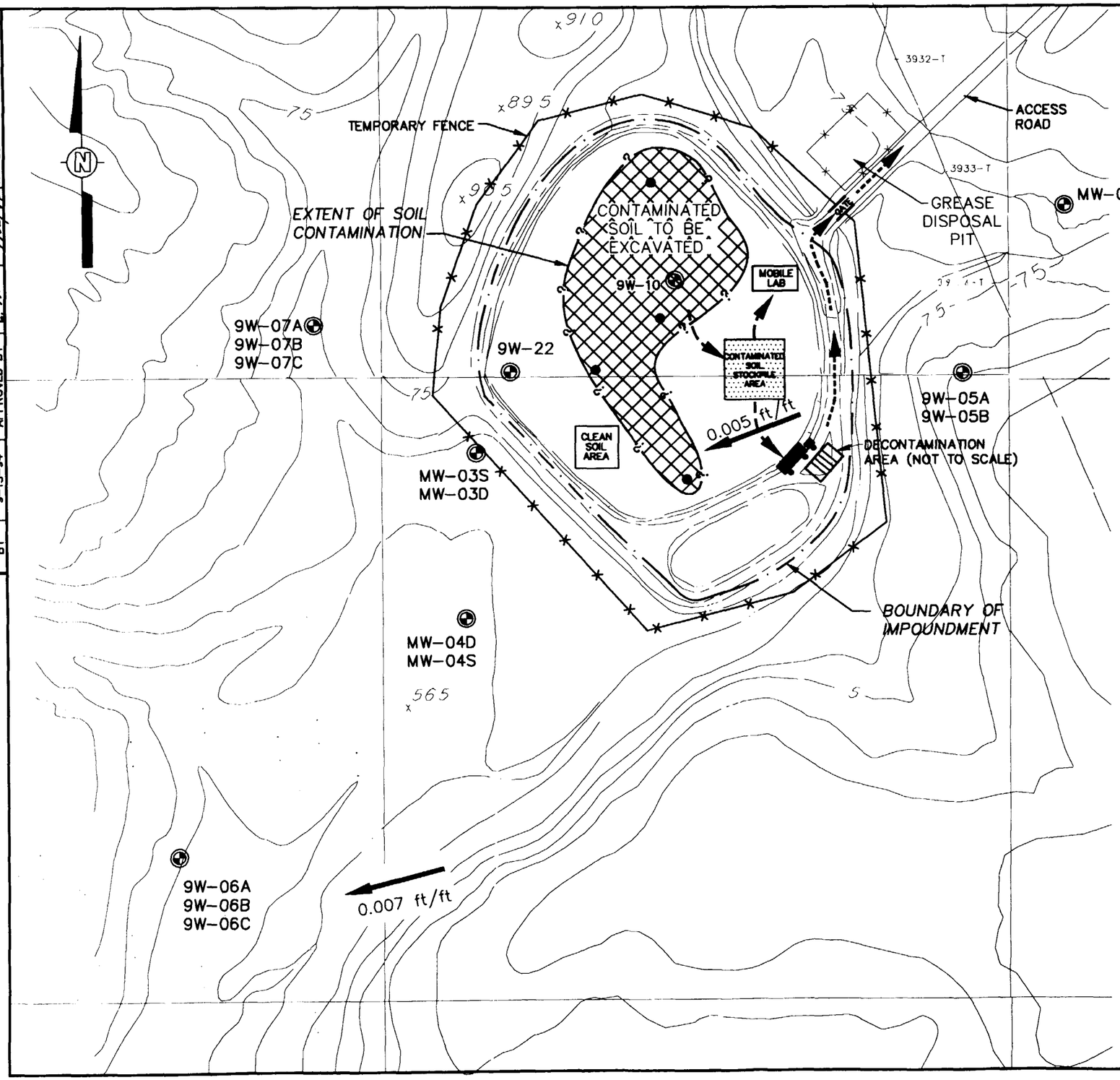

LEGEND:

9W-07A — MONITORING WELL LOCATION

0.007 ft/ft — APPROXIMATE GROUNDWATER FLOW DIRECTION AND GRADIENT IN SHALLOW (UNCONFINED) AQUIFER MEASURED 28 AUGUST 1992 (3rd Qtr. 1992)

SOIL MOVEMENT

TRUCK HAULING CONTAMINATED SOIL

LOCATIONS WITH CADMIUM OR LEAD CONCENTRATIONS POTENTIALLY EXCEEDING SOLUBLE THRESHOLD LIMIT CONCENTRATIONS (STLCs) OR BERYLLIUM CONCENTRATIONS EXCEEDING THE PROPOSED REMEDIATION GOAL (RG).

NOTE:

ALTERNATIVE 2: SOIL – EXCAVATION AND OFF-BASE LANDFILL FOR HOT SPOTS, ZONE I, AND ZONE II; GROUNDWATER-INSTITUTIONAL CONTROLS.

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 13B, 13D, 14A AND 14C DATE: DECEMBER 1987

SCALE:
0 175 350 FEET

FIGURE 2-9

SITE 9
SCHEMATIC FOR ALTERNATIVE 2
TPH-DIESEL GREATER THAN 100 mg/kg
MCB CAMP PENDLETON
CALIFORNIA

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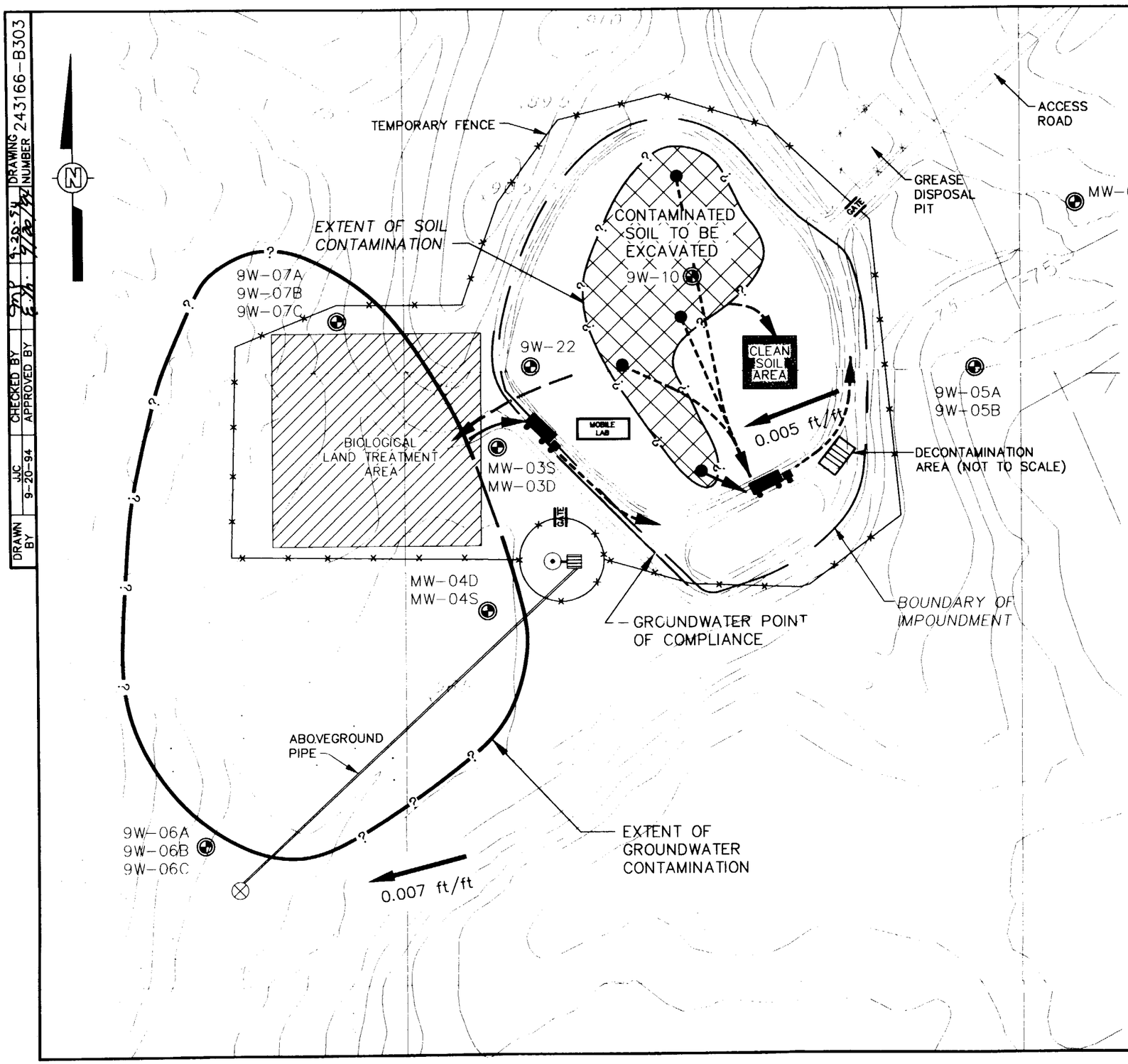

9W-07A

LEGEND:

- MONITORING WELL LOCATION
- INJECTION WELL LOCATION
- EXTRACTION WELL LOCATION
- ULTRAVIOLET(UV)/CHEMICAL OXIDATION SKID
- APPROXIMATE GROUNDWATER FLOW DIRECTION AND GRADIENT IN SHALLOW (UNCONFINED) AQUIFER MEASURED 28 AUGUST 1992 (3rd Qtr. 1992) — 0.007 ft/ft
- DENOTES EXTENT OF CONTAMINATION WHERE THE CONCENTRATION OF AT LEAST ONE CONTAMINANT EXCEEDS THE PROPOSED REMEDIATION GOALS (RGs) QUERIED WHERE INFERRED
- LOCATIONS WITH CADMIUM OR LEAD CONCENTRATIONS POTENTIALLY EXCEEDING SOLUBLE THRESHOLD LIMIT CONCENTRATIONS (STLCs) OR BERYLLIUM CONCENTRATIONS EXCEEDING THE PROPOSED REMEDIATION GOAL (RG).
- SOIL MOVEMENT
- TRUCK HAULING CONTAMINATED SOIL (NOT TO SCALE)

NOTES:

ALTERNATIVE 3: SOIL – EXCAVATION AND OFF-BASE LANDFILL FOR ZONE I AND HOT SPOTS, BIOLOGICAL LAND TREATMENT FOR ZONE II; GROUNDWATER – EXTRACTION, UV/CHEMICAL OXIDATION, AND REINJECTION.

THIS SCHEMATIC SHOWS THE GENERAL TREATMENT AREA AND INDICATES IT WILL BE FENCED. THE FENCE AND BIOLOGICAL LAND TREATMENT AREA WILL NOT EXTEND THROUGH THE RIPARIAN AREA AND ASSOCIATED DRAINAGE.

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON GENERAL DEVELOPMENT MAPS 13B, 13D, 14A AND 14C DATE: DECEMBER 1987

SCALE:
0 175 350 FEET

FIGURE 2-10

SITE 9
SCHEMATIC FOR ALTERNATIVE 3
TPH-DIESEL GREATER THAN 100 mg/kg
MCB CAMP PENDLETON
CALIFORNIA

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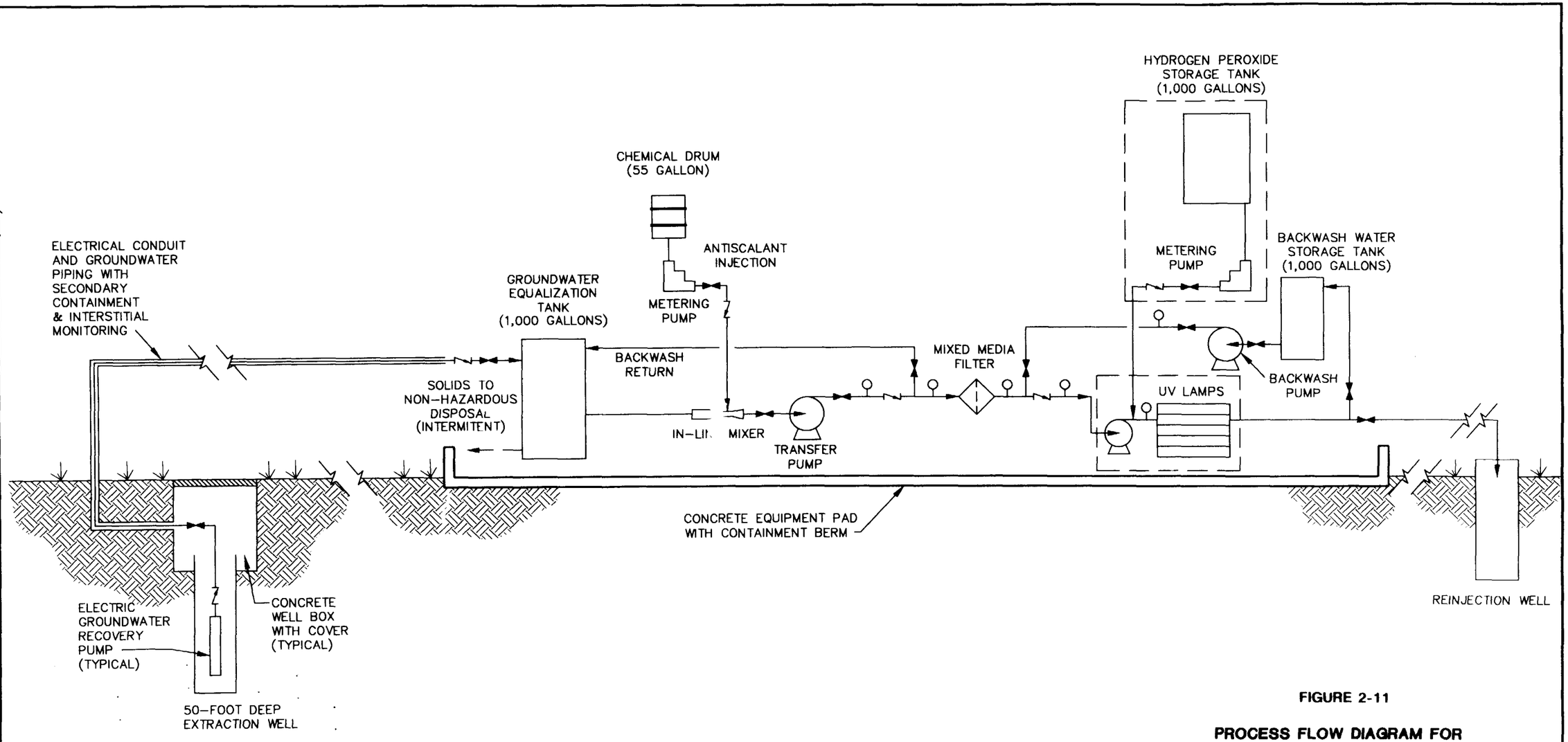

NOTE:

ALTERNATIVE 3: SOIL – EXCAVATION AND OFF-BASE LANDFILL FOR ZONE I AND HOT SPOTS, BIOLOGICAL LAND TREATMENT FOR ZONE II; GROUNDWATER – EXTRACTION, UV/CHEMICAL OXIDATION, AND REINJECTION.

LEGEND

- CHECK VALVE
- CONTROL VALVE
- PRESSURE GAGE

FIGURE 2-11

PROCESS FLOW DIAGRAM FOR GROUNDWATER TREATMENT SYSTEM (ALTERNATIVE 3)
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
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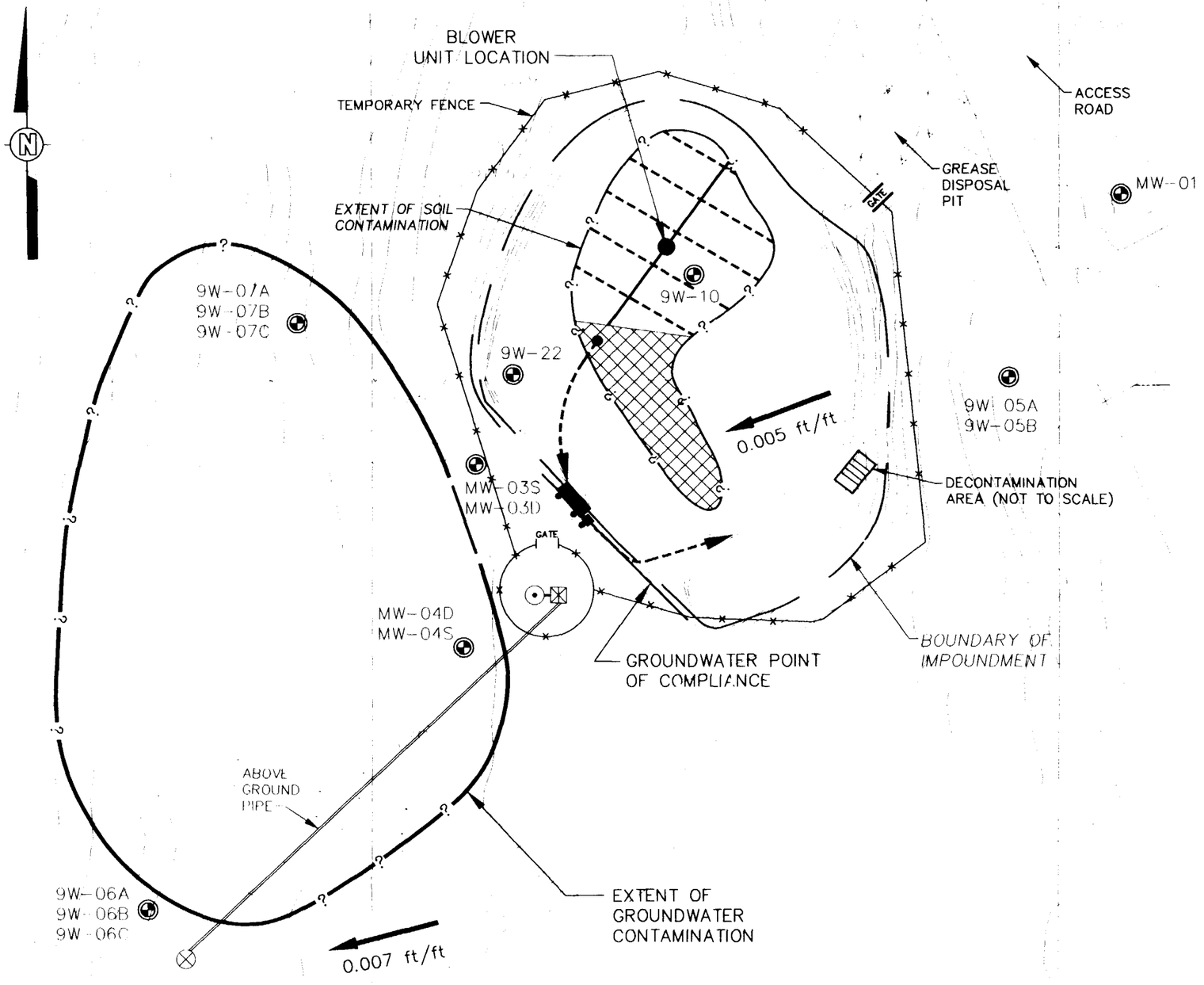

LEGEND:

- 9W-07A — MONITORING WELL LOCATION
- INJECTION WELL LOCATION
- EXTRACTION WELL LOCATION
- CARBON ADSORPTION SKID
- 0.007 ft/ft — APPROXIMATE GROUNDWATER FLOW DIRECTION AND GRADIENT IN SHALLOW (UNCONFINED) AQUIFER MEASURED 28 AUGUST 1992 (3rd Qtr. 1992)
- DENOTES EXTENT OF CONTAMINATION WHERE THE CONCENTRATION OF AT LEAST ONE CONTAMINANT EXCEEDS THE PROPOSED REMEDIATION GOALS (RGs) QUERIED WHERE INFERRED
- SOIL MOVEMENT
- TRUCK HAULING CONTAMINATED SOIL (NOT TO SCALE)
- BERYLLIUM CONCENTRATION EXCEEDING THE PROPOSED RG
- AREA TO BE TILLED
- BIOVENTING PIPE LOCATION– SOLID AIR CONDUIT
- BIOVENTING PIPE LOCATIONS– SLOTTED PIPING

NOTE:

ALTERNATIVE 4: SOIL – EXCAVATION AND OFF-BASE LANDFILL FOR ZONE I, IN SITU BIOREMEDIATION/BIOVENTING FOR ZONE II. GROUNDWATER – EXTRACTION, CARBON ADSORPTION, AND REINJECTION.

SCALE: 0 175 350 FEET

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON GENERAL DEVELOPMENT MAPS 13B, 13D, 14A AND 14C DATE: DECEMBER 1987

FIGURE 2-12

SITE 9
SCHEMATIC FOR ALTERNATIVE 4
TPH-DIESEL GREATER THAN 100 mg/kg
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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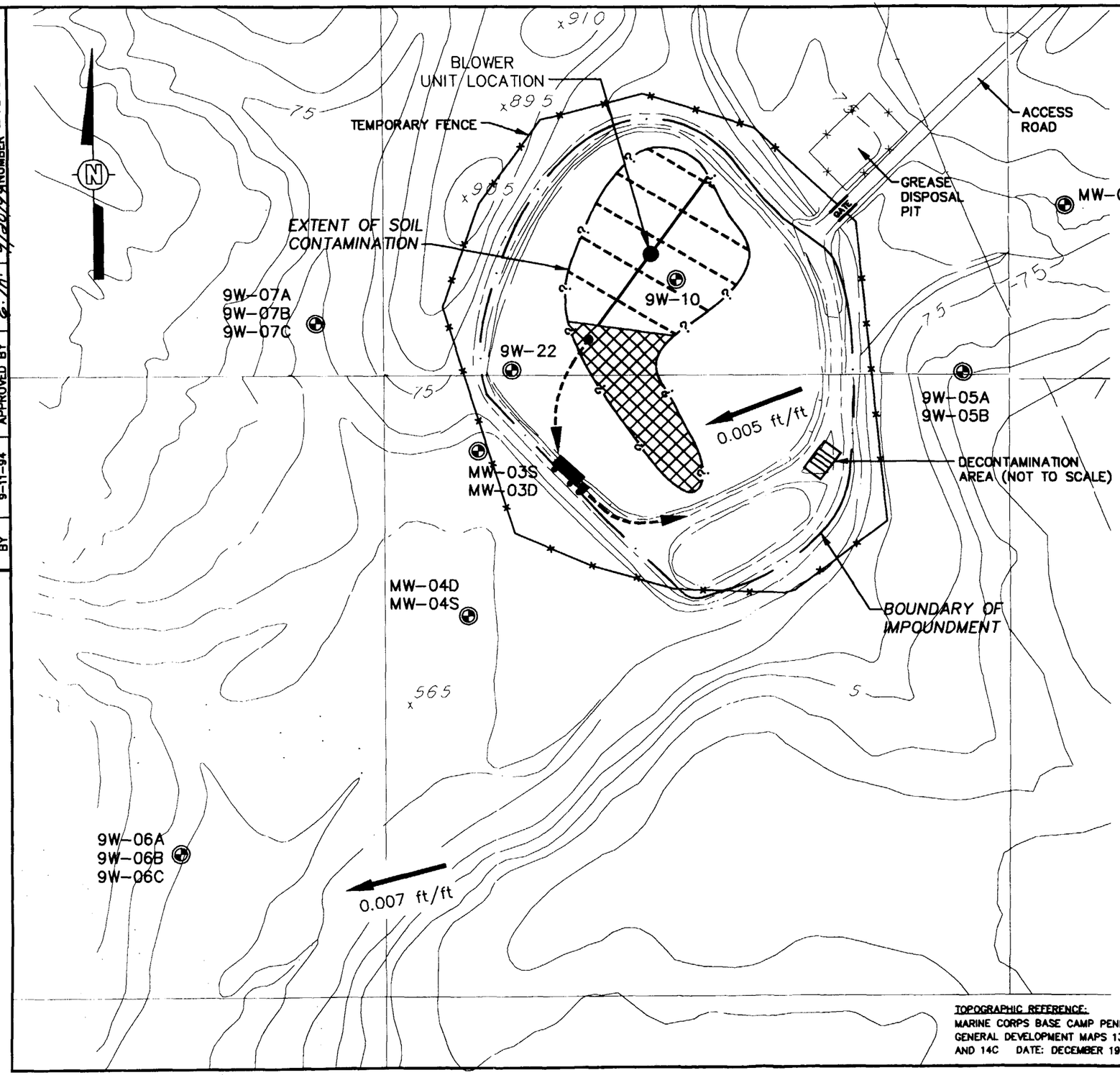

LEGEND:

- 9W-07A — MONITORING WELL LOCATION
- 0.007 ft/ft — APPROXIMATE GROUNDWATER FLOW DIRECTION AND GRADIENT IN SHALLOW (UNCONFINED) AQUIFER MEASURED 28 AUGUST 1992 (3rd Qtr. 1992)
- SOIL MOVEMENT
- TRUCK HAULING CONTAMINATED SOIL (NOT TO SCALE)
- BERYLLIUM ABOVE PROPOSED REMEDIATION GOAL
- AREA TO BE TILLED (INSITU BIOREMEDIATION)
- BIOVENTING PIPE LOCATION– SOLID AIR CONDUIT
- BIOVENTING PIPE LOCATIONS– SLOTTED PIPING

NOTE:

ALTERNATIVE 5: SOIL – EXCAVATION AND OFF–BASE LANDFILL FOR ZONE I, IN SITU BIOREMEDIATION/BIOVENTING FOR ZONE II; GROUNDWATER – INSTITUTIONAL CONTROLS.

SCALE:

0 175 350 FEET

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON GENERAL DEVELOPMENT MAPS 13B, 13D, 14A AND 14C DATE: DECEMBER 1987

FIGURE 2-13

SITE 9
SCHEMATIC FOR ALTERNATIVE 5
TPH-DIESEL GREATER THAN 100 mg/kg
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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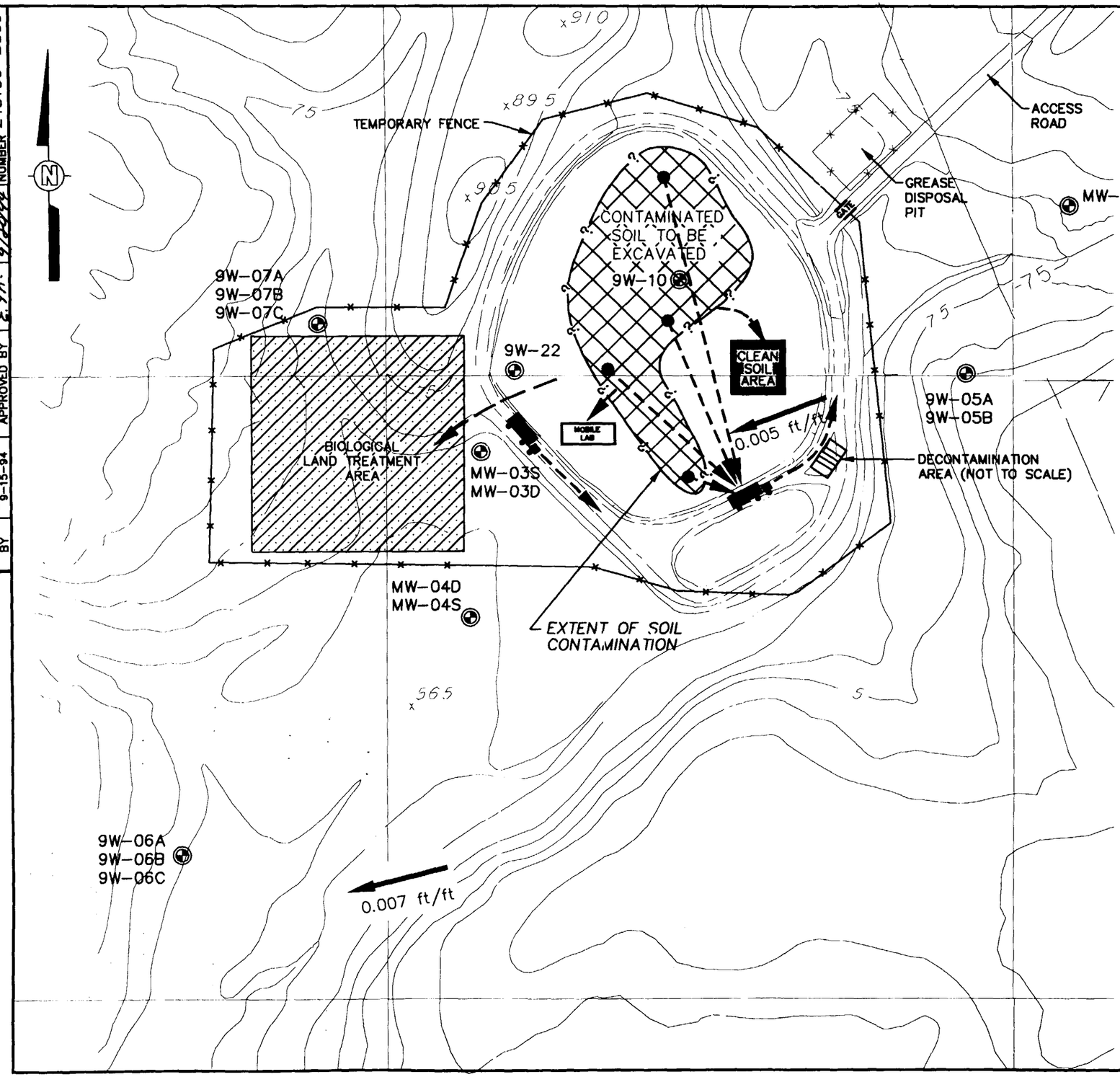

LEGEND:

9W-07A — MONITORING WELL LOCATION

0.007 ft/ft — APPROXIMATE GROUNDWATER FLOW DIRECTION AND GRADIENT IN SHALLOW (UNCONFINED) AQUIFER MEASURED 28 AUGUST 1992 (3rd Qtr. 1992)

● — LOCATIONS WITH CADMIUM OR LEAD CONCENTRATIONS POTENTIALLY EXCEEDING SOLUBLE THRESHOLD LIMIT CONCENTRATIONS (STLCs) OR BERYLLIUM CONCENTRATIONS EXCEEDING THE PROPOSED REMEDIATION GOAL (RG).

SOIL MOVEMENT

TRUCK HAULING CONTAMINATED SOIL (NOT TO SCALE)

NOTES:

ALTERNATIVE 6: SOIL – EXCAVATION AND OFF-BASE LANDFILL FOR ZONE I AND HOT SPOTS. BIOLOGICAL LAND TREATMENT FOR ZONE II; GROUNDWATER – INSTITUTIONAL CONTROLS.

THIS SCHEMATIC SHOWS THE GENERAL TREATMENT AREA AND INDICATES IT WILL BE FENCED. THE FENCE AND BIOLOGICAL LAND TREATMENT AREA WILL NOT EXTEND THROUGH THE RIPARIAN AREA AND ASSOCIATED DRAINAGE.

TOPOGRAPHIC REFERENCE:
MARINE CORPS BASE CAMP PENDLETON
GENERAL DEVELOPMENT MAPS 13B, 13D, 14A AND 14C DATE: DECEMBER 1987

SCALE:
0 175 350 FEET

FIGURE 2-14

SITE 9
SCHEMATIC FOR ALTERNATIVE 6
TPH-DIESEL GREATER THAN 100 mg/kg
MCB CAMP PENDLETON
CALIFORNIA

PREPARED FOR

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT N68711-89-D-9296
CLE-101-01F166-B7-0029

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3.0 RESPONSIVENESS SUMMARY

As previously mentioned in Section 2.3, a public review period for the Feasibility Study and the Proposed Plan for Operable Unit 1 - Site 9, Stuart Mesa Waste Stabilization Pond, was conducted during the period December 2, 1994 through January 27, 1995. In addition, a public meeting to discuss the Proposed Plan and to respond to questions or comments concerning the Proposed Plan or the Feasibility Study Report was held on January 4, 1995 at the Oceanside Senior Citizens Center. Notice of the public review period, the public meeting, and the availability of the Proposed Plan and Feasibility Study Report at the local information repositories was published in the Blade-Citizen newspaper (San Diego County residents) on December 11, 1994 and in the South County News (Orange County residents) on December 29, 1994. In addition, the Proposed Plan was widely distributed on-base through facilities frequented by base residents (e.g., Marine Exchange, Commissary, etc.). Despite efforts to solicit input from base residents and citizens from surrounding communities, no verbal or written comments were received concerning the Proposed Plan, Feasibility Study Report, Draft Final RI Report for Group A Sites, or any other of the numerous documents available to the public at the two information repositories. Similarly, the public was not represented at the public meeting held on January 4, 1995. Appendix A is the verbatim transcript of the public meeting recorded by a Certified Shorthand Reporter, Elana K. Fitzgerald, CSR No. 9651. The purpose of including this transcript into Appendix A is to document the fact that there was no public participation at the January 4, 1995 public meeting. Since there were no comments received either during the public meeting or during the public review period, general acceptance of the Proposed Plan and the Feasibility Study for Operable Unit 1 - Site 9, Stuart Mesa Waste Minimization Pond, is assumed, and a formal Responsiveness Summary is not required.

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APPENDIX A

VERBATIM TRANSCRIPT OF PUBLIC MEETING HELD
JANUARY 4, 1995
AT THE
SENIOR CITIZENS CENTER
OCEANSIDE, CALIFORNIA

CALIFORNIA DEPOSITION REPORTERS
A California Corporation
WHEN EVERY WORD COUNTS . . .

P.O. Box 108
Covina, California 91723

(800) 242-1996
(818) 915-1996

PUBLIC MEETING

Taken by	:	ED MINUGH
Commencing	:	7:15 p.m.
Location	:	455 Country Club Lane Oceanside, California 92054
Day, Date	:	Wednesday, January 4, 1995
Reported by	:	ELANA K. FITZGERALD, CSR No. 9651, RPR
Pursuant to	:	Oral agreement
Original to	:	ED MINUGH

COPY

EXHIBITS

EXHIBIT NO.	DESCRIPTION	MARKED FOR IDENTIFICATION
A	Public Meeting Attendance Record and Agenda, 11 pages	8
B	Overview of Superfund Program, 8 pages	8
C	MCB Camp Pendleton Installation Restoration Sites by Group, 1 page	8
D	Sign-in Sheet, 1 page	8

OCEANSIDE, CALIFORNIA, WEDNESDAY, JANUARY 4, 1995

7:15 P.M.

-oOo-

MR. NORQUIST: Good evening. Thank you brave souls for joining the Marine Corps Base Camp Pendleton in this public presentation of the remedial action plan for Site 9. As I look around, I see faces that I work with every day and faces that I have met over the last couple of weeks as part of the technical review committee and from southwest division and the contractor, IT Corporation. I do not recognize anyone from the public outside the base or outside the contractual regulatory agencies dealing with the installation restoration program or the technical review committee from Marine Corps Base Camp Pendleton. If that is not the case, I would like any individual outside that spectrum, anyone from the public, from the community, to identify themselves if you would.

(Pause in proceedings)

And for the record, there are no hands or no identification of any individuals outside of the Base Staff Regulatory Committee. Okay. That being the case, I'll discuss and hear some input from perhaps you regulatory agencies, USEPA, Ms. Sheryl Lauth, in the area of toxic control, Mr. Isaac Hirbawi and Mr. John Odermatt from the Regional Quality Control Board, San Diego County.

And what I would like to determine is the requirement for a public meeting when there is no public present. It's a consensus that the full requirement for a public meeting does not exist if the public is not present.

MR. ARMAS: Can I make a move that maybe we close the meeting whenever you feel, as you walk through, close the meeting and maybe wait till 7:30. Some of us -- so maybe if an individual was to walk in we could answer questions and from there maybe officially say we waited long enough.

Is that a consensus? Can I recommend that? Counsel, would you agree?

MR. SCHARFEN: I think that is a reasonable response in this situation. Good faith effort to make the information available to the public.

MR. NORQUIST: Our court recorder here is Elana Fitzgerald; is that correct?

THE REPORTER: (Nods head).

MR. NORQUIST: She will provide a transcript of what we have determined and we will adjourn these proceedings at this point and we will wait until 1930 at which time we'll see if anyone does show up from the public and we can go through one on one with them perhaps a presentation. If not, we will terminate the proceedings at that time.

MR. ARMAS: And for the record maybe could you very quickly go through the scope of what the meeting is for. The

specific scope as you probably have it there. So if you could add that on the record.

MR. NORQUIST: This meeting is convened to enable Marine Corps Base Camp Pendleton to meet its moral obligation and legal requirement to present its plan for remedial action for Site 9 aboard Marine Corps Base Camp Pendleton to the public and to allow public input and comment on that remedial action plan prior to implementation. The public not being present at this time for that input, we would adjourn for about 15 minutes or so to allow them to come on board and for us to present that to them.

MR. NORQUIST: Did you want anything further?

MR. ARMAS: I think that's good, Stan. Just make sure we go on the record as to what the scope is.

MR. NORQUIST: We certainly can skip some of these. Tonight's agenda, complete agenda, was to discuss the CERCLA process and Sheryl Lauth from USEPA was going to do that. The IR program, installation restoration, for Marine Corps Base Camp Pendleton was going to be presented by Ms. Jane Joy and then alternatives for remedial action as applied to Site 9 was to be presented by Robin Smith of International Technologies Corporation. After that, Jane Joy was going to review the alternative of the Marine Corps Base Camp Pendleton, had selected and go through the considerations that were involved in -- in arriving at that determination for that course of

remedial action and then after that we would open it up to the public for comment, receive those comments and then adjourn the meeting. We have published in the local media a notice of this meeting and provided opportunity for comments with the addresses and the time frame for those responses to be provided.

MR. SCHARFEN: I think we can attach our information sheet to the record.

MR. NORQUIST: Um-hum.

MR. SCHARFEN: Anything that we have that was available for the public we should attach to the record.

MR. NORQUIST: Major Scharfen recommended that we attach our proposed plan to the record which we will certainly do and publish that record.

Is there any other considerations that you feel we might address as a body?

MR. ARMAS: Just that we could have everybody that is here today sign the official record so that also could be attached to the minutes of the meeting as those present today that would be really good.

MR. NORQUIST: Just make sure that each of us here sign the roster before we leave.

Keith LeBouef, if you would have that up here at the table and let's make sure that we all sign it.

MR. UETZ: General Norquist, were any written notices received pursuant to the notice?

MR. NORQUIST: To date have any written comments been received? No?

MS. JOY: (Inaudible).

THE REPORTER: I couldn't hear that.

MR. NORQUIST: I'll repeat what she said. No comments have been received. The comment period is open until the 27th of January of '95.

Okay. This meeting stands adjourned and after about 10, 15 minutes you will hear me announce that we're dismissed unless we have someone else here.

(Recess)

MR. NORQUIST: Okay. If I can have your attention, please. The time is about 1933, that's 7:33 p.m. for some of you. Has anyone come in from the community? If so, identify yourself, please. No identification. No one has come in from the community.

For the record, let it be shown that at 1900 Marine Corps Base Camp Pendleton opened its public presentation on its plan, proposed plan for remedial action for Site 9 of the installation restoration program aboard Marine Corps Base Camp Pendleton. There was no public representation outside the base or immediate contractual or regulatory staff dealing with the Site 9 remedial action process and therefore the presentation was not presented and the meeting adjourned at 1934, 7:34 p.m. This meeting stands adjourned. I thank you very much.

(Exhibits A through D marked)

(The public meeting was concluded at 7:34 p.m.)

REPORTER'S CERTIFICATE

STATE OF CALIFORNIA)
) ss
COUNTY OF SAN DIEGO)

I, ELANA K. FITZGERALD, CSR No. 9651, a Certified Shorthand Reporter for the State of California do hereby certify:

That said public meeting was taken before me at the time and place therein stated and was thereafter transcribed into print under my direction and supervision, and I hereby certify the foregoing public meeting is a full, true and correct transcript of my shorthand notes so taken.

I further certify that I am not of counsel or attorney for either of the parties hereto or in any way interested in the event of this case and that I am not related to either of the parties thereto.

Witness my hand this 10th day of January, 1995

Elana K. Fitzgerald

ELANA K. FITZGERALD
CSR No. 9651, RPR

CERTIFIED COPY CERTIFICATE

I, Elana K. Fitzgerald, a Certified Shorthand Reporter, No. 9651, hereby certify that the attached public meeting is a correct copy of the original transcript of the public meeting, taken before me on January 4, 1995, as thereon stated.

I declare under penalty of perjury that the foregoing is true and correct.

Executed at San Diego, California, this 10th day of January, 1995.

Elana K. Fitzgerald

ELANA K. FITZGERALD
CSR No. 9651, RPR

PUBLIC MEETING ATTENDANCE RECORD

Date

Please Print Name _____

Mailing Address _____

Street, P. O. Box or Route & Box

_____

City, State, Zip Code

Name of Official, Organization, or Group you represent

_____

Check Appropriate Blocks	
☐ I want to make a statement	☐ I am a property owner in the project area
☐ I will hand in a written statement	
☐ I do not plan to make a statement	☐ I am a resident in the project area

MARINE CORPS BASE, CAMP PENDLETON
INSTALLATION RESTORATION PROGRAM
PROPOSED PLAN FOR SITE 9
PUBLIC MEETING

4 JANUARY 1995

AGENDA

7:00 PM	Welcoming Remarks and Introductions	LtCol Norquist Deputy, Environment Assistant Chief of Staff, Environmental Security
	The CERCLA Process	Ms. Sheryl Lauth Remedial Project Manager U.S. Environmental Protection Agency
	Status of the Camp Pendleton Installation Restoration Program	Ms. Jayne Joy Environmental Engineering Division Assistant Chief of Staff, Environmental Security
	Alternatives Evaluated for Site 9	Ms. Robin Smith Feasibility Study Manager IT Corporation
	Proposed Plan for Site 9	Ms. Jayne Joy
	Public Comments	
8:30 PM	Adjourn	

A.2

Marine Corps Base Camp Pendleton Superfund Site

Naval Facilities Engineering Command, Southwest Division

Camp Pendleton, California — November 1994

NAVY PROPOSES PLAN FOR REMEDIAL ACTION AT OPERABLE UNIT 1

INTRODUCTION

The U.S. Department of the Navy (Navy), in cooperation with the U.S. Environmental Protection Agency (EPA), the California Regional Water Quality Control Board (RWQCB), and the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), is soliciting public comment on the results of environmental investigations and the proposed *remedial alternatives* for soil and groundwater at *operable unit 1 (OU1)* at the Marine Corps Base Camp Pendleton, California (MCB CamPen) Superfund site (Figure 1). OU1 consists of *unsaturated soil* and *groundwater* at the location known as Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond (Figure 2). The Navy is the lead federal agency for site activities, EPA is the lead regulatory agency, and RWQCB and DTSC are support agencies for proposed cleanup actions.

NOTE: Terms in italics are explained in the Glossary of Terms.

Section 117 of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)*, as amended by the *Superfund Amendments and Reauthorization Act of 1986 (SARA)*, requires that the public be advised of any proposed remedial actions, and afforded the opportunity to comment, either orally or in writing, on such plans. This *proposed plan* documents a proposed no action alternative for addressing chemicals detected in low concentrations in the unsaturated soils at Site 9 (Figure 2), and proposes institutional controls, in the form of long-term monitoring (10 years) and restrictions on the use of *groundwater* in the vicinity of Site 9 for drinking water purposes, as the preferred alternative for dealing with low concentrations of chemicals detected in the groundwater at Site 9. The no action alternative for soil has been proposed because the *baseline risk assessment*, contained in the Draft Final Remedial Investigation Report for Group A

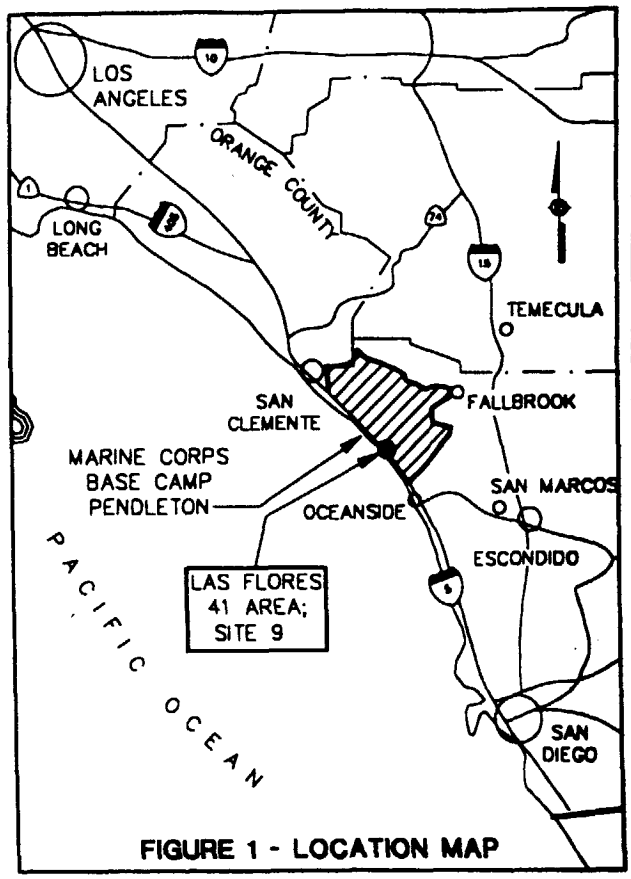

FIGURE 1 - LOCATION MAP

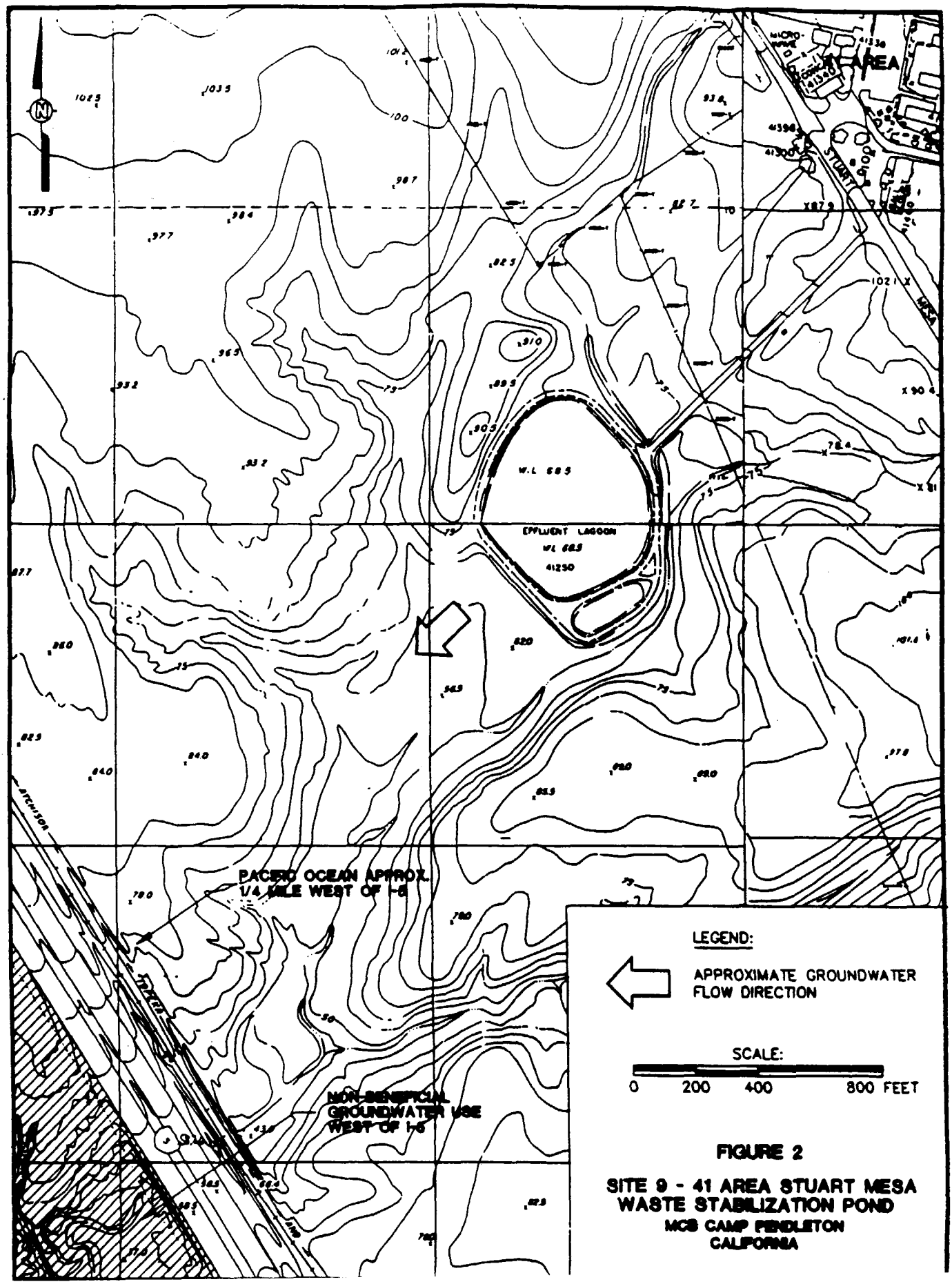

FIGURE 2

SITE 9 - 41 AREA STUART MESA
WASTE STABILIZATION POND
MCB CAMP PENDLETON
CALIFORNIA

Sites (Navy, October 1993), concluded that based on current and future military land use scenarios, and hence *exposure pathways*, the chemical concentrations present in soil do not pose risks to human health which are appreciably greater than the risks associated with *background concentrations* of contaminants in the soil. Similarly, there are no threatened or endangered species or sensitive habitat areas at Site 9 that would be adversely affected by the low concentrations of chemicals in the soil.

The 1993 Remedial Investigation (RI) Report contains the results of environmental investigations and the baseline risk assessment conducted for soil and groundwater at Site 9. The 1994 *Feasibility Study* identifies and evaluates various remediation alternatives for Site 9. Both documents are part of the MCB Camp Pendleton *Administrative Record* and are available for public review at the Camp Pendleton Base Library and at the Oceanside Public Library. The public comment period on the Feasibility Study and this Proposed Plan is scheduled to begin **12 December 1994** and end **27 January 1995.** A public meeting will also be conducted during the public comment period. The Navy will consider all comments received from the public on the Feasibility Study and the Proposed Plan in making the final decision regarding the Site 9 - 41 Area Waste Stabilization Pond cleanup.

Facility Description

MCB Camp Pendleton is located between the cities of Los Angeles to the north and San Diego to the south (Figure 1). It is the Marine Corps' primary amphibious training center for the West Coast. Construction of MCB Camp Pendleton began in March 1942, and the base was dedicated in September 1942 by President Franklin D. Roosevelt. The base encompasses approximately 125,000 acres, most of which is in San Diego County. Surrounding communities include San Clemente to the northwest, Fallbrook to the east, and Oceanside to the south. The base is bordered to the west by the Pacific Ocean, which includes 17 miles of undisturbed coast. Since its inception, the primary mission of the base has been training. The base currently supports more than 36,000 military personnel and their dependents, and employs approximately 4,600 civilians.

Site Background

Site 9, also known as the 41 Area Stuart Mesa Waste Stabilization Pond, is located in an uninhabited area approximately one-quarter mile from Stuart Mesa road in the 41 Area and approximately one-quarter mile east of Interstate 5. The abandoned surface impoundment covers an area approximately 400 by 500 feet. The waste stabilization pond was operated as a sewage lagoon for oxidation and percolation of raw sewage generated in the 41 Area from 1963 until 1974 or 1975. In 1975, a wet well and lift station were installed in 41 Area to pump raw sewage to a treatment facility in 43 Area, and the use of the stabilization pond was discontinued. The waste stabilization pond, which contains water only briefly following heavy rainfall, has also been used for stockpiling of soils contaminated with petroleum hydrocarbons, primarily fuel and oil.

Scope and Role of Operable Unit 1

MCB Camp Pendleton and the Department of the Navy have been actively involved in the *Installation Restoration (IR) Program* process since 1980. The IR Program consists of the following phases:

- Preliminary Assessment/Site Inspection (PA/SI). The goal of the preliminary assessment is to review base activities and identify all sites that may require remediation. The site inspection is an on-site investigation to augment data collected during the preliminary assessment and to generate sampling and other field data required to evaluate whether additional investigation or action is appropriate.

- Remedial Investigation/Feasibility Study (RI/FS). The objective of the remedial investigation is to assess the nature and extent of contamination to a level of detail sufficient to support a risk assessment and feasibility study. During the feasibility study, the data compiled during the remedial investigation are used to develop and evaluate options for remedial action.

- Remedial Design/Remedial Action (RD/RA). The goal of the remedial design is to conduct technical analyses, following selection of a remedy for a site, as necessary to provide detailed plans and specifications for implementation of the remedial action. Remedial action is remediation of the site.

Forty-two sites have been identified for inclusion in the RI/FS phase, including regional groundwater, surface water, sediment, and wetland studies. The sites were divided into four manageable groups: Groups A, B, C, and D. Group A consists of six sites. The October 1993 Remedial Investigation Report for Group A Sites describes in considerable detail the site histories, physical characteristics of each site, a description of the remedial investigations conducted at each site, and the nature and extent of contamination at each of the Group A sites. The RI Report also includes the findings of the baseline human health and ecological risk assessments for the Group A sites, which include Site 9 - Stuart Mesa Waste Stabilization Pond. Expedited removal actions will be conducted at three of the Group A Sites (3, 5, and 6) in accordance with EPA guidelines.

Operable Unit 1 consists only of Site 9 - Stuart Mesa Waste Stabilization Pond. Both the soil and the groundwater beneath the waste stabilization pond have been contaminated with low levels of chemicals. The September 1994 Feasibility Study identified and evaluated several remedial alternatives for both the soil and the groundwater. The findings contained in the RI Report and the evaluations of the remedial alternatives contained in the Feasibility Study Report are the basis for determining the preferred alternative outlined in this Proposed Plan.

Summary of Site Risks

The RI identified beryllium and total petroleum hydrocarbons in the diesel fuel range (TPH-diesel) as soil contaminants that require evaluation for potential remedial action. The naturally-occurring background concentration for beryllium in soils located outside of the Waste Stabilization Pond (Site 9) is estimated to be in the range from <0.1 to 1.1 parts per million (ppm). In order to estimate the actual range of natural background soil concentrations for beryllium, the Navy collected and chemically analyzed 71 soil samples from the vicinity of Site 9. The maximum beryllium concentration observed at Site 9 was 1.9 ppm detected in a single soil sample located inside the Waste Stabilization Pond. The range in concentrations of total petroleum hydrocarbons for diesel fuel in soils from Site 9 was <0.5 (Non-Detectable) to 6,700 ppm.

As a means of estimating the human health risks caused by exposure to contaminants, EPA has established an acceptable range of risk levels, which are presented as *incremental lifetime cancer risks (ILCRs)* for carcinogens (cancer-causing chemicals) and *hazard indices* (HIs) for noncarcinogens (non-cancer-causing chemicals). EPA considers an ILCR range of $1x10^{-6}$ (one in a million) to $1x10^{-4}$ (one in ten thousand) an acceptable range for carcinogens. EPA considers an HI value of less than one for noncarcinogens to be protective of human health. The results of the human health risk assessment indicate that all current and future risks are within EPA's acceptable risk range. Therefore, the soil at Site 9 does not pose a risk to human health or the environment.

Unlike the individual chemical constituents of petroleum hydrocarbons, cancer risk factors associated with TPH-diesel (a mixture of chemicals) are not published by either State or Federal regulatory agencies. Guidance concerning recommended maximum concentrations of TPH-diesel in soil is based primarily on the protection of groundwater, and is based on site-specific conditions. The overriding consideration is the leachability of hydrocarbons from contaminated soil to the groundwater. According to the guidance provided in the California State Water Resources Control Board publication Leaking Underground Fuel Tank (LUFT) Field Manual, TPH-diesel concentrations of 1,000 ppm can be allowed to remain in place at Site 9. The LUFT Manual guidance was initially used in the absence of site-specific leachability studies.

Groundwater contaminants at Site 9 that require evaluation for potential remedial action are tetrachloroethene (PCE) and trichloroethene (TCE). The presence of these contaminants in groundwater did not result in an ILCR exceeding $1x10^{-6}$, regardless of whether the maximum or average concentration was used in the risk calculation, and based on a current military use scenario. The results of the human health risk assessment indicate that future risk, utilizing an improbable residential *land use scenario*, is within EPA's acceptable risk range. However, both chemicals have been, on occasion, detected in groundwater samples at concentrations exceeding the State and Federal maximum contaminant levels (MCL) of 5.0 parts per billion (ppb). PCE was detected in only one groundwater monitoring well at a maximum concentration of 18 ppb, while TCE was detected in a different well at a maximum concentration of 15 ppb. The range of contaminants observed in

groundwater during six separate sampling events are as follows:

Compound	State MCL (ppb)	Federal MCL (ppb)	Observed Range (ppb)	Maximum Observed (ppb)
Tetrachloroethene (PCE)	5	5	4-18	18
Trichloroethene (TCE)	5	5	1-15	15

Summary of Alternatives

Seven alternatives were identified as potential remedial alternatives for Site 9. Each alternative addressed both the soil and the groundwater media.

For purposes of evaluating the treatment alternatives, contaminated soil at Site 9 was grouped into three types. Zone 1 soil contains beryllium concentrations exceeding the proposed remediation goal (PRG) of 0.69 ppm, which is the background concentration for beryllium in soils at Site 9. Zone II soil contains TPH-diesel concentrations exceeding 100 ppm (Option 1) or 1,000 ppm (Option 2). Volumes of soil with concentrations of metals that potentially exceed State or Federal hazardous waste leaching criteria are designated as "hot spots."

The seven remedial alternatives which were evaluated in the Feasibility Study are:

- Alternative 1: No Action

- Alternative 2: **Soil** - Excavation and Off-Base Disposal (Landfill) for Hot Spots, Zone I, and Zone II
  Groundwater - Institutional Controls (groundwater monitoring for 10 years and land use restrictions so that the groundwater is not used for drinking water)

- Alternative 3: **Soil** - Excavation and Off-Base Disposal (Landfill) for Zone I and Hot Spots; Biological Land Treatment for Zone II
  Groundwater - Extraction, ultraviolet (*UV*)/Chemical Oxidation, and Reinjection, with groundwater monitoring

- Alternative 4: **Soil** - Excavation and Off-Base Disposal (Landfill) for Zone I; In Situ Bioremediation/Bioventing for Zone II
  Groundwater - Extraction, Carbon Adsorption, and Reinjection, with groundwater monitoring

- Alternative 5: **Soil** - Excavation and Off-Base Disposal (Landfill) for Zone I; In Situ Bioremediation/Bioventing for Zone II
  Groundwater - Institutional Controls (groundwater monitoring for 10 years and land use restrictions so that the groundwater is not used for drinking water)

- Alternative 6: **Soil** - Excavation and Off-Base Disposal (Landfill) for Zone I and Hot Spots; Biological Land Treatment for Zone II
  Groundwater - Institutional Controls (groundwater monitoring for 10 years and land use restrictions so that the groundwater is not used for drinking water)

- Alternative 7: **Soil** - No Action
  Groundwater - Institutional Controls (groundwater monitoring for 10 years and land use restrictions so that the groundwater is not used for drinking water)

The detailed analysis of alternatives provides the information necessary for decision-makers to select a site remedy. Each alternative was assessed in accordance with the EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, with consideration of the following:

- Overall protection of human health and the environment
- Compliance with *Applicable or Relevant and Appropriate Requirements (ARARs)*
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume
- Short-term effectiveness
- Implementability
- Cost.

Two other criteria, State acceptance and community acceptance, will be assessed after public comment on the FS and this Proposed Plan.

The alternative analysis, discussed in detail in the FS, is summarized as follows:

Criteria	Alternatives						
	1	2	3	4	5	6	7
Overall Protection of Human Health and the Environment	No	Yes	Yes	Yes	Yes	Yes	Yes
Compliance with ARARs (Note 1)	No	Yes[a]	Yes	Yes	Yes[a]	Yes[a]	Yes[a]
Long-Term Effectiveness and Permanence	NA	Low	High	High	Mod	Mod	Low
Reduction of Toxicity, Mobility, or Volume	No	Low	High	High	High	High	Low
Short-Term Effectiveness	NA	Mod	Mod	High	High	Mod	NA
Implementability	NA	High	Mod	High	High	Mod	High
Cost ($ millions)							
Option 1	0	4.1	2.4	1.3	0.7	1.8	0.4
Option 2	0	1.5	1.4	1.1	0.5	0.8	

Description of the Preferred Alternative

As previously mentioned, each of the seven remedial alternatives considered both the soil and groundwater media. Based on the detailed information provided in the RI Report and the FS Report, the Navy has identified Alternative 7 as the preferred alternative. The rationale for the selection of Alternative 7 is as follows:

Soil Media: No Action

The human health risk associated with the beryllium in the soil, utilizing the future residential land use scenario, is an ILCR of $2x10^{-5}$, which is within the acceptable range determined by the EPA of $1x10^{-6}$ to $1x10^{-4}$. The future residential land use scenario represents the most conservative approach when conducting human health risk assessments. The probability that Site 9 will ever be used for anything other than training is extremely low. In addition, beryllium was detected in only one boring in the Site 9 impoundment at levels that exceeded the area background concentrations of beryllium. The single sample found to contain 1.9 ppm of beryllium was from a depth of 1 foot below the surface at one specific location. In the unlikely event that the impoundment is utilized for residential purposes at some time in the future, considerable grading and import of clean fill would be required. Thus, site preparation would in all probability result in a lesser likelihood for dermal contact or ingestion of soil containing elevated levels of beryllium.

The primary concern for the TPH-diesel concentrations in soil at Site 9 is that these hydrocarbons as well as other metals present in the soil, could leach to the groundwater and degrade the quality of the shallow groundwater. In order to assess the potential for such leaching, soil samples were collected from the locations and depths containing maximum concentrations of beryllium and TPH-diesel and submitted to the laboratory for analysis using the *synthetic precipitation leaching procedure* (SPLP; U.S. EPA Method 1312) for volatile organics, and the *waste extraction test (WET)* for beryllium, cadmium, and lead. The test results showed that these compounds were not detected in the extract solution. Based on the results of these leachability tests, TPH-diesel, beryllium, cadmium, and lead are not expected to leach to, or degrade, the groundwater.

Groundwater: Institutional Controls and Long-Term Groundwater Monitoring

As previously mentioned, concentrations of tetrachloroethane (PCE) and trichloroethene (TCE) do not pose a significant risk to human health using either the maximum or average concentration of those chemicals, and utilizing the current military use scenario in the risk calculations. Although these compounds do not pose a significant health risk, both have been detected in individual samples at concentrations which exceed the State and Federal maximum contaminant levels (MCLs). As shown in the FS Report, there are several treatment alternatives which can effectively remove these constituents from groundwater. The difficulty does not lie in the ability to successfully treat the groundwater, but in the ability to pump sufficient quantities of groundwater from the *aquifer*.

It was determined during the remedial investigation that much of Site 9 is underlain by highly impermeable marine terrace deposits. Wells installed in these deposits could not be tested using conventional pumping techniques because these wells yielded extremely small quantities of groundwater. Based on the results of the RI, it is not likely that wells completed in these deposits would be considered suitable as a source of municipal or domestic water supply. In addition, implementability of any groundwater treatment alternatives which involve groundwater extraction will necessarily be hampered by the low *permeability* of the marine terrace deposits, and consequently the low yield of wells completed in those deposits.

Computer modeling suggests that the low concentrations of contaminants in Site 9 groundwater will not reach the ocean. The computer model used was not extensively calibrated to the hydrogeologic conditions at Site 9. For these reasons, results of computer modeling performed for this site should not be considered definitive, but a best estimate based upon available information. However, the computer modeling results suggest that an impact on marine receptors is not likely. There are no users of groundwater downgradient between Site 9 and the ocean, and the groundwater flow path is through the nonbeneficial zone which is located approximately one-quarter mile west of Site 9 (parallel to Interstate 5). Although levels of PCE and TCE above MCLs were detected in groundwater beneath the Waste Stabilization Pond, the groundwater fate and transport model indicates that concentrations of contaminants will be reduced to below maximum contaminant levels by dispersion and natural attenuation within 30 years. As indicated in the preamble to the National Oil and Hazardous Pollution Contingency Plan, the use of natural attenuation as a remediation technique is consistent with EPA's groundwater protection policy when active restoration is not practical or warranted due to site conditions, and groundwater is unlikely to be used in the foreseeable future. Alternative 7 specifies that groundwater will be sampled and analyzed semi-annually for 10 years to ensure that dispersion and natural attenuation is occurring, and that contaminant levels are not increasing as a result of some unknown source. During the long-term monitoring period, and until contaminants in the groundwater at the site are at or below Maximum Contamination Levels (MCLs), the base masterplan will be amended to restrict future access to the groundwater in the immediate vicinity of Site 9. As required by current regulations, a compliance monitoring program consisting of eight rounds of groundwater sampling will be conducted after 7 years to assess the effectiveness of the dispersion and natural attenuation of the low concentrations of PCE and TCE in the groundwater. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) will be achieved over time through natural groundwater attenuation. Compliance with water quality objectives and the need for further action will be re-evaluated periodically during the groundwater monitoring period.

Glossary of Terms

Remedial Alternative - One of several alternatives for remediating, or cleaning up, a site.

Operable Unit - Made up of one or more sites with similar characteristics that may require the same or similar methods of remediation.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) - Commonly referred to as the Superfund, authorized Federal action to respond to the release, or substantial threat of release, into the environment of hazardous substances, pollutants, or contaminants which may present an imminent or substantial danger to public health or welfare.

Superfund Amendments and Reauthorization Act of 1986 (SARA) - Reauthorized CERCLA and amended the authority and requirements of CERCLA and associated laws.

Proposed Plan - A document intended to facilitate public participation in the remedy selection process by identifying the preferred alternative for a remedial action at a site or operable unit and explaining the reasons for the preference.

Unsaturated Soil - Soil in which the space between grains is not filled with water.

Groundwater - Water beneath the ground surface found in between soil grains and cracks in rocks.

Baseline Risk Assessment - The process of defining the actual and potential risks of various types of pollution to human health and the environment. The "environment" in this context refers to all animals and plants, in addition to air, water, and soil, and how they may be affected by exposure to significantly higher levels of hazardous materials.

Exposure Pathways - Means by which humans or animals may be exposed to contaminants, including dermal exposure, ingestion, inhalation, food chain, etc.

Background Concentrations - Naturally occurring concentrations of certain compounds in soil and/or groundwater, including minerals, heavy metals, and organic compounds. Background concentrations are often determined statistically, and are expressed as mean (average) or reasonable maximum exposure (RME) levels.

Feasibility Study - An engineering evaluation of several alternatives which may be used to remediate a site. Criteria used to evaluate the alternatives include overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements, long-term effectiveness and relevance, reduction of toxicity, short-term effectiveness, implementability, and cost.

Administrative Record - A record of all information considered or relied upon in selecting a remedy. The record must be maintained "at or near" the facility at issue and must be available to the public.

Installation Restoration (IR) Program - Navy program to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps activities.

Incremental Lifetime Cancer Risk (ILCR) - The risk of developing cancer, due to exposure to a contaminant, which is in addition to the cancer risk from all other sources during a lifetime.

Hazard Index (HI) - Potential for noncancer toxicity from exposure to site-related contamination. The HI is found by dividing the daily intake by the reference dose, or the estimate of the quantity of the contaminant which may be taken daily without significant risk of toxicity.

Land Use Scenario - Various purposes for which land may be used, such as residential, industrial, military, etc.

Applicable or Relevant and Appropriate Requirements (ARARs) - State and Federal laws and regulations which may be relevant or appropriate when remediating a site.

Aquifer - A layer of rock, sand, or gravel located beneath the ground surface capable of storing water within cracks and pore spaces, or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be used for drinking and other purposes. The water contained in an aquifer is called groundwater.

Synthetic Precipitation Leaching Procedure (SPLP) - A laboratory procedure wherein reagent water is used to extract volatiles and cyanides from soil samples. The extracted fluid is then analyzed by gas chromatogram. The procedure is designed to measure leachability of contaminants from soil.

Waste Extraction Test (WET) - A laboratory procedure designed to measure the leachability of compounds, particularly heavy metals, from soil. Citric acid is used as the extracting fluid.

Permeability - The rate at which groundwater may diffuse through soil.

FOR MORE INFORMATION

If you have any questions about Marine Corps Base Camp Pendleton OU1 please contact:

Ms. Jayne Joy
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COMMUNITY PARTICIPATION

The Navy invites the public to become involved in the process of selecting the final remedy. Comments from residents of MCB Camp Pendleton and the surrounding communities are valuable in helping the Navy select a final remedy for the site. Based on new information or public comments, the Navy may change the preferred alternative or choose another alternative.

There are two ways for you to provide your comments during the public comment period between 2 December 1994 and 27 January 1995. You may send written comments to GY Sgt Ruth Carver at the following address:

GY Sgt Ruth Carver
Joint Public Affairs Office
Marine Corps Base Camp Pendleton
Building 1160
Camp Pendleton, CA 92055-5001
(619) 725-5569

Alternatively, you may submit your comments to the Navy during the public meeting which will be held as follows:

Date: 4 January 1995
Place: Oceanside Senior Citizens Center
455 Country Club Lane
Oceanside, California
Time: 6:30 p.m.

A court reporter will be present at the meeting to record comments for a written record. The public meeting will be an information open house until 7:00 pm when the proposed plan will be presented and public comments taken.

After the public comment period is over, the Navy will review and consider the submitted comments before making a final decision on the remedial action alternative to be used at the site. Comments received from the public will be addressed in a Responsiveness Summary which will be included in the Administrative Record. The complete Administrative Record is available for review at the following locations:

Oceanside Public Library
300 North Hill Street
Oceanside, CA 92054
(619) 966-4690

Marine Corps Base Camp Pendleton
Base Library
Building 1122
Camp Pendleton, CA 92055-5001
(619) 725-5669

OVERVIEW OF

SUPERFUND PROGRAM

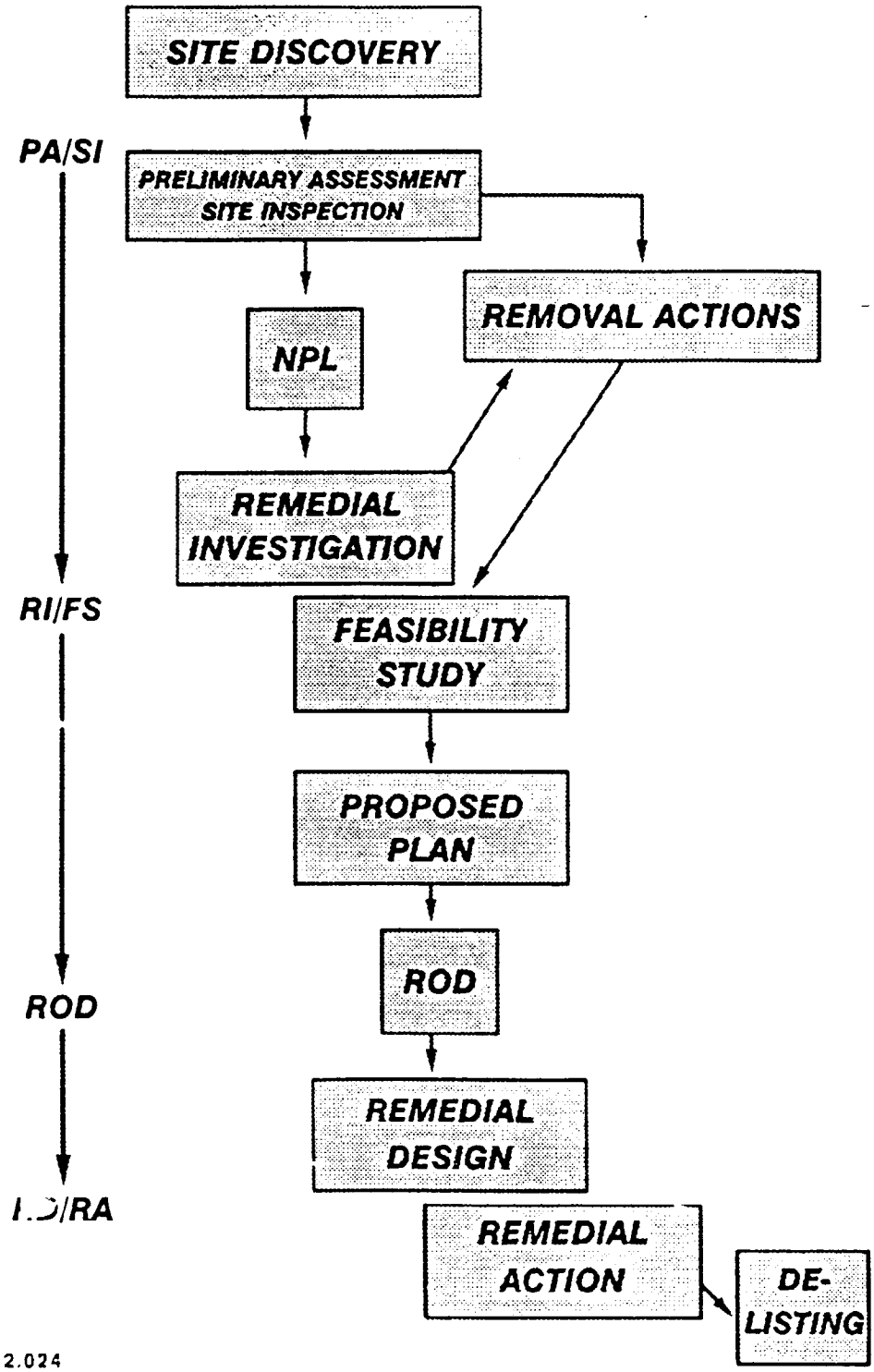
AS IT RELATES TO FEDERAL FACILITIES

D1082.013

EXHIBIT B
DEPO OF: PUBLIC HEARING
DATE: 1-4-95
ELANA K. FITZGERALD
8 PAGES

SUPERFUND PROGRAM AS IT RELATES TO FEDERAL FACILITIES

THE SUPERFUND PROCESS



D1082.024

AC/S, Environmental Security

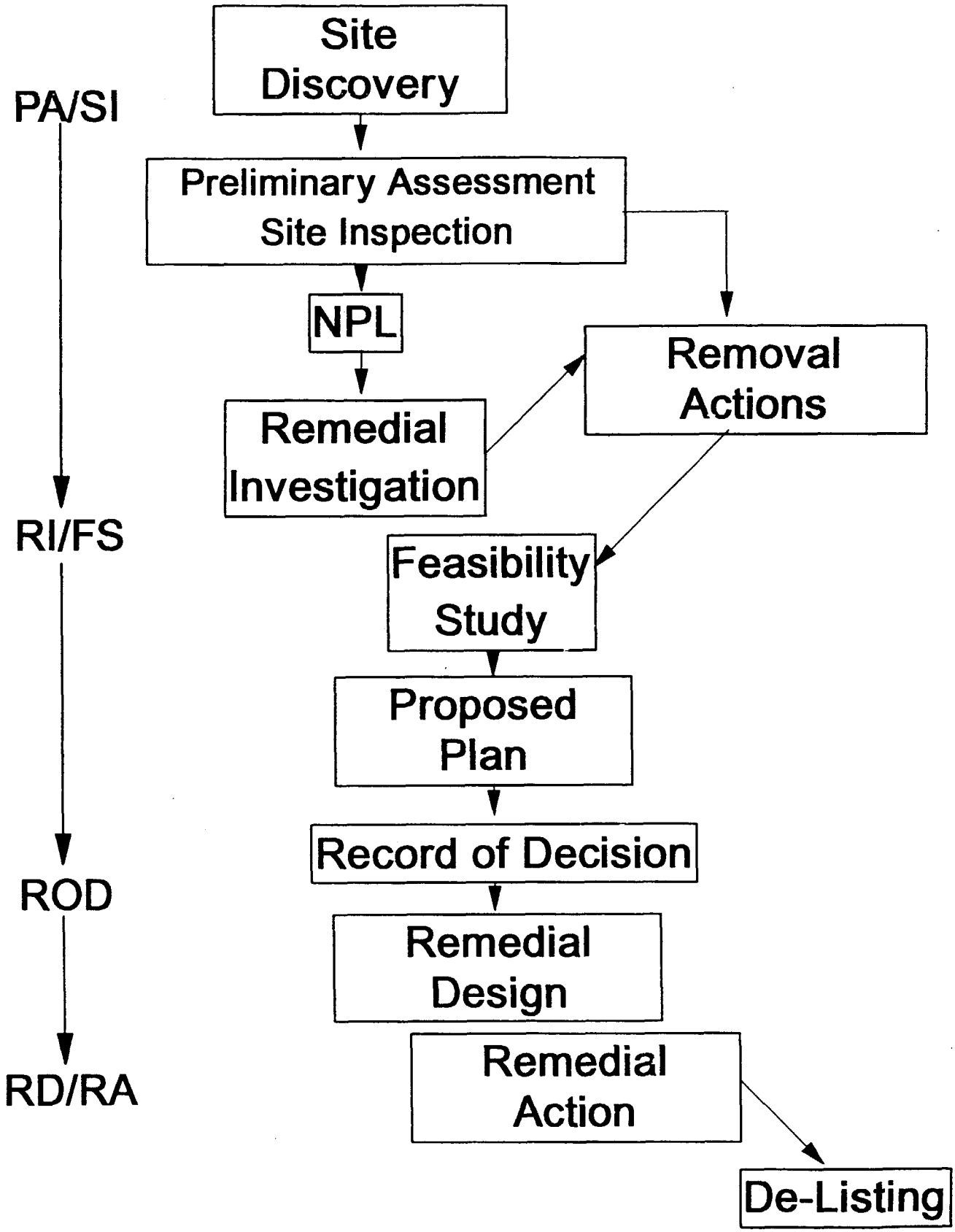
Installation Restoration Program

- Installation Restoration (IR) Program History
  - ► Placed on the National Priority List on 15 Nov 89
    - → EPA ranking score of 32.5
  - ► Federal Facilities Agreement
    - → Signed in October 1990
    - → Revised in October of 1992
    - → Placed the Sites into Groups
  - ► IR Program has 42 Sites, typical sites include
    - → Abandoned dumps/grease pits
    - → Pesticide handling areas
    - → Ditches associated with operations
    - → Landfills and surface impoundments

AC/S, Environmental Security
Installation Restoration Program

- Status of the Installation Restoration Program
  - ► Group "A" Completed Remedial Investigation and Feasibility Study:
    - → One Site Feasibility Study/Proposed Plan
    - → Three Sites Removal Actions
    - → Three Sites No Further Action
  - ► Group "B" Completed the Remedial Investigation
  - ► Group "C" Completed the Field Investigation
  - ► Group "D" Begin Field Investigation in FY96

THE CERCLA PROCESS



Criteria	Alternatives						
	1	2	3	4	5	6	7
Overall Protection of Human Health and the Environment	No	Yes	Yes	Yes	Yes	Yes	Yes
Compliance with ARARs	No	Yes[a]	Yes	Yes	Yes[a]	Yes[a]	Yes[a]
Long-Term Effectiveness and Permanence	NA	Low	High	High	Mod	Low	Low
Reduction of Toxicity, Mobility, or Volume	No	Low	High	High	High	High	Low
Short-Term Effectiveness	NA	Mod	Mod	High	High	Mod	NA
Implementability	NA	High	Mod	High	High	Mod	High
Cost ($ millions) Option 1 (100 ppm TPH) Option 2 (1,000 ppm TPH)	 0 0	 4.1 1.5	 2.4 1.4	 1.3 1.1	 0.7 0.5	 1.8 0.8	 0.4

[a]ARARs achieved over time through natural groundwater attenuation.
NA - Not applicable.

AC/S, Environmental Security

Installation Restoration Program

- Proposed Plan for Site 9
  - Preferred Action Alternative No. 7
    - Soil - No Action
    - Groundwater - Institutional Controls & Restricted Use
  - The Pendleton Team, including regulatory agencies, has agreed on this alternative

AC/S, Environmental Security
Installation Restoration Program

- Rationale
  - Levels of Contamination
  - Soil
    - Background Concentration of Beryllium
    - Leaching Test Results
  - Groundwater
    - No Downgradient Drinking Water Wells
    - Fate and Transport
    - Low Well Yield

EXHIBIT C
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MCB CAMP PENDLETON INSTALLATION RESTORATION SITES BY GROUP

Group A (Sites with Limited Previous Investigation)

- Site 3 - Pest Control Wash Rack
- Sites 4 and 4A - MCAS Drainage Ditch and Concrete-Lined Surface Impoundment
- Site 5 - Firefighter Drill Field
- Site 6 - DPDO (DRMO) Scrap Yard and Building 2241
- Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
- Site 24 - 26 Area MWR Maintenance Facility

Group B (Landfills and Surface Impoundments)

- Site 7 - Box Canyon Landfill
- Sites 8 and 8A - Las Pulgas Landfill and Las Flores Creek
- Site 14 - San Onofre Landfill
- Site 19 - 31 Area ACU-5 (LCAC) Surface Impoundments
- Site 20 - 43 Area Las Pulgas Vehicle Wash Rack
- Site 22 - 23 Area Unlined Surface Impoundment

Group C (Remaining Sites in the Santa Margarita Basin (SMB))

- Site 1 - Refuse Burning Grounds in SMB (2 locations)
- Site 2 - Grease Disposal Pits in SMB (2 locations)
- Site 10 - 26 Area Sewage Sludge Composting Yard
- Site 16 - 22 Area Buildings 22151 and 22187 Ditch Confluence and Ditch
- Site 17 - 22 Area Building 22187 Marsh and Ditch
- Site 27 - 22 Area Ditches Behind Building 22210
- Site 28 - 26 Area Trash Hauler's Maintenance Area
- Site 29 - 25 Area Skeet Range
- Site 30 - Firing Range Soil Fill in 31 Area
- Site 31 - Building 210801 Transformer (no sampling)
- Site 35 - Former Sewage Treatment Plant Facility in 25 Area
- SMB Groundwater Study
- SMB Surface Water and Sediment Study
- Santa Margarita Coastal Wetland Study

Group D (Remaining Sites outside the SMB)

- Site 1 - Refuse Burning Grounds outside SMB (7 locations)
- Site 2 - Grease Disposal Pits outside SMB (4 locations)
- Site 18 - 13/16 Area Building 1687 Spill and Ditch
- Site 32 - Drum Storage Area and Drainage Between Buildings 41303 and 41366
- Site 33 - 52 Area Armory (Building 520452) and Drainage to Southeast
- Site 34 - Combat Engineers Maintenance Facility, Buildings 62580 - 62583
- Site 36 - Debris Pile Area Behind Ponds at Sewage Treatment Plant 11
- Site 37 - Pesticide- and POL-Handling Areas at San Clemente Ranch
- Site 38 - 52 Area Sewer Line, Building 52188
- Site 39 - 41 Area Sewer Line, Buildings 41300 and 41346
- Site 40 - 13 Area Sewer Line, Building 13103
- Site 41 - 13 Area Sewer Line, Building 13128
- Site 42 - 13 Area Sewer Line, Building 13129
- Groundwater Study outside SMB
- Surface Water and Sediment Study outside SMB
- Coastal Wetland Study outside SMB

EXHIBIT D
DEPO OF: PUBLIC HEARING
DATE: 1-4-95
ELANA K. FITZGERALD
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PUBLIC MEETING 4 JAN 95
REMEDIAL ACTION SITE 9
TROPOSED PLAN

NAME

KEITH LEBOUEF
Capt D. S. Jump USMC
JOHN OWENS
John Gleason
Lloyd Cuman USMC
Major J. R. Scharfen, USMC Western Area Counsel Office
Sheryl Lauth USEPA
Edwina K. Dim, SWDIV
Larry R. Froebe, IT Corporation
CATHY ROTHWELL, SWDIV
ISAAC HIRBAWI, DTSC
John Odermatt, RWQCB
ED MINUGH, IT CORP
Harry Ohlendorf, CH2M HILL
Wayne Joy, USMC
Robin Smith, IT Corp.
Liz Luecker, CH2M Hill
William Dougherty Hucs
CPL ALLEN USMC
David Boyer USMC
Cpl Wade W Fairbanks
Cpl Stephanie N Conrad
LtCol S.W. Nugent DepAC/S ES RWQB CGEN
Mary Parker, IT

APPENDIX B

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR SITE 9

APPENDIX B

1.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) states that remedial actions at CERCLA sites must attain (or the decision document justify the waiver of) any Federal or more stringent State environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate (referred to as ARARs).

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address the situation at a CERCLA site. If the requirement is not legally applicable, the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, although not applicable, address problems or situations sufficiently similar to the circumstances of the proposed response action and are well suited to the conditions of the site (U.S. Environmental Protection Agency [EPA], 1988). The criteria for determining relevance and appropriateness are listed in Title 40, Code of Federal Regulations (CFR), Section 300.400(g)(2).

In order to qualify as a State ARAR under CERCLA and the National Contingency Plan (NCP), a State requirement must be all of the following:

- A State law
- An environmental or facility siting law
- Promulgated (of general applicability and legally enforceable)
- Substantive (not procedural or administrative)
- More stringent than the Federal requirement
- Identified in a timely manner
- Consistently applied.

In order to constitute an ARAR, a requirement must be substantive. Therefore, only substantive provisions of requirements identified as ARARs in this analysis will be considered ARARs. The ARARs for the selected remedy and the other remedial alternatives are summarized in the following sections and attached tables. The complete ARARs analysis is presented in Appendix B of the Draft Final Feasibility Study for Site 9 (SWDIV, 1994).

2.0 SELECTED REMEDY - ALTERNATIVE 7 - ARARS

The selected remedy, alternative 7, consists of no action for soil. The RI indicated that the soil was below RCRA hazardous waste toxicity characteristic levels. Leachability testing indicated that the soil contaminants would not migrate to groundwater. The risk assessment results indicated no threat to human health or the environment. No ARARs were identified for leaving the soil in place.

The selected remedy proposed no treatment for the groundwater because the results of the risk assessment indicated no threat to human health or the environment. However, because the PCE and TCE were detected above MCLs, the selected remedy will be achieved through institutional controls restricting access and monitoring during natural attenuation.

Federal RCRA groundwater protection standards set forth in 22 CCR 66264.92, 66264.93 and 66264.94 are relevant and appropriate for Site 9. These ARARs establish constituents of concern, point of compliance, and monitoring requirements. The provisions of 23 CCR 2550.10(g)(2) for demonstration of compliance were determined to be more stringent than Federal ARARs and are therefore, State ARARs. This ARAR requires eight evenly distributed sampling events for each monitoring point for 1 year as proof of compliance. These groundwater ARARs require monitoring for constituents of concern at levels exceeding required chemical-specific ARARs presented in Table B-1. Federal MCLs were determined to be the controlling ARARs for groundwater remediation levels. Potential State ARARs including State MCLs, SWRCB Resolution Nos. 68-16 and 92-49, and 23 CCR Chapter 15 requirements except for the more stringent section cited above were determined to be no more stringent than Federal ARARs for the groundwater left in place.

Under RCRA groundwater requirements, 22 CCR 66264.94, concentration limits for groundwater may be established greater than background if it is technologically or economically infeasible to achieve background and the established concentration limit will not pose a threat to human health or the environment. The concentration limit may not exceed the MCL. Therefore, the Federal MCLs for PCE and TCE were established as the concentration limits because the State MCLs were not more stringent.

The selected remedy includes groundwater monitoring to satisfy the ARARs during natural attenuation of the contamination to reach concentration limits.

3.0 SUMMARY OF ARARS FOR SITE 9

No ARARs were identified for soil cleanup levels because the soil does not exhibit the characteristics of a regulated waste. Action-specific ARARs for soil remediation were evaluated for CERCLA actions such as excavation, storage of soil in waste piles, on-site land treatment, and in situ bioremediation/bioventing. RCRA requirements generally were determined to be relevant and appropriate for proposed RCRA-type soil and groundwater remedial activities (e.g., treatment or storage). Title 23, Chapter 15, requirements for discharges of waste to land that are more stringent than or supplemental to RCRA ARARs were determined to be applicable.

Groundwater at Site 9 is contaminated with chlorinated solvents. Under Federal and State RCRA requirements, groundwater withdrawn from the aquifer is considered nonhazardous. However, RCRA groundwater protection standards are the controlling ARARs for the proposed CERCLA actions at the site. The proposed actions are limited to institutional controls and monitoring or treatment and reinjection into the source aquifer.

In the draft Feasibility Study, the Department of the Navy (DON) had indicated that State Water Resources Control Board (SWRCB) Resolution No. 68-16 was a potential ARAR governing further migration of the groundwater plume. Upon further consideration, DON has determined that further migration of already-contaminated groundwater does not appear to be a "discharge" governed by the language in SWRCB Resolution No. 68-16. However, DON has also determined that the selected remedial action is consistent with and will comply with that resolution.

In the DRAFT Feasibility Study, DON had indicated that SWRCB Resolution No. 92-49 did not qualify as a State ARAR because it had not been properly promulgated. The State subsequently properly promulgated the resolution. Therefore, DON has reevaluated the substantive provisions of State Water Resources Control Board Resolution No. 92-49 as a potential ARAR for the groundwater remedial action. The provisions of Section III.G. of the resolution are promulgated substantive environmental requirements and are potential "relevant and appropriate" State ARARs. Because this resolution has not been demonstrated to be more stringent than Federal ARAR at Title 22 CCR Section 66264.94, this State requirement is not considered an ARAR for this remedial action. However, DON has also determined that the selected remedial action is consistent with and will comply with that resolution.

Numerical limits for groundwater are presented and the controlling numerical values associated with Federal or State ARARs for each chemical of concern are identified in Table B-1.

Surface water is seasonal on site. Potential ARARs for surface-water discharge from rainfall runoff were identified. No numerical values were provided because surface water at Site 9 is not impacted and remediation of surface water is not proposed.

APCD rules governing emissions to air were identified for on-site actions such as excavation, storage, and treatment of soil and treatment of groundwater. Rules addressing emissions involving fugitive dust, particulate matter, and treatment unit activities are the controlling ARARs.

Location-specific ARARs were identified for Federal and State endangered species and migratory birds because regulated species were observed on or near the site during the RI (SWDIV, 1993). Requirements for protection of archaeological and historic resources were also identified even though initial surveys did not indicate the presence of such resources at Site 9.

The ARARs for Site 9 remedial Alternatives 1 through 7 are detailed in Tables B-2 through B-7.

4.0 REFERENCES

SWRCB, 1975, California State Water Resources Control Board, Comprehensive Water Quality Control Plan for the San Diego Basin, California Water Quality Control Board, San Diego Region, July.

SWDIV, 1993, Southwest Division Naval Facilities Engineering Command, "Draft Final RI Report for Group A Sites, Remedial Investigation/Feasibility Study, Marine Corps Base Camp Pendleton, California," prepared by Jacobs Engineering Group, Inc., 15 October.

SWDIV, 1994, Southwest Division Naval Facilities Engineering Command, "Draft Final Feasibility Study For Group A Sites, Site 9 - Operable Unit 1, Remedial Investigation/Feasibility Study, Marine Corps Base Camp Pendleton, California," prepared by Jacobs Engineering Group Inc., 21 September.

U.S Environmental Protection Agency, 1988, CERCLA Compliance With Other Laws Manual, Draft Guidance, EPA/540/G-89/006, Office of Emergency and Remedial Response, Washington, DC, August.

U.S Environmental Protection Agency, 1992, Drinking Water Regulations and Health Advisories, Office of Water, November.

TABLE B-1
Numerical Values of Potential Chemical-Specific ARARs for Groundwater
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton

Chemicals	California Primary MCLs[a] (µg/l)	Federal MCLs[b] (µg/l)	Federal MCLGs[b] (µg/l)	Controlling ARAR[c] (µg/l)
Tetrachloroethene (PCE)	5	5	zero	5[d]
Trichloroethene (TCE)	5	5	zero	5[d]

Organic constituents detected once but not confirmed in repeated (two or more quarterly rounds) subsequent sampling are considered questionable and are not included in this table.

[a]22 CCR 64444.5.
[b]40 CFR Parts 141 and 143 and U.S. Environmental Protection Agency, 1992, *Drinking Water Regulations and Health Advisories*, Office of Water, November.
[c]The controlling ARAR determination was not based on stringency alone (Section 2.2.1); the MCLs were determined to be the controlling ARAR under the RCRA groundwater protection standard (22 CCR 66264.94); remediation to background levels was determined to be technologically infeasible (Section 3.4.3.5 of the draft final FS report).
[d]The Federal MCL is the controlling ARAR.

ARARs - Applicable or relevent and appropriate requirements.
CCR - California Code of Regulations.
CFR - Code of Federal Regulations.
MCL - Maximum contaminant level.
MCLG - Maximum contaminant level goal.
µg/l - Micrograms per liter.

TABLE B-2
Potential Federal Chemical-Specific ARARs[a]
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 1 of 2)

Requirement	Prerequisite	Citation	ARAR Determination	Comments
GROUNDWATER				
Safe Drinking Water Act (SDWA), 42 USC 300(f)[b]				
Maximum contaminant level goals [MCLGs] pertain to known or anticipated adverse health effects (also known as recommended maximum contaminant levels [MCLs]).	Public water system.	Public Law No. 99-339; 100 Statute 642 (1986); 40 CFR 141, Subpart F	Not applicable Relevant and appropriate	MCLGs that have nonzero values are relevant and appropriate for groundwater determined to be a current or potential source of drinking water (40 CFR 300.430[e][2][i][B] through [D]). Groundwater in the vicinity of Site 9 has been designated for municipal/domestic use (potential drinking water) by the Regional Water Quality Control Board (RWQCB), San Diego Region (California State Water Resources Control Board [SWRCB], 1975).
National primary drinking water standards are health-based standards for public water systems (MCLs).	Public water system.	40 CFR 141.11 - 141.16, excluding 141.11(d)(3); 40 CFR 141.60 -141.63	Not applicable Relevant and appropriate	The National Contingency Plan (NCP) defines MCLs as relevant and appropriate for groundwater determined to be a current or potential source of drinking water in cases where MCLGs are not ARARs. The San Diego RWQCB has designated groundwater for municipal/ domestic use (potential drinking water) in the vicinity of Site 9 (SWRCB, 1975).

TABLE B-2
Potential Federal Chemical-Specific ARARs[a] by Media
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 2 of 2)

[a]Chemical-specific concentrations used for feasibility study evaluation may not be listed as ARARs in this table but may be based on other factors. Such factors may include the following:

- Human health risk-based concentrations (risk-based preliminary remediation goals; 40 CFR 300.430[e][2][i][A][1] and [2]).
- Ecological risk-based concentrations (40 CFR 300.430[e][2][i][G]).
- Practical quantitation limits of contaminants (40 CFR 300.430[e][2][i][A][3]).

[b]Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific potential ARARs follow each general heading.

ARARs - Applicable or relevant and appropriate requirements.
CFR - Code of Federal Regulations.
MCLs - Maximum contaminant levels.
MCLGs - Maximum contaminant level goals.
NCP - National Contingency Plan.
RWQCB - California Regional Water Quality Control Board.
SWRCB - California State Water Resources Control Board.
SDWA - Safe Drinking Water Act.
USC - United States Code.

References:

California State Water Resources Control Board, 1975, *Comprehensive Water Quality Control Plan for the San Diego Basin*, California Regional Water Quality Control Board, San Diego Region, July.

TABLE B-4
Potential Federal Location-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
National Historical Preservation Act 16 USC 470 et seq.[a]					
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Construction on previously undisturbed land would require an archaeological survey of the area.	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeologic data.	36 CFR 65	Relevant and appropriate	An on-site archaeologist will monitor excavation activities during remedial Alternatives 2 through 6.
Endangered Species Act of 1973 16 USC 1531[a]					
Critical habitat upon which endangered or threatened species depend	Action to conserve endangered species or threatened species, including consultation with the Department of the Interior.	Determination of effect upon endangered or threatened species or its habitat.	16 USC 1536(a)	Applicable	Endangered species have been observed in the site vicinity but are not known to be affected by current site conditions (SWDIV, 1993h). Applicable for remedial Alternatives 2 through 6. Not an ARAR for soil no action Alternative 1 or 7.
Migratory Bird Treaty Act of 1972 16 USC 703[a]					
Migratory bird area	Protects almost all species of native birds in the United States from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds.	16 USC 703	Applicable	Migratory birds have been observed on and in the vicinity of the site (SWDIV, 1993h).

[a]Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific potential ARARs follow each general heading.

ARARs - Applicable or relevant and appropriate requirements.
CFR - Code of Federal Regulations.
SWDIV - Southwest Division Naval Facilities Engineering Command.
USC - United States Code.

References:

Southwest Division Naval Facilities Engineering Command, 1993h, "Draft Final RI Report for Group A Sites, Remedial Investigation/Feasibility Study, Marine Corps Base, Camp Pendleton, California," prepared by Jacobs Engineering Group Inc., 15 October.

TABLE B-5
Potential State Location-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
California Endangered Species Act[a]					
Endangered Species Habitat	No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	Threatened or endangered species determination on or before 1 January 1985 or a candidate species with proper notification.	Fish and Game Code Section 2080	Applicable	Endangered species have been identified in the vicinity of Site 9. Not pertinent to no action alternative; therefore, not an ARAR for Alternative 1 or 7.

[a]Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific potential ARARs are addressed in the table below each general heading.

ARAR - Applicable or relevant and appropriate requirements.

TABLE B-6
Potential Federal Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 1 of 6)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone 1 soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone 1 soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.
"H" indicates soil hot spots only. "Z" indicates soils from Zones I and/or II only. "G" indicates groundwater only.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Resource Conservation and Recovery Act (RCRA), 42 USC 6901 et seq.*							
Closure of land treatment unit	Closure and postclosure care requirements for hazardous waste land treatment units.	Land treatment unit used to treat or dispose of hazardous waste.	22 CCR 66264.280		3Z, 6Z		Relevant and appropriate for the proposed land treatment unit in alternatives 3 and 6. Not an ARAR for other alternatives or for existing unit.
Closure of waste piles	At closure owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste.	Waste pile used to store hazardous waste.	22 CCR 66264.258(a) and (b), except references to procedural requirements		2, 3, 5, 6		Excavated soil may be stored in waste piles. Relevant and appropriate for waste soil piles. Not an ARAR for no action, existing unit, or groundwater.
Closure of miscellaneous unit	Closure shall be in a manner that will ensure protection of human health and the environment in compliance with appropriate provisions of 22 CCR, Division 4.5, Chapter 14, Articles 9-15, and Chapter 20; 40 CFR Part 146; and Article 5.5, Chapter 6.5, Division 20, Health and Safety Code beginning at Section 25100.	Miscellaneous unit used to treat, transfer, store, or dispose of hazardous waste.	22 CCR 66264.601		3G, 4G		Relevant and appropriate for groundwater treatment units. Not an ARAR for other alternatives or existing unit.

TABLE B-6
Potential Federal Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 2 of 6)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone 1 soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone 1 soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.
"H" indicates soil hot spots only. "Z" indicates soils from Zones I and/or II only. "G" indicates groundwater only.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Container storage	Containers of RCRA hazardous waste must be maintained in good condition, compatible with hazardous waste to be stored, and closed during storage except to add or remove waste.	Storage of RCRA hazardous waste not meeting small-quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere in a container.	22 CCR 66264.171, 66264.172, and 66264.173		2, 3, 4, 5, 6, 7G		Excavated soil and extracted groundwater may be temporarily stored in containers on site. Not an ARAR for no action.
	Inspect container storage areas weekly for deterioration.		22 CCR 66264.174		2, 3, 4, 5, 6, 7G		
	Place containers on a sloped, crack-free base and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		22 CCR 66264.175(a) and (b)		2, 3, 4, 5, 6, 7G		
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		22 CCR 66264.177		2, 3, 4, 5, 6, 7G		Excavated soil and extracted groundwater may be temporarily stored in containers on site.
	At closure, remove all hazardous waste and residues from the containment system and decontaminate or remove all containers and liners.		22 CCR 66264.178		2, 3, 4, 5, 6, 7G		
On-site waste generation	Person who generates waste shall determine if the waste is a hazardous waste.	Generator of hazardous waste in California.	22 CCR 66262.10(a) and 66262.11	2, 3, 4, 5, 6, 7G			Applicable to alternatives that will generate waste. Not an ARAR for no action.

TABLE B-6
Potential Federal Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 3 of 6)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone 1 soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone 1 soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.
"H" indicates soil hot spots only. "Z" indicates soils from Zones I and/or II only. "G" indicates groundwater only.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Treatment in a miscellaneous unit	Design and operating standards for unit in which hazardous waste is treated.	Treatment of hazardous waste in a unit.	22 CCR 66264.601		3, 4		Relevant and appropriate for on-site treatment of groundwater. Not an ARAR for soil treatment units.
Land treatment	Treatment unit design requirements and specifications.	Facilities that treat or dispose of hazardous waste in land treatment units.	22 CCR 66264.271(a)(2) and (3)		3Z, 6Z		Relevant and appropriate to new on-site land treatment unit for bioremediation.
	Design, construction, operation, and maintenance of land treatment units.	Facilities that treat or dispose of hazardous waste in land treatment units.	22 CCR 66264.273(a) to (g), (j)(1), and (k)		3Z, 6Z		Relevant and appropriate to new on-site land treatment unit for bioremediation.
	Vadose zone monitoring and response requirements.	Facilities that treat or dispose of hazardous waste in land treatment units.	22 CCR 66264.278		3Z, 6Z		Relevant and appropriate to new on-site land treatment unit for bioremediation.
Waste pile	Use a single liner and leachate collection system.	RCRA hazardous waste, non-containerized accumulation of solid, nonflammable hazardous waste for treatment or storage.	22 CCR 66264.251, except (e)(11) and (j)		2, 3, 5, 6		Excavated soil may be stored in waste soil piles on site.

TABLE B-6
Potential Federal Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 4 of 6)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone 1 soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone 1 soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.
"H" indicates soil hot spots only. "Z" indicates soils from Zones I and/or II only. "G" indicates groundwater only.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Groundwater monitoring and response	Groundwater protection standards: Owners/operators of RCRA treatment, storage, or disposal facilities must comply with conditions in this section designed to ensure that hazardous constituents entering the groundwater from a regulated unit do not exceed the concentration limits for contaminants of concern, set forth under Section 66264.93, in the uppermost aquifer underlying the waste management area beyond the point of compliance.	Uppermost aquifer underlying a waste management unit beyond the point of compliance; RCRA hazardous waste, treatment, storage, or disposal.	22 CCR 66264.94(a)(1) and (3), (c), (d), and (e)		1, 2, 3, 4, 5, 6, 7		Relevant and appropriate for groundwater at Site 9 because of similarities to RCRA-type actions proposed.
	Owners/operators of RCRA surface impoundment, waste pile, land treatment unit, or landfill shall conduct a monitoring and response program for each regulated unit.	Surface impoundment, waste pile, land treatment unit, or landfill for which constituents in or derived from waste in the unit may pose a threat to human health or the environment.	22 CCR 66264.91(a) and (c), except as it cross-references permit requirements		1, 2, 3, 4, 5, 6, 7		Relevant and appropriate for groundwater at Site 9 because of similarities to RCRA-type actions proposed and RCRA-type contamination.
	Establish a water-quality protection standard consisting of constituents of concern under Section 66264.293, concentration limits under Section 66264.294, and the point of compliance under Section 66264.295.	Regulated unit.	22 CCR 66264.92 except as it cross-references permit requirements		1, 2, 3, 4, 5, 6, 7		Relevant and appropriate for groundwater at Site 9 because of similarities to RCRA-type actions proposed and RCRA-type contamination.

TABLE B-6
Potential Federal Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 5 of 6)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone 1 soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone 1 soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.
"H" indicates soil hot spots only. "Z" indicates soils from Zones I and/or II only. "G" indicates groundwater only.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Underground injection of wastes and treated groundwater	The underground injection control (UIC) program prohibits injection activities that allow movement of contaminants into underground sources of drinking water that may result in violations of maximum contaminant levels (MCLs) or adversely affect health. Injection into Class V wells is authorized until further requirements under future regulations become applicable.	An approved UIC program is required in States listed under Safe Drinking Water Act (SDWA) Section 1422. Class V wells are used to inject nonhazardous waste into or above a formation that contains an underground source of drinking water (USDW).	40 CFR 144.12, excluding the reporting requirements in 144.12(b) and (c)(1); 40 CFR 144.6 and 144.24	3, 4			Reinjection of treated groundwater into the source aquifer is proposed. Applicable for proposed reinjection wells that meet Class V definition.
Clean Air Act (CAA), 40 USC 7401 et seq.[a]							
Discharge to air	Provisions of State Implementation Plan (SIP) approved by the U.S. Environmental Protection Agency (EPA) under Section 110 of CAA.	Major sources of air pollutants.	40 USC 7410; portions of 40 CFR 52.220 applicable to San Diego County Air Pollution Control District (APCD)				Specific pertinent rules are listed below.
	No person shall discharge into the atmosphere, from any single source of emissions, any air contaminant darker than number 1 on the Ringelmann chart for more than 3 minutes in any 60-minute period.	Discharge of any air contaminant other than uncombined water vapor.	APCD Rule 50(d)(1)	2, 3, 4, 5, 6, 7G			Fugitive dust emissions are expected for excavation, waste soil stored in piles, and land treatment. Diesel generator emissions are expected for bioventing and groundwater treatment and monitoring.

TABLE B-6
Potential Federal Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 6 of 6)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone 1 soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone 1 soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.
"H" indicates soil hot spots only. "Z" indicates soils from Zones I and/or II only. "G" indicates groundwater only.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Discharge of particulate matter	Particulate matter from any source may not be discharged to the atmosphere in excess of 0.1 grain per dry standard cubic foot (0.231 gram per dry standard cubic meter) of gas (except stationary internal combustion engines, sulfur recovery plants, burning of carbon-containing material, or sources of fumes and dust under Rule 54).	Discharge of particulate matter into atmosphere.	APCD Rule 52	2, 3, 4, 5, 6, 7G			Fugitive dust emissions are expected from the excavation, soil piles, and land treatment. Diesel generator emissions are expected for bioventing and groundwater treatment.
Operate fuel-burning equipment	A person shall not operate any stationary fuel-burning equipment if gaseous fuel contains more than 10 grains of sulfur compounds, calculated as hydrogen sulfide, per cubic meter of dry gaseous fuel at standard conditions; liquid or solid fuel contains more than 0.5 percent sulfur by weight; or if person cannot document by stack test that equipment can achieve equivalent amounts.	All stationary fuel-burning equipment except for combustion of sewage treatment plant digester gases and the incineration of gases emitted from solid waste disposal landfill sites.	APCD Rule 62	3,4,5			Applicable to groundwater treatment units and soil bioventing treatment unit.

[a]Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific potential ARARs follow each general heading.

A - Applicable.
APCD - Air Pollution Control District (San Diego County).
ARAR - Applicable or relevant and appropriate requirement.
CAA - Clean Air Act.
CCR - California Code of Regulations.
CFR - Code of Federal Regulations.
MCLs - Maximum contaminant levels.
RA - Relevant and appropriate.
RCRA - Resource Conservation and Recovery Act.
SDWA - Safe Drinking Water Act.
SIP - State Implementation Plan.
TBC - To be considered.
UIC - Underground injection control.
USC - United States Code.
USDW - Underground source of drinking water.
UV - Ultraviolet.

TABLE B-7
Potential State Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 1 of 4)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone I soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone I soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB)[a]							
	Authorizes the State and Regional Water Boards to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes Regional Water Boards to issue permits for discharges to land, surface water, or groundwater that could affect water quality, including National Pollutant Discharge Elimination System (NPDES) permits, and to take enforcement action to protect water quality.		California Water Code, Division 7, Sections 13241, 13269, 13243, 13263(a), and 13360 (Porter-Cologne Water Quality Control Act)	1,2,34 ,5,6,7			See Section 2.2.1.2 of FS Appendix B.
			Other provisions of Porter-Cologne Water Quality Control Act				Not ARARs; see Section 2.2.1.2 FS Appendix B.
	Describes the water basins in the San Diego region, establishes beneficial uses of groundwater and surface waters, establishes water-quality objectives, including narrative and numerical standards, establishes implementation plans to meet water-quality objectives and protect beneficial uses, and incorporates statewide water-quality control plans and policies.		Comprehensive Water Quality Control Plan for the San Diego Basin (Water Code §13240)	1,2,34 ,5,6, 7			Substantive provisions are ARARs; see Section 2.2.1.2 FS Appendix B.

TABLE B-7
Potential State Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 2 of 4)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone I soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone I soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
	Incorporated into all Regional Board basin plans. Requires that, unless certain findings are made, waters of the State be maintained at a quality that is better than needed to protect all beneficial uses. Discharges to high-quality waters must be treated using best practicable treatment or control necessary to prevent pollution or nuisance and to maintain the highest quality water. Requires cleanup to background water quality or to lowest concentrations technically and economically feasible to achieve. Beneficial uses must, at least, be protected.		SWRCB Resolution No. 68-16, Policy with Respect to Maintaining High Quality of Waters in California (Water Code §13140)				Not an ARAR; not more stringent than 22 CCR 66264.94; however selected remedy, Alternative 7 will comply.
	Establishes policies and procedures for the oversight of investigations and cleanup and abatement activities resulting from discharges of waste that affect or threaten water quality. It requires cleanup of all waste discharged and restoration of affected water to background conditions. Requires actions for cleanup and abatement to conform to Resolution No. 68-16 and applicable provisions of Title 23, Division 3, Chapter 15, as feasible.		SWRCB Resolution No. 92-49, Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code §13304 (Water Code §13307)				Not an ARAR; not more stringent than 22 CCR 66264.94; however selected remedy, Alternative 7 will comply.

TABLE B-7
Potential State Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 3 of 4)

Alternatives: 1 - No action. 2 - Soil excavation and off-site disposal; groundwater institutional controls. 3 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater extraction, UV/chemical oxidation, and reinjection. 4 - Zone I soil excavation and off-site disposal; Zone II in situ bioremediation/bioventing; groundwater extraction, carbon adsorption, and reinjection. 5 - Zone I soil excavation and off-site disposal; Zone II bioremediation/bioventing; groundwater institutional controls. 6 - Zone I and hot spots soil excavation and off-site disposal; Zone II biological land treatment; groundwater institutional controls. 7 - No action for soil; groundwater monitoring and institutional controls.

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
	Regulates siting, design, construction, operation, closure, and monitoring of waste discharges to land for treatment, storage, or disposal, including landfills, surface impoundments, waste piles, and land treatment facilities. Wastes regulated include hazardous, designated, nonhazardous, and inert wastes.		23 CCR 2511(d); 2520(a) and (c), 2523(a); 2530(a), (c), and (d); and 2533(a), (c), and (e)	2,3, 5,6			Applicable to the land treatment unit and waste soil piles proposed because these requirements are more stringent than Federal ARARs; these requirements are for nonhazardous solid waste as defined by 23 CCR 2533.
	Waste management units shall be designed to withstand the maximum credible earthquake without damage to the foundation or to the structures that control leachate, surface drainage, erosion, or gas.		23 CCR 2547	3,6			Applicable to the land treatment units because it is more stringent than Federal ARARs. Not an ARAR for in situ treatment.
	Compliance demonstration must include eight evenly distributed sampling events for each monitoring point for 1 year.		23 CCR 2250.10(g)(2)	1, 2, 3, 4, 5, 6, 7			Applicable for groundwater monitoring and response because it is more stringent than Federal ARARs.
	Establishes numerical water-quality objectives for the protection of human health and freshwater aquatic life for a large number of toxic pollutants. Also establishes narrative objectives and toxicity objectives. Provides a program of implementation and specifies proposals to adopt numerical standards for water bodies that are predominantly reclaimed water and agricultural drainage.		Water Code Section 13170; Clean Water Act Section 303(c)(1) (Water Quality Control Plan for Inland Surface Waters of California)	1, 2, 3, 4, 5, 6, 7			Applicable to seasonal surface water, except as invalidated by Judicial determinations; see Section 2.2.2.2 of FS Appendix B.

TABLE B-7
Potential State Action-Specific ARARs
Site 9 - 41 Area Stuart Mesa Waste Stabilization Pond
MCB Camp Pendleton
(Sheet 4 of 4)

*Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific potential ARARs follow each general heading.

A - Applicable.
ARAR - Applicable or relevant and appropriate requirement.
Cal/EPA - California Environmental Protection Agency.
CCR - California Code of Regulations.
DTSC - Department of Toxic Substances Control.
NPDES - National Pollutant Discharge Elimination System.
RA - Relevant and appropriate.
RCRA - Resource Conservation and Recovery Act.
RWQCB - California Regional Water Quality Control Board.
SWRCB - California State Water Resources Control Board.
TBC - To be considered.
TPH - Total petroleum hydrocarbons.
UV - Ultraviolet.

APPENDIX C

ADMINISTRATIVE RECORD FILE INDEX
MARINE CORPS BASE
CAMP PENDLETON, CALIFORNIA

Report Date: 3/31/95

Table 1
Administrative Record File Index
MCB Camp Pendleton

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
011-001	National Priorities List Document # NPL-U9-2-34	U.S.EPA	None specified		Rpt	1.1	1
011-002	Status of the Least Bell's Vireo on Camp Pendleton	Larry L. Salata	U.S. Fish & Wildlife Service	1-Dec-83	Rpt	1.1	81
011-003	Engineering Study/Investigation, Areas 22 and 23 JP-5 Fuel Spills	Woodward-Clyde Consultants	ENRMO, MCB Camp Pendleton	5-Feb-86	Rpt	1.1	57
011-004	Management and Restoration of Habitat for Light-Footed Clapper Rails on Camp Pendleton	U.S. Fish & Wildlife Service	SOUTHWESTNAVFACENGCOM	1-Mar-86	Rpt	1.1	25
011-005	Hydrogeologic Investigation of the San Onofre and Las Pulgas Landfills-Draft	Dames & Moore	Public Works Office, MCB Camp Pendleton	4-Aug-86	Rpt	1.1	42
011-006	Preliminary Groundwater Investigation, Las Pulgas Landfill	Harding Lawson Associates	Public Works Office, MCB Camp Pendleton	8-Jun-87	Rpt	1.1	83
011-007	Initial Geologic and Hydrogeologic Characterization, Box Canyon Landfill	Dames & Moore	Public Works Office, MCB Camp Pendleton	30-Sep-87	Rpt	1.1	85
011-008	Box Canyon Landfill Gas Migration Assessment and Feasibility Study	Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	1-Mar-88	Rpt	1.1	159
011-009	Box Canyon Landfill Test Protocol	Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	1-Jul-88	Rpt	1.1	75
011-010	Las Pulgas Landfill Test Protocol	Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	1-Jul-88	Rpt	1.1	56
011-011	San Onofre Landfill Test Protocol	Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	1-Jul-88	Rpt	1.1	56

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
011-012	Final Work Plan for Remedial Investigations/Feasibility Studies	Camp Dresser and McKee, Inc.	MCB Camp Pendleton	22-Jul-88	Plan	1.1	128
011-013	SWAT Report for Box Canyon Landfill (Air SWAT)	Mittelhauser Corp.	MCB Camp Pendleton	1-Nov-88	Rpt	1.1	118
011-014	SWAT Report for Las Pulgas Landfill (Air SWAT)	Mittelhauser Corp.	MCB Camp Pendleton	1-Nov-88	Rpt	1.1	109
011-015	SWAT Report for San Onofre Landfill (Air SWAT)	Mittelhauser Corp.	MCB Camp Pendleton	1-Nov-88	Rpt	1.1	107
011-016	Camp Pendleton Annual Water Quality Report	ENRMO, Water Resources Branch	None specified	1-Jan-89	Rpt	1.1	2
011-017	SWAT Water Quality Proposal for Box Canyon Landfill	Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	1-Aug-89	Rpt	1.1	49
011-018	SWAT Water Quality Proposal for Las Pulgas Landfill	Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	1-Aug-89	Rpt	1.1	43
011-019	SWAT Water Quality Proposal for San Onofre Landfill	Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	1-Aug-89	Rpt	1.1	44
011-020	Contamination Investigation at the LCAC Water Recycling Facility	Almgren & Koptionak, Inc.	SOUTHWESTNAVFACENGCOM	1-Oct-89	Rpt	1.1	38
011-021	Off-Site Gas Migration Assessment Report, Las Pulgas Landfill	Mittelhauser Corp.	MCB Camp Pendleton	1-Dec-89	Rpt	1.1	17
011-022	Site Investigation, Air Station, 23 Area	Hydro-Fluent, Inc.	Public Works Office, MCB Camp Pendleton	2-Feb-90	Rpt	1.1	29

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
011-023	Investigation of MWR Maintenance Complex, 26 Area	MCB Camp Pendleton	None specified	18-Jun-90	Rpt	1.1	4
011-024	Draft Work Plan for Closure of Surface Impoundments	Dames & Moore	SOUTHWESTNAVFACENGCOM	20-Aug-90	Rpt	1.1	85
011-025	Report on First and Second Round Groundwater Sampling at Box Canyon Landfill	Mittelhauser Corp.	MCB Camp Pendleton	6-Nov-90	Rpt	1.1	4
011-026	Final Camp Pendleton SWAT Investigation Report, San Onofre Landfill	Mittelhauser Corp.	MCB Camp Pendleton	1-Jun-91	Rpt	1.1	312
011-027	Groundwater Sampling Using a Variable Speed Submersible Pump	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	1-Feb-92	Rpt	1.1	5
011-028	Summary Report, CTO #12 Installation Restoration Program	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	1-Mar-90	Rpt	1.1	55
011-029	Hydrogeological Assessment Report Work Plan for the 41 Area Waste Stabilization Pond- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	11-May-90	Rpt	1.1	146
011-030	Hydrogeological Assessment Report Work Plan for the DPDO Scrap Yard- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	11-May-90	Rpt	1.1	107
011-031	Master Plan Volumes 1 & 2: Basewide Analysis MCB Camp Pendleton	NFEC Port Hueneme	MCB Camp Pendleton	1-Aug-90	Plan	1.1	350
011-032	Final Hydrogeological Assessment Report Work Plan for the 41 Area Waste Stabilization Pond	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	15-Aug-90	Rpt	1.1	135
011-033	Final Hydrogeological Assessment Report Work Plan for the DPDO Scrap Yard	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	15-Aug-90	Rpt	1.1	138

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
011-034	Draft Site Management Plan for Camp Pendleton IR Program	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	11-Sep-90	Plan	1.1	48
011-035	Draft RCRA Facility Assessment Preliminary Review Report	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	13-May-91	Rpt	1.1	440
011-036	Technical Memorandum for Draft Final Preliminary Review Report	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	15-Jul-91	Rpt	1.1	6
011-037	Draft RCRA Facility Assessment Sampling Visit Work Plan	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	26-Jul-91	Rpt	1.1	396
011-038	Technical Memorandum for Draft Final Sampling Visit Work Plan	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	10-Oct-91	Rpt	1.1	26
011-039	Draft RCRA Facility Assessment (RFA) Report	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	683
011-040	RFA Report Appendix A: PR/VSI Documentation Forms Volume 1 of 3-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	1450
011-041	RFA Report Appendix A: PR/VSI Documentation Forms Volume 2 of 3-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	1500
011-042	RFA Report Appendix A: PR/VSI Documentation Forms Volume 3 of 3-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	1430
011-043	RFA Report Appendix B: Photographic Documentation-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	415
011-044	RFA Report Appendices C & D: PR/SV Site Maps & PR Site Descriptions-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	272

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
011-045	RFA Report Appendices E & F: Sampling Visit Logbook and H&S Plan-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	734
011-046	RFA Report Appendix G: Analytical Results Volume 1 of 4-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	1600
011-047	RFA Report Appendix G: Analytical Results Volume 2 of 4-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	1650
011-048	RFA Report Appendix G: Analytical Results Volume 3 of 4-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	1650
011-049	RFA Report Appendix G: Analytical Results Volume 4 of 4-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	633
011-050	RFA Report Appendices H, I, & J: Geophysics, Soil Vapor & Tank Testing Results-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	473
011-051	RFA Report Appendix K: Boring Logs-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Nov-92	Rpt	1.1	700
011-052	Draft Final RCRA Facility Assessment Report	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	25-Jun-93	Rpt	1.1	716
013-001	Initial Assessment Study	SCS Engineers, Inc.	NEESA	1-Sep-84	Rpt	1.3	240
014-001	Site Investigation Report	Camp Dresser & McKee, Inc.	MCB Camp Pendleton	22-Jul-88	Rpt	1.4	257
014-002	Site Investigation Report, Analytical Data, Vol. 1	Camp Dresser & McKee, Inc.	MCB Camp Pendleton	22-Jul-88	Rpt	1.4	430

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
014-003	Site Investigation Report, Analytical Data, Vol. 2	Camp Dresser & McKee, Inc.	MCB Camp Pendleton	22-Jul-88	Rpt	1.4	430
014-004	Site Investigation Report, Analytical Data, Vol. 3	Camp Dresser & McKee, Inc.	MCB Camp Pendleton	22-Jul-88	Rpt	1.4	430
014-005	Site Investigation Report, Analytical Data, Vol. 4	Camp Dresser & McKee, Inc.	MCB Camp Pendleton	22-Jul-88	Rpt	1.4	430
016-001	Draft Hazard Ranking Scores	Steve Y. Tsai, Argonne National Laboratory	Henry Shanks, SOUTHWESTNAVFACENGCOM	21-Mar-88	Ltr	1.6	1
016-002	Environmental Compliance Evaluation, MCAS, Camp Pendleton	Commanding Officer, SOUTHWESTNAVFACENGCOM	Commandant of the Marine Corps, USMC Headquarters in Wash, D.C.	21-Jun-89	Memo	1.6	14
016-003	Environmental Compliance Evaluation, MCB Camp Pendleton	Commanding Officer, SOUTHWESTNAVFACENGCOM	Commandant of the Marine Corps, USMC Headquarters in Wash, D.C.	3-Jul-89	Memo	1.6	12
016-004	Latest Laboratory Analysis Results for Groundwater at Las Pulgas Landfill	E. Terry Jensen, Mittelhauser Corp.	Public Works Office, MCB Camp Pendleton	10-Jul-89	Ltr	1.6	4
016-005	TPCA - LCAC-5, Area 33 Facility	Ladin H. Delaney, SDRWQCB	Commanding General, MCB Camp Pendleton	23-Mar-90	Ltr	1.6	2
016-006	Area 33 , LCAC-5 Facility	Arthur L. Coe, SDRWQCB	Commanding General, MCB Camp Pendleton	10-Apr-90	Ltr	1.6	2
016-007	TPCA - 14 Area Fuel Dock	Arthur L. Coe, SDRWQCB	Commanding General, MCB Camp Pendleton	19-Jun-90	Ltr	1.6	11
016-008	Minutes for MCB Camp Pendleton Project Manager's Meeting	David L. Mark, IT Corp	EPA, SDRWQCB, CDHS, Navy, ENRMO, Lockheed-EMSC, Med-Tox Assoc.,URS	7-May-91	Corresp	1.6	14

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016-009	Minutes of Ecological Assessment Group Meeting	David L. Mark, IT Corp	EPA, CDHS, US Fish & Wildlife, Nat Park Ser, NOAA, Navy, ENRMO, ERT	26-Mar-91	Corresp	1.6	5
016-010	Recommended Application of New Submersible Pump	David L. Mark, IT Corp	R. Blank,EPA; J. Anderson, SDRWQCB; L. Miller, CDHS	3-May-91	Corresp	1.6	1
016-011	Minutes for MCB Camp Pendleton FFA Project Managers' Meeting	Dave Mark, Jagdish Mathur, IT Corp	EPA, SDRWQCB, CA DTSC, Navy, ENRMO	10-Mar-92	Corresp	1.6	7
016-012	MCB Camp Pendleton RFA Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	26-May-92	Corresp	1.6	2
016-013	Decision Logic: Recommendations for Further Action at SV Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	17-Aug-92	Corresp	1.6	2
016-014	Review of Recommendations for RFA Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	24-Sep-92	Corresp	1.6	1
016-015	HRS Scores for 6 Potentially Contaminated Sites at MCB Camp Pendleton	Steve Tsai, Argonne National Lab	SOUTHWESTNAVFACENGCOM	21-Mar-88	Ltr	1.6	1
016-016	RCRA Facility Assessment Identified IR Sites	Roberta Blank, EPA	SOUTHWESTNAVFACENGCOM	29-Jan-90	Ltr	1.6	1
016-017	Draft List of Recommended Sites at MCB Camp Pendleton for RI/FS Under Superfund	Margo Boodakian, CRWQCB	SOUTHWESTNAVFACENGCOM	5-Feb-90	Ltr	1.6	1
016-018	Sites at Camp Pendleton Designated for RI/FS Under Superfund	Robert W. Morris, CRWQCB	SOUTHWESTNAVFACENGCOM	2-Mar-90	Ltr	1.6	2
016-019	Identification of TRC Representative for EPA, San Francisco	J. Kemmerer, EPA, San Francisco	T. Zugsay, MCB Camp Pendleton	15-Mar-90	Ltr	1.6	1

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
016-031	Potential Additional Work Effort for RFA Report Preparation, CTO #178	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	20-Aug-92	Corresp	1.6	2
016-032	Waste Management, Treatment & Disposal	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	28-Sep-92	Corresp	1.6	2
016-033	RFA Recommendations for Further Action at SV Sites & Waste Disposal	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	13-Nov-92	Corresp	1.6	3
016-034	Comments on Draft RFA Report Dated Nov 1992 for MCB Camp Pendleton	Richard Seraydarian, US EPA	Ed Dias, SOUTHWESTNAVFACENGCOM	31-Dec-92	Ltr	1.6	2
016-035	Comments on USMC Camp Pendleton RCRA Facility Assessment (Draft)	Leticia Segovia, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	6-Jan-93	Ltr	1.6	4
016-036	Schedule for Submitting Draft Final RFA Report	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	17-Feb-93	Corresp	1.6	1
016-037	Schedule for Submittal of the Draft Final RFA Report & Impact of (15 March) Comments from the Navy	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	19-Mar-93	Corresp	1.6	2
016-038	Resolution of Issues Regarding the Draft Final RFA Report & Schedule for Issuance	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	3-May-93	Corresp	1.6	3
016-039	Minutes of 30 April Conference Call on Evaluation of RFA Sites, MCBCP RFA	Mary Parker, IT Corp	SDRWQCB, DTSC, EPA, SW DIV, ENRMO	10-May-93	Corresp	1.6	2
016-040	Comments on Draft Final RCRA Facility Assessment Report dated June 25, 1993	Richard Seraydarian, US EPA	Ed Dias, SOUTHWESTNAVFACENGCOM	26-Jul-93	Ltr	1.6	1
016-041	Comments on Camp Pendleton Draft Final RCRA Facility Assessment Report	Haissam Salloum, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	30-Jul-93	Ltr	1.6	2

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016-042	Comments on Draft Final RCRA Facility Assessment (RFA) Report	Mark Alpert, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	3-Aug-93	Ltr	1.6	1
016-043	Minor Revisions to Draft Final RCRA Facility Assessment Report	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	30-Aug-93	Corresp	1.6	4
021-001	Final Removal Action Site Work Plan, Bioremediation of Group A IR Program Site 5	OHM Remediation Services	SOUTHWESTNAVFACENGCOM	5-Dec-94	Plan	2.1	198
024-001	Engineering Evaluation/Cost Analysis (EE/CA) for Site 5- Firefighter Drill Field- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	4-Feb-94	Rpt	2.4	52
024-002	EE/CA for Site 3, Pest Control Wash Rack, and Site 6, DPDO (DRMO) Scrap Yard- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Mar-94	Rpt	2.4	340
024-003	Engineering Evaluation/Cost Analysis (EE/CA) for Site 5- Firefighter Drill Field- Draft Final	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	27-May-94	Rpt	2.4	202
025-001	Draft Action Memorandum for Non-Time-Critical Removal Action Site 5 Firefighter Drill Field	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	15-Jul-94	Rpt	2.5	100
025-002	Final Action Memorandum for Non-Time-Critical Removal Action Site 5 Firefighter Drill Field	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	17-Aug-94	Rpt	2.5	100
027-001	Final Wetland Delineation of Site 6 DPDO (DRMO) Scrap Yard	J. Miller, Biosystems	SOUTHWESTNAVFACENGCOM	1-Dec-93	Rpt	2.7	200
027-002	Applicability of 40 CFR 268.42(A)2 & Correlative State Reg. to Sites 3 & 6	Ed Minugh/Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	17-Jan-94	Corresp	2.7	4
027-003	Archaeological Survey for Group A Sites at Camp Pendleton	Lupe Armas, MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	24-Jan-94	Ltr	2.7	1

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027-004	Follow-up Effort for EE/CA for Group A Sites 3 and 6 - Soil Washing	Ed Minugh, A. Sood, J. Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	31-Jan-94	Corresp	2.7	74
027-005	Draft Eng. Evaluation/Cost Analysis (EE/CA) for Group A Site 5, MCBCP	Sheryl Lauth, US EPA Region IX	Ed Dias, SOUTHWESTNAVFACENGCOM	3-Mar-94	Ltr	2.7	2
027-006	Comments on Camp Pendleton Draft EE/CA for Group A Site 5	Omoruyi Patrick, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	14-Mar-94	Ltr	2.7	3
027-007	Review of Appendix A - ARARs for Site 5	John Turner, Department of Fish & Game	Omoruyi Patrick, DTSC	18-Mar-94	Ltr	2.7	4
027-008	Camp Pendleton Site 5 ARARs	Lewis Maldonado, US EPA	Rex Callaway, SOUTHWESTNAVFACENGCOM	28-Mar-94	Ltr	2.7	5
027-009	Draft Identificaton of ARARs for Site 5, Camp Pendleton	Richard Smith, APCD, County of San Diego	Ed Dias, SOUTHWESTNAVFACENGCOM	4-Apr-94	Ltr	2.7	14
027-010	Comments on Draft Eng. Evaluation/Cost Analysis (EE/CA) for Group A Sites 3 & 6	Sheryl Lauth, Remedial Proj. Mgr., US-EPA	Ed Dias, SOUTHWESTNAVFACENGCOM	7-Apr-94	Ltr	2.7	3
027-011	Review of Appendix A: ARARs Dated 14 March 1994	Arthur Coe, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	25-Apr-94	Ltr	2.7	1
027-012	Minutes of 21 April 1994 Meeting on ARARs for Site 5	Ed Minugh, IT Corp	SOUTHWESTNAVFACENGCOM	28-Apr-94	Corresp	2.7	5
027-013	Comments on Draft Eng. Evaluation/Cost Analysis (EE/CA) for Sites 3 & 6	Omoruyi Patrick, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	28-Apr-94	Ltr	2.7	3
027-014	31 March 1994 Meeting on APCD and Dept of Fish & GAme ARARs for Site 5	Ed Minugh, IT Corp	SOUTHWESTNAVFACENGCOM	29-Apr-94	Corresp	2.7	38

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027-015	Comments on Appendix A: Site 5, ARARs	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	29-Apr-94	Ltr	2.7	2
027-016	Government Comments Regarding MCBCP Draft EE/CA for Site 5	SOUTHWESTNAVFACENGCOM	Jacobs Engineering Group	5-May-94	Corresp	2.7	2
027-017	Review of Draft EE/CA for Site 5, Firefighter Drill Field	John Anderson, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	9-May-94	Ltr	2.7	6
027-018	Review of Notes of March 31, 1994 Meeting on Dept of Fish & Game ARARs & April 11 & 15 Conference Calls	John Turner, Department of Fish & Game	Ed Dias, SOUTHWESTNAVFACENGCOM	9-May-94	Ltr	2.7	4
027-019	Request to Review Draft ARARs for Camp Pendleton Sites 3 & 6	Richard Smith, APCD, County of San Diego	Ed Dias, SOUTHWESTNAVFACENGCOM	9-May-94	Ltr	2.7	2
027-020	Site 5 EE/CA Review Comments & Addendum Waiver of WDR & Stockpile Management Requirements	Arthur Coe, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	10-May-94	Ltr	2.7	7
027-021	23 May 1994 Meeting on Review of Draft Final EE/CA for Site 5	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	23-May-94	Corresp	2.7	3
027-022	Response to Comments on Draft EE/CA and ARARs for Site 5	Mary Parker and Kathleen Neuber, IT Corp	SOUTHWESTNAVFACENGCOM	26-May-94	Corresp	2.7	37
027-023	Comments on EE/CA of Site 5 Remediation, Camp Pendleton	Richard Smith, APCD, County of San Diego	Omoruyi Patrick, DTSC	22-Jun-94	Corresp	2.7	2
027-024	Comments on Draft EE/CA for Sites 3 and 6	John Anderson, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	5-Jul-94	Ltr	2.7	12
027-025	Trip Report Bioremediation of Site 21 and Group A IRP Site 5 MCB Camp Pendleton	C. Jespersen, OHM Remediation	NFEC	11-Jul-94	Ltr	2.7	3

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
027-026	Review of MCBCP, Draft Action Memorandum for Site 5, Firefighter Drill Field	John Anderson, SDRWQCB	Isaac Hirbawi, DTSC	22-Jul-94	Ltr	2.7	4
027-027	Comments on Draft Action Memorandum/Draft Final EE/CA for Site 5	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	25-Jul-94	Ltr	2.7	2
027-028	Soil Washing Treatability Study Report for Sites 3 & 6	Alternative Remedial Technologies, Inc.	SOUTHWESTNAVFACENGCOM	19-Oct-94	Rpt	2.7	100
027-029	Review of Soil Washing Treatability Study Report for Sites 3 & 6	Laszlo Saska, DTSC	Isaac Hirbawi, DTSC	18-Jan-95	Corresp	2.7	6
027-030	Workshop on EE/CA for Sites 3 & 6 at MCBCP	Ed Dias, SOUTHWESTNAVFACENGCOM	Carol Roberts, US Dept of the Interior, Fish & Wildlife Service	26-Jan-95	Ltr	2.7	5
027-031	Request for Comments on ARARs for Sites 3 and 6	Milasol Gaslan, DTSC	Alberto Abreu, APCD	31-Jan-95	Ltr	2.7	5
027-032	SDRWQCB Review of Soil Washing Treatability Study for Sites 3 & 6	John Anderson, SDRWQCB	Isaac Hirbawi, DTSC	1-Feb-95	Ltr	2.7	4
027-033	Comments on Soil Washing Treatability Report for Sites 3 and 6 Dated 19 October 1994	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	3-Feb-95	Ltr	2.7	11
031-001	Draft Final Sampling and Analysis Plan for RI/FS	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	24-May-91	Plan	3.1	593
031-002	Technical Memorandum Addressing Comments on Draft Final RI/FS Planning Documents	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	2-Apr-92	Plan	3.1	278
031-003	Draft Final Ecological Risk Assessment Sampling and Analysis Plan, Group A Sites	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	26-Feb-93	Plan	3.1	139

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031-004	Draft Sampling and Analysis Plan for RI/FS	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	27-Dec-90	Plan	3.1	550
031-005	Draft Ecological Risk Assessment Sampling and Analysis Plan, Group A Sites	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	13-Nov-92	Plan	3.1	134
031-007	Remedial Investigation/ Feasibility Study Work Plan- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	27-Dec-90	Plan	3.3	358
033-001	Work Plan for RI/FS	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	24-May-91	Plan	3.3	377
033-002	Draft Data Management Plan	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	24-Apr-92	Plan	3.3	380
033-003	Addendum to Draft Data Management Plan	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	8-Sep-92	Plan	3.3	6
033-004	Draft Final RI/FS Waste Management Plan	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	9-Oct-92	Plan	3.3	114
033-005	Draft Final Human Health Risk Assessment Work Plan for Group A Sites	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	29-Oct-92	Plan	3.3	127
033-006	Draft Final Ecological Risk Assessment Work Plan, Group A Sites	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	19-Feb-93	Plan	3.3	236
033-008	Operable Unit 1 Human Health Risk Assessment Work Plan- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	27-Jul-92	Plan	3.3	160
033-009	Ecological Risk Assessment Work Plan Group A Sites-Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	16-Oct-92	Plan	3.3	223

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033-010	Phase 2 RI Work Plan Addendum for Group A Sites- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	26-May-93	Plan	3.3	19
033-011	Work Plan Addendum for RFA Sites Added to RI/FS- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	29-Jun-93	Plan	3.3	81
033-012	Technical Memorandum for Draft Final Phase 2 RI Work Plan Addendum for Group A Sites	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	30-Jul-93	Plan	3.3	4
033-013	Group B Sites Ecological Risk Assessment Work Plan- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	20-Aug-93	Plan	3.3	253
033-014	Group B Sites Human Health Risk Assessment Work Plan- Draft	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	9-Sep-93	Plan	3.3	141
033-015	Group B Sites Human Health Risk Assessment Work Plan- Draft Final	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	9-Nov-93	Plan	3.3	70
033-016	Work Plan for Phase 2 RI at Group B Sites	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	1-Apr-94	Plan	3.3	9
033-017	Draft Santa Margarita Basin Groundwater Study Work Plan Addendum	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	26-Jan-95	Plan	3.3	120
033-018	Draft Work Plan Addendum for Additional Investigation at Site 8	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	26-Jan-95	Plan	3.3	73
034-001	Phase 1 RI Technical Memorandum for Group A Sites Volumes I through IV	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	25-Feb-93	Rpt	3.4	1491
034-002	Draft RI Report for Group A Sites Main Text-Volume 1 of 6	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	28-May-92	Rpt	3.4	751

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034-014	RI/FS Phase I RI Technical Memorandum Group B Sites MCB Camp Pendleton	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	10-Dec-93	Rpt	3.4	550
034-015	Draft RI Report for Group B Sites Main Text and Appendix A-Volume 1 of 4	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	28-Oct-94	Rpt	3.4	452
034-016	Draft RI Report for Group B Sites Appendices B through F-Volume 2 of 4	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	28-Oct-94	Rpt	3.4	374
034-017	Draft RI Report for Group B Sites Appendices G through P-Volume 3 of 4	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	28-Oct-94	Rpt	3.4	530
034-018	Draft RI Report for Group B Sites Appendices Q through V-Volume 4 of 4	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	28-Oct-94	Rpt	3.4	1464
035-001	Health and Safety Plan for RI/FS	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	24-May-91	Plan	3.5	143
035-002	Revised Final Health and Safety Plan for RI/FS	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	14-Sep-92	Plan	3.5	145
035-003	Revised Final Health and Safety Plan	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	18-Jan-92	Plan	3.5	143
036-001	Regulatory Agency Comments on Draft RI/FS Plans	EPA, CDHS, SDRWQCB, NEESA, NOAA, ICF	SOUTHWESTNAVFACENGCOM	5-Mar-91	Corresp	3.6	63
036-002	RFA and RI Schedule Extensions	Commander Tower, SOUTHWESTNAVFACENGCOM	Roberta Blank, EPA Region IX	5-Nov-91	Ltr	3.6	6
036-003	RFA and RI Schedule Extensions	Commander Tower, SOUTHWESTNAVFACENGCOM	John Broderick, CA EPA	5-Nov-91	Ltr	3.6	6

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036-004	RFA and RI Schedule Extensions	Julie Anderson, EPA Region IX	Commander Tower, SOUTHWESTNAVFACENGCOM	15-Nov-91	Ltr	3.6	2
036-005	RFA and RI Schedule Extensions	John Broderick, CA EPA	Commander Tower, SOUTHWESTNAVFACENGCOM	15-Nov-91	Ltr	3.6	2
036-006	RFA and RI Schedule Extensions	Commander Tower, SOUTHWESTNAVFACENGCOM	John Broderick, CA EPA	7-Feb-92	Ltr	3.6	10
036-007	RFA and RI Schedule Extensions	Commander Tower, SOUTHWESTNAVFACENGCOM	Julie Anderson, EPA Region IX	7-Feb-92	Ltr	3.6	10
036-008	Schedule Extension Request	John Scandura, CA EPA	Commander Tower, SOUTHWESTNAVFACENGCOM	14-Feb-92	Ltr	3.6	1
036-009	RFA and RI Schedule Extensions	Julie Anderson, EPA Region IX	Commander Tower, SOUTHWESTNAVFACENGCOM	14-Feb-92	Ltr	3.6	1
036-010	RFA and RI Schedule Extensions	James Pawlisch, SOUTHWESTNAVFACENGCOM	Julie Anderson, EPA Region IX	21-Feb-92	Ltr	3.6	1
036-011	RFA and RI Schedule Extensions	James Pawlisch, SOUTHWESTNAVFACENGCOM	John Scandura, CA EPA	21-Feb-92	Ltr	3.6	1
036-012	Schedule Extension Request	John Scandura, CA EPA	Commander Tower, SOUTHWESTNAVFACENGCOM	21-Feb-92	Ltr	3.6	2
036-013	RFA and RI Schedule Extensions	Julie Anderson, EPA Region IX	Commander Tower, SOUTHWESTNAVFACENGCOM	21-Feb-92	Ltr	3.6	2
036-014	Response Correction, Schedule Extension Request	Albert Arellano, Jr., CA EPA	Ed Dias, SOUTHWESTNAVFACENGCOM	25-Feb-92	Ltr	3.6	2

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036-015	Regulatory Agency Comments on Draft Data Management Plan	EPA, SDRWQCB	SOUTHWESTNAVFACENGCOM	6-Jul-92	Corresp	3.6	6
036-016	Regulatory Agency Comments on Draft Waste Management Plan	EPA, SDRWQCB	SOUTHWESTNAVFACENGCOM	3-Aug-92	Corresp	3.6	13
036-017	Extension Request for Draft RI Report for Operable Unit #1	James Pawlisch, SOUTHWESTNAVFACENGCOM	Julie Anderson, EPA Region IX	31-Aug-92	Ltr	3.6	8
036-018	Summary of Discussion during 13 August Informal Dispute Resolution Meeting	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	27-Aug-92	Corresp	3.6	3
036-019	Summary of 10 September Informal Dispute Resolution Meeting	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	24-Sep-92	Corresp	3.6	4
036-020	Regulatory Agency Comments on Draft OU#1 Human Health Risk Assessment Work Plan	EPA, SDRWQCB	SOUTHWESTNAVFACENGCOM	1-Oct-92	Corresp	3.6	31
036-021	Response to Comments on OU#1 Human Health Risk Assessment Draft Work Plan of 27 July 1992	L.R. Froebe, IT Corp	SOUTHWESTNAVFACENGCOM	29-Oct-92	Corresp	3.6	16
036-022	Informal Resolution of Dispute for Camp Pendleton/Revised FFA Appendix A	Richard Seraydarian, U.S. EPA	Navy, ENRMO, DTSC, SDRWQCB	3-Nov-92	Ltr	3.6	13
036-023	Quarterly Project Managers' Meeting; Minutes of 19 October Meeting	Mary Parker, IT Corp	EPA, SDRWQCB, Navy, ENRMO	25-Nov-92	Corresp	3.6	2
036-024	Draft Final Field Audit Report of Subsurface Soil Sampling and Monitoring Well Installation for RI/FS	B&V Waste Science and Technology Corp.	US EPA	18-Mar-92	Corresp	3.6	20
036-025	Technical Review Committee Meeting Minutes for 20 October 1992 Meeting	MCB Camp Pendleton	TRC members, EPA, DTSC, SDRWQCB, Navy	20-Oct-92	Corresp	3.6	4

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036-026	Audit of Navy CLEAN MCB Camp Pendleton Field Team, RI/FS	Jacobs Engineering Group	Dave Mark, IT Corp	21-Dec-92	Corresp	3.6	60
036-027	Comments on Draft Ecological Risk Assessment Work Plan and SAP for Group A Sites	EPA, DTSC, Navy	SOUTHWESTNAVFACENGCOM	30-Dec-92	Corresp	3.6	31
036-028	Results of Survey to Locate RI Sites 1 and 2, Camp Pendleton	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	27-Jan-93	Corresp	3.6	53
036-029	Comments on Draft Ecological Sampling and Analysis Plan for Group A Sites, RI/FS	SOUTHWESTNAVFACENGCOM	Jacobs Engineering Group	29-Jan-93	Corresp	3.6	4
036-030	Corrective Action Plan No. 1 for November 1992 Jacobs Field Audit of RI/FS	Dave Mark, IT Corp	Jacobs Engineering Group	22-Feb-93	Corresp	3.6	52
036-031	MCB Camp Pendleton FFA Project Managers' Meeting Minutes; 20 November 1992 Meeting	Dave Mark, IT Corp	EPA, DTSC, SDRWQCB, Navy, ENRMO	5-Mar-93	Corresp	3.6	4
036-032	Minutes of MCB Camp Pendleton Project Managers' Meeting; 5 February 1993 Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, ENRMO	5-Mar-93	Corresp	3.6	6
036-033	Technical Review Committee	SOUTHWESTNAVFACENGCOM	MCB Camp Pendleton	30-Mar-88	Ltr	3.6	2
036-034	Solicitation Letter for TRC Members	MCB Camp Pendleton	Distribution	7-Feb-90	Ltr	3.6	2
036-035	TRC Membership Being Sought	Tom Zugsay, MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	1-Mar-90	Ltr	3.6	2
036-036	Federal Facilities Agreement (FFA) for Marine Corps Base Camp Pendleton	Dana Sakamoto, SOUTHWESTNAVFACENGCOM	US Dept of The Interior	13-Nov-90	Ltr	3.6	3

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036-037	Camp Pendleton Community Relations Plan Review	Kristin Stultz, DTSC	Len Miller, DTSC	29-Jan-91	Corresp	3.6	3
036-038	Comments on Draft Community Relations Plan	Roberta Blank, US EPA Region IX	Ed Dias, SOUTHWESTNAVFACENGCOM	31-Jan-91	Ltr	3.6	3
036-039	Response to the Final Draft of the RI/FS Work Plan, Community Relations Plan, and SAP	Ester Beatty, City of Oceanside	SOUTHWESTNAVFACENGCOM	26-Jun-91	Ltr	3.6	2
036-040	Comments on RI/FS Draft, Final Work Plan, Draft Final SAP and Draft Final CRP	Roberta Blank, EPA	SOUTHWESTNAVFACENGCOM	1-Jul-91	Ltr	3.6	20
036-041	Draft TRC Charter	T. Evans, MCB Camp Pendleton	TRC Members	18-Oct-91	Ltr	3.6	7
036-042	TRC Meeting Minutes of Feb 6, 1991	Ed Dias, SOUTHWESTNAVFACENGCOM	Roberta Blank, US EPA Region IX	23-Oct-91	Corresp	3.6	5
036-043	Review of Request for an Extension	SOUTHWESTNAVFACENGCOM	SOUTHWESTNAVFACENGCOM	15-Nov-91	Ltr	3.6	2
036-044	Comments on the Draft TRC Charter	DTSC	SOUTHWESTNAVFACENGCOM	26-Nov-91	Ltr	3.6	2
036-045	Comments on the Draft TRC Charter	US EPA	MCB Camp Pendleton	2-Dec-91	Ltr	3.6	5
036-046	TRC Charter for Review and Comments, Second Draft	T. Evans, MCB Camp Pendleton	TRC Members	31-Jan-92	Ltr	3.6	4
036-047	User Needs Assessment and Software Recommendation for the MCBCP RI/FS	Dave Mark, IT Corp	SOUTHWESTNAVFACENGCOM	11-Feb-92	Corresp	3.6	6

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036-048	Comments on Request for Extension for MCB Camp Pendleton	Arthur Coe, CRWQCB	MCB Camp Pendleton	13-Mar-92	Ltr	3.6	2
036-049	Handling of Investigation-Derived Wastes (IDW), MCBCP RI	Dave Mark, IT Corp	SOUTHWESTNAVFACENGCOM	11-Apr-92	Corresp	3.6	2
036-050	Recommendations for Future Public Meetings	Claire Best, DTSC	Lt. Colonel Meyers, MCB Camp Pendleton	27-Apr-92	Ltr	3.6	4
036-051	Schedule Extension for MCB Camp Pendleton RI/FS Workplan	SOUTHWESTNAVFACENGCOM	US EPA Region IX	1-May-92	Ltr	3.6	30
036-052	CTO #166 Database	Dave Mark, IT Corp	SOUTHWESTNAVFACENGCOM	6-May-92	Corresp	3.6	1
036-053	Response to 4 May 1992 Navy Memorandum on Claire Best/Cal-EPA Letter	Alicia Dixon, Grigsby Graves	SOUTHWESTNAVFACENGCOM	1-Jun-92	Corresp	3.6	7
036-054	Management of Investigation-Derived Soil & Ground Water Waste (IDW) at MCBCP	Arthur Coe, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	11-Jun-92	Ltr	3.6	3
036-055	Letter Concerning MCB Camp Pendleton Data Management Plan and Waste Management Plan	Ed Dias, SOUTHWESTNAVFACENGCOM	US EPA Region IX	14-Jul-92	Ltr	3.6	2
036-056	Request a Schedule Extension to a FFA Deadline for MCB Camp Pendleton	S.E. Tower, MCB Camp Pendleton	US EPA Region IX	15-Jul-92	Ltr	3.6	17
036-057	Extension Request for Draft Remedial Investigation Report for OU#1 MCB Camp Pendleton	S.E. Tower, MCB Camp Pendleton	US EPA Region IX	31-Jul-92	Ltr	3.6	6
036-058	Review of Camp Pendleton Draft Ecological Risk Assessment Work Plan for OU#1	J.M. Polisini, DTSC	Leticia Segovia, DTSC	11-Aug-92	Ltr	3.6	4

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036-059	Working Draft Ecological Workplan for OU1 for MCB Camp Pendleton	A.A. Arellano, Jr., DTSC	SOUTHWESTNAVFACENGCOM	20-Aug-92	Ltr	3.6	2
036-060	Extension Request for Draft Remedial Investigation Report for OU#1 MCB Camp Pendleton	E.L. Rogers, MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	31-Aug-92	Ltr	3.6	11
036-061	Informal Resolution of Dispute for MCB Camp Pendleton	S.E. Tower, SOUTHWESTNAVFACENGCOM	US EPA	22-Oct-92	Ltr	3.6	13
036-062	Options for Hazardous IDW Disposal, MCB Camp Pendleton RI/FS	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	25-Mar-93	Corresp	3.6	15
036-063	Minutes of 10th Project Managers' Meeting on 2 April 1993	Mary Parker, IT Corp	Navy, EPA, SDRWQCB, ENRMO	13-Apr-93	Corresp	3.6	9
036-064	TRC Meeting Minutes of April 1, 1993	L. Armas, MCB Camp Pendleton	Distribution	19-Apr-93	Corresp	3.6	5
036-065	Response to Comments on Phase 1 RI Technical Memorandum for Group A Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	8-Jun-93	Corresp	3.6	4
036-066	Minutes of 11th Project Managers' Meeting on 6 & 7 May 1993	Mary Parker, IT Corp	Navy, EPA, DTSC, SDRWQCB, ENRMO	15-Jun-93	Corresp	3.6	16
036-067	Use of California Cancer Potency Factors for MCB Camp Pendleton	J.P. Christopher, EPA	SOUTHWESTNAVFACENGCOM	28-Jun-93	Ltr	3.6	4
036-068	Minutes of 12th FFA Project Managers' Meeting	Mary Parker, IT Corp	Navy, EPA, DTSC, SDRWQCB, ENRMO	1-Jul-93	Corresp	3.6	14
036-069	Response to Comments on Draft Phase 2 RI Work Plan Addendum for Group A Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	19-Jul-93	Corresp	3.6	4

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036-070	Addition to Project Note CLE-I01-01F166-I3-0024 Figure 2-6	Dave Mark, IT Corp	SOUTHWESTNAVFACENGCOM	21-Jul-93	Corresp	3.6	2
036-071	TRC Meeting Minutes of June 17, 1993	L. Armas, MCB Camp Pendleton	Distribution	2-Aug-93	Corresp	3.6	38
036-072	Identification & Screening of Treatment Technologies - Soil & GW at Group A Sites 3, 5, 6, & 9	Anu Sood, D. Rao, IT Corp	SOUTHWESTNAVFACENGCOM	7-Sep-93	Corresp	3.6	36
036-073	Preparation of the Site 9 Feasibility Study	Dave Mark, Robin Smith, IT Corp	SOUTHWESTNAVFACENGCOM	9-Sep-93	Corresp	3.6	2
036-074	Confirmation of Extension of the Due Date for the Draft Final RI Report for Group A Sites	Ed Dias, SOUTHWESTNAVFACENGCOM	John Anderson, SDRWQCB	16-Sep-93	Ltr	3.6	2
036-075	Confirmation of Extension of the Due Date for the Draft Final RI Report for Group A Sites	Ed Dias, SOUTHWESTNAVFACENGCOM	Oruyi Patrick, DTSC	16-Sep-93	Ltr	3.6	2
036-076	Confirmation of Extension of the Due Date for the Draft Final RI Report for Group A Sites	Ed Dias, SOUTHWESTNAVFACENGCOM	Richard Seraydarian, US EPA Region IX	16-Sep-93	Ltr	3.6	2
036-077	Content of Technical Memorandum & RI Report for Group B Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	16-Sep-93	Corresp	3.6	2
036-078	Minutes of 13th FFA Project Managers' Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, ENRMO	17-Sep-93	Corresp	3.6	28
036-079	DTSC Lead Designation for California Military Base Cleanup	James Strock, Cal-EPA	Executive Officers/Department Directors	20-Sep-93	Memo	3.6	5
036-080	Use of California Cancer Potency Factors for MCBCP	James Pawlisch, SOUTHWESTNAVFACENGCOM	John Scandura, DTSC, Cal-EPA	24-Sep-93	Ltr	3.6	7

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036-081	Request for an Extension to a Deadline Set Forth in Appendix A of the FFA	SOUTHWESTNAVFACENGCOM	US EPA Region IX	7-Oct-93	Ltr	3.6	24
036-082	Measuring & Sampling Free Product in Monitoring Wells	Dave Mark, IT Corp	SOUTHWESTNAVFACENGCOM	20-Oct-93	Corresp	3.6	3
036-083	Response to Comments on the Draft Work Plan Addendum for RFA Sites Added to the RI/FS	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	22-Oct-93	Corresp	3.6	9
036-084	Response to Comments on Draft RI Report for Group A Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	27-Oct-93	Corresp	3.6	73
036-085	Response to Comments from EPA, NOAA, & DTSC on Draft Ecological RA Work Plan for Group B Sites	Harry Ohlendorf, CH2M Hill	SOUTHWESTNAVFACENGCOM	28-Oct-93	Corresp	3.6	12
036-086	Extension Request for Submittal Deadlines for OU#1, MCB Camp Pendleton	R. Seraydarian, US EPA	SOUTHWESTNAVFACENGCOM	8-Nov-93	Ltr	3.6	9
036-087	MCB Camp Pendleton IR Program Technical Review Committee Members List	J. Joy, MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	30-Nov-93	Ltr	3.6	4
036-088	Invitation to Serve as a Member of a Technical Review Committee	J. Joy, MCB Camp Pendleton	Department of Fish & Game	2-Dec-93	Ltr	3.6	2
036-089	Response to Comments, on Draft Human Health Risk Assessment Work Plan for Group B Sites	Larry Froebe, IT Cop	SOUTHWESTNAVFACENGCOM	15-Dec-93	Corresp	3.6	13
036-090	Invitation to Participate in Technical Review Committee, Camp Pendleton	John Turner, Dept of Fish and Game	MCB Camp Pendleton	22-Dec-93	Ltr	3.6	2
036-091	Technical Memorandum for RI/FS Group B Sites, MCB Camp Pendleton	Richard Seraydarian, EPA	SOUTHWESTNAVFACENGCOM	12-Jan-94	Ltr	3.6	3

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036-092	Technical Memorandum for RI/FS Group B Sites, MCB Camp Pendleton	R. Seraydarian, US EPA	SOUTHWESTNAVFACENGCOM	20-Jan-94	Ltr	3.6	3
036-093	Estimated Cost of Conducting RFA Investigation for RI Site 37 (RFA Site 255)	Jagdish Mathur, IT Corp	SOUTHWESTNAVFACENGCOM	31-Jan-94	Corresp	3.6	2
036-094	Response to Comments on Draft Final Technical Memorandum for Group B Sites	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	14-Feb-94	Corresp	3.6	21
036-095	MCB Camp Pendleton RI/FS, FS for Group A Sites	J. Turner, Dept of Fish and Game	SOUTHWESTNAVFACENGCOM	10-Mar-94	Ltr	3.6	2
036-096	Requesting Extension to the Deadline for the Draft RI Report for Group B Sites	W.A. Dos Santos, SOUTHWESTNAVFACENGCOM	US EPA	10-Mar-94	Ltr	3.6	7
036-097	Extension Request for the Draft RI Report, Group B Sites, MCBCP	Julie Anderson, US EPA Region IX	Commander Dos Santos, SOUTHWESTNAVFACENGCOM	14-Mar-94	Ltr	3.6	9
036-098	Minutes of 14th FFA Project Managers' Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, ENRMO	15-Mar-94	Corresp	3.6	71
036-099	Summary and Evaluation of Results to Date from the Basewide Groundwater Study, Site 23	Alan Bradford, IT Corp	SOUTHWESTNAVFACENGCOM	29-Mar-94	Corresp	3.6	193
036-100	Use of CA. Cancer Potency Factors for MCBCP	John Scandura, DTSC	James Pawlisch, SOUTHWESTNAVFACENGCOM	31-Mar-94	Ltr	3.6	6
036-101	New Remedial Project Manager (RPM) for Camp Pendleton IR Program	Commanding General, MCBCP	Commanding Officer, SOUTHWESTNAVFACENGCOM	8-Apr-94	Ltr	3.6	1
036-102	Environmental Compliance Inspection	Ed Dias, SOUTHWESTNAVFACENGCOM	Commanding General, MCB Camp Pendleton	14-Apr-94	Ltr	3.6	2

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036-103	Minutes of 6 April 1994 Meeting on Property Disposition for CTO #166	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	14-Apr-94	Corresp	3.6	6
036-104	Minutes of 15th FFA Project Managers' Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, ENRMO	15-Apr-94	Corresp	3.6	17
036-105	Minutes of 14 April 1994 Meeting on Ecological Clearance for Remaining RI Sampling	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	19-Apr-94	Corresp	3.6	5
036-106	RWQCB Review of Cost Control Strategies for the IR Program at MCBCP Dated 24 Nov 1993	John Anderson, SDRWQCB	Omoruyi Patrick, DTSC	28-Apr-94	Ltr	3.6	5
036-107	Summary & Evaluation of Results to Date from the RI of Groundwater at Site 6	Alan Bradford, IT Corp	SOUTHWESTNAVFACENGCOM	5-May-94	Corresp	3.6	158
036-108	Step 2 RI for Group C Sites	Ed Minugh, IT Corp	SOUTHWESTNAVFACENGCOM	11-May-94	Corresp	3.6	92
036-109	Remedial Investigaton/Feasibility Study (RI/FS) at MCBCP	James Pawlisch, SOUTHWESTNAVFACENGCOM	John Turner, California Department of Fish & Game	11-May-94	Ltr	3.6	15
036-110	Government Property- CTO 166 Camp Pendleton Hiatus	Debra Nicastro, Jacobs Engineering Group	Laird Hodge, SOUTHWESTNAVFACENGCOM	25-May-94	Ltr	3.6	13
036-111	Government Property - Disposition Request	Debra Nicastro, Jacobs Engineering Group	Laird Hodge, SOUTHWESTNAVFACENGCOM	15-Jun-94	Ltr	3.6	3
036-112	Request for Extension to the Deadline for the Draft RI Report for Group B Sites	James Pawlisch, SOUTHWESTNAVFACENGCOM	Julie Anderson, US EPA Region IX	27-Jun-94	Ltr	3.6	7
036-113	Request for an Extension to the Deadline for OU #1 Draft Proposed Plan	James Pawlisch, SOUTHWESTNAVFACENGCOM	Julie Anderson, US EPA Region IX	27-Jun-94	Ltr	3.6	6

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036-114	Soliciting Technical Membership to the TRC for the IRP	SOUTHWESTNAVFACENGCOM	MCB Camp Pendleton	29-Jun-94	Ltr	3.6	3
036-115	Extension Request for the Draft Plan and Interim Record of Decision for OU#1	J. Anderson, CRWQCB	SOUTHWESTNAVFACENGCOM	30-Jun-94	Ltr	3.6	2
036-116	Extension Request for Draft Proposed Plan & Interim Record of Decision for OU#1	Sheryl Lauth, US EPA Region IX	Ed Dias, SOUTHWESTNAVFACENGCOM	22-Jul-94	Ltr	3.6	6
036-117	Seventeenth FFA Project Managers' Meeting Proposed Agenda	Ed Dias, SOUTHWESTNAVFACENGCOM	EPA, DTSC, SDRWQCB, Navy, AC/S, ES	1-Aug-94	Corresp	3.6	1
036-118	Minutes of 16th FFA Project Managers' Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, AC/S, ES	10-Aug-94	Corresp	3.6	67
036-119	Property Administration-Disposition Instructions (CTO #166)	Laird Hodge, SOUTHWESTNAVFACENGCOM	Debra Nicastro, Jacobs Engineering Group	12-Sep-94	Ltr	3.6	2
036-120	Minutes of 17th FFA Project Managers' Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, AC/S, ES	23-Sep-94	Corresp	3.6	45
036-121	Confirmation of Telecon with Mr. Tom DeCosta on Groundwater Sampling at Base Water Supply Well	Arthur Coe, SDRWQCB	Jayne Joy, ENRMO, MCB Camp Pendleton	19-Oct-94	Ltr	3.6	3
036-122	Wetland Assessment for Sites 3,6,&9 at MCB Camp Pendleton-Provide for Comments	J. Joy, MCB Camp Pendleton	Army Corps of Engineers	21-Oct-94	Ltr	3.6	4
036-123	Revised FFA Deadlines for Operable Unit #2 and Group C Sites	Sheryl Lauth, US EPA Region IX	Ed Dias, SOUTHWESTNAVFACENGCOM	27-Oct-94	Ltr	3.6	6
036-124	Minutes of 18th FFA Project Managers' Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, AC/S, ES	16-Nov-94	Corresp	3.6	97

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036-125	TRC Meeting Notice: Dec. 15, 1994 to Discuss the Draft Group B RI Report	J. Joy, MCB Camp Pendleton	Distribution	21-Nov-94	Ltr	3.6	1
036-126	Comments on Draft RI Report for Group B Sites	John Anderson, SDRWQCB	Isaac Hirbawi, DTSC	29-Dec-94	Ltr	3.6	15
036-127	Comments on the Draft RI Report for Group B Sites	G. Kobetich, US Dept of Interior	SOUTHWESTNAVFACENGCOM	30-Dec-94	Ltr	3.6	4
036-128	Comments on the Draft RI Report for Group B Sites of 28 Oct 1994	M. Gaslan, DTSC	SOUTHWESTNAVFACENGCOM	30-Dec-94	Ltr	3.6	26
036-129	Comments on the Draft RI Report for Group B Sites of 28 Oct 1994	S. Lauth, US EPA	SOUTHWESTNAVFACENGCOM	30-Dec-94	Ltr	3.6	19
036-130	Comments on RI/FS RI Report for Group B Sites	Edward Walton, TRC Member	ABB-ES, ES	3-Jan-95	Corresp	3.6	1
036-131	Schedule Extension Request	W.A. Dos Santos, SOUTHWESTNAVFACENGCOM	Julie Anderson, US EPA Region IX	10-Jan-95	Ltr	3.6	33
036-132	Technical Review Committee Meeting Minutes for 15 December 1994	Jayne Joy, MCB Camp Pendleton	TRC Members, EPA, DTSC, SDRWQCB, Navy	23-Jan-95	Corresp	3.6	6
036-133	Response to Marine Corps Base (MCB) Camp Pendleton Schedule Extension Request	Julie Anderson, US EPA Region IX	W.A. Dos Santos, SOUTHWESTNAVFACENGCOM	25-Jan-95	Ltr	3.6	6
036-134	Comments on Draft Santa Margarita Groundwater Study Work Plan (WP) Addendum & Draft WP Addendum at Site 8	S. Lauth, UP EPA Region IX	Ed Dias, SOUTHWESTNAVFACENGCOM	2-Feb-95	Ltr	3.6	28
036-135	RWQCB Comments on RI/FS Draft Work Plan Addendum for Additional Investigation at Site 8	John Anderson, SDRWQCB	Isaac Hirbawi, DTSC	14-Feb-95	Ltr	3.6	3

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036-136	Notification to EPA on Extension of the Due Date for the Draft Final RI Report for Group B Sites	Ed Dias, SOUTHWESTNAVFACENGCOM	Sheryl Lauth, US EPA Region IX	16-Feb-95	Ltr	3.6	1
036-137	Minutes of Nineteenth FFA Project Managers Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, AC/S, ES	16-Feb-95	Corresp	3.6	56
036-138	Notification to DTSC on Extension of the Due Date for the Draft Final RI Report for Group B Sites	SOUTHWESTNAVFACENGCOM	Issaac Hirvawi, DTSC	16-Feb-95	Ltr	3.6	1
036-139	Notification to SDRWQCB on Extension of the Due Date for the Draft Final RI Report for Group B Sites	SOUTHWESTNAVFACENGCOM	John Odermatt, SDRWQCB	16-Feb-95	Ltr	3.6	1
036-140	Minutes of Twentieth Project Managers Meeting	Mary Parker, IT Corp	EPA, DTSC, SDRWQCB, Navy, AC/S, ES	17-Feb-95	Corresp	3.6	29
036-141	Comments on Draft Work Plan(WP) Addendum at Site 8 & Draft Santa Margarita Basin Groundwater Study WP Addendum	D.S. Eversole, TRC Member	Ed Dias, SOUTHWESTNAVFACENGCOM	23-Feb-95	Ltr	3.6	1
036-142	Comments on RI/FS Santa Margarita Basin Groundwater Study	HM2 Edward Walton, TRC Member	Assistant Chief of Staff, Environmental Security, MCB Camp Pendleton	26-Feb-95	Corresp	3.6	1
036-143	Comments on RI/FS Work Plan Addendum for Site 8	HM2 Edward Walton, TRC Member	Assistant Chief of Staff, Environmental Security, MCB Camp Pendleton	26-Feb-95	Corresp	3.6	1
036-144	Comments on Draft Work Plan (WP) Addendum for Site 8 and the Draft Santa Margarita Basin Groundwater Study WP	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	27-Feb-95	Ltr	3.6	8
036-145	Comments on Draft Santa Margarita GW Study Work Plan (WP) Addendum & Draft WP Addendum at Site 8	G.C. Kobetich, U.S. Fish & Wildlife	Ed Dias, SOUTHWESTNAVFACENGCOM	28-Feb-95	Ltr	3.6	2
041-001	Potential ARAR's for MCAS Camp Pendleton	Leonard Miller, DHS	SOUTHWESTNAVFACENGCOM	7-Dec-90	Ltr	4.1	40

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041-002	Update Proposed State Applicable, Relevant, and Appropriate Requirements	A. Arellano, Jr., DTSC	SOUTHWESTNAVFACENGCOM	12-Apr-92	Ltr	4.1	7
041-003	Identification of State ARAR's for Group A Sites 3,5,6, and 9 at MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	CRWQCB	14-Jan-93	Ltr	4.1	5
041-004	Identifying and Addressing Potential ARAR's in the RI/FS for Group A Sites OU#1 MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	DTSC	3-Mar-93	Ltr	4.1	4
041-005	Response to Proposed State ARAR's for MCB Camp Pendleton to Letter Received March 10, 1992	DTSC	SOUTHWESTNAVFACENGCOM	7-May-93	Ltr	4.1	9
041-006	Identification of Potential State and Regional Water Board ARARs and To-Be-Considered Requirements	CRWQCB	DTSC	15-Jun-93	Ltr	4.1	15
041-007	Federal Chemical & Location-Specific ARARs for MCBCP	Dave Mark & Kathleen Neuber, IT Corp	SOUTHWESTNAVFACENGCOM	13-Jul-93	Corresp	4.1	50
041-008	Identification of State Applicable or Relevant and Appropriate Requirements (ARAR) for MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	US EPA Region IX	16-Jul-93	Ltr	4.1	3
041-009	Identification of State Applicable or Relevant and Appropriate Requirements for MCB Camp Pendleton	SOUTHWESTNAVFACENGCOM	US EPA Region IX	12-Aug-93	Ltr	4.1	8
041-010	Request for Identification of Chemical Location & Action Specific ARARs for Group A Sites	J. Odermatt, County of San Diego	Milasol Gaslan, DTSC	24-Sep-93	Ltr	4.1	3
041-011	Identification of Potential State and RWQCB ARARs and To-Be-Considered Requirements	Mark Albert, CRWQCB	Milasol Gaslan, DTSC	27-Sep-93	Ltr	4.1	7
041-012	Request for Identification of ARARs for MCB Camp Pendleton Group A Sites	Richard Smith, APCD	Milasol Gaslan, DTSC	28-Sep-93	Ltr	4.1	150

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041-013	RI/FS ARARs Enclosed Complete List of ARARs for Protection of State Fish and Wildlife Resources at MCBCP	Dept of Fish & Game	Milasol Gaslan, DTSC	18-Oct-93	Ltr	4.1	48
041-014	State ARARs for MCB Camp Pendleton Group A Sites List of Other Agency ARAR's	DTSC	SOUTHWESTNAVFACENGCOM	22-Oct-93	Ltr	4.1	21
041-015	Identification of State ARAR's Under the CERCLA	SOUTHWESTNAVFACENGCOM	CRWQCB	14-Dec-93	Ltr	4.1	5
041-016	Request for Clarification of the State and RWQCB Position Regarding ARARs	SOUTHWESTNAVFACENGCOM	CRWQCB	14-Dec-93	Ltr	4.1	6
041-017	Discussion of ARARs Identified by Fish and Game	SOUTHWESTNAVFACENGCOM	Department of Fish & Game	23-Dec-93	Ltr	4.1	4
041-018	Minutes of 16 December Meeting on ARARs	Kathleen Neuber, IT Corp	SOUTHWESTNAVFACENGCOM	28-Dec-93	Corresp	4.1	6
041-019	Minutes of 17 December 1993 Meeting on Remediation Goals	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	1-Feb-94	Corresp	4.1	25
041-020	Regarding ARARs Comments on the APCD Position on Applicability of State Environ Laws at MCBCP	W.A. Dos Santos, SOUTHWESTNAVFACENGCOM	APCD	11-Feb-94	Ltr	4.1	4
041-021	DTSC Role as Lead State Agency for Identification of State ARARs for MCBCP	J. Pawlisch, SOUTHWESTNAVFACENGCOM	US EPA	25-Feb-94	Ltr	4.1	5
041-022	Minutes of 21 April 1994 Meeting on ARARs for Site 5	Kathleen Neuber, IT Corp	SOUTHWESTNAVFACENGCOM	28-Apr-94	Corresp	4.1	4
041-023	31 March 1994 Meeting on APCD and Department of Fish and Game ARARs for Site 5	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	28-Apr-94	Corresp	4.1	37

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041-024	Request that DTSC Fund APCD for Continued Participation in the Identification and Enforcement of State ARARs for Site 9	R. Smith, APCD San Diego	DTSC	28-Apr-94	Ltr	4.1	1
041-025	Reg. Board Res. No. 83-21, A Conditional Waiver of Waste Discharge Requirements for Specific Contaminated Soils	Arthur Coe, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	10-May-94	Corresp	4.1	7
041-026	Analysis of ARARs for Feasibility Study, Site 9, & for EE/CA, Sites 3 & 6	Lewis Maldonado, US EPA	Rex Callaway, SOUTHWESTNAVFACENGCOM	31-May-94	Ltr	4.1	6
041-027	Draft Feasibility Study (FS) for Group A Sites, Site 9 ARARs Comments	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	8-Jul-94	Ltr	4.1	2
041-028	Comments on Proposed ARARs for IR Site 9	John Anderson, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	13-Jul-94	Ltr	4.1	8
041-029	Request for RWQCB ARARs for Installation Restoration Site 3 and Site 6	J. Anderson, CRWQCB	DTSC	7-Oct-94	Ltr	4.1	10
042-001	Draft Feasibility Study for Group A Sites- Site 9	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	15-Mar-94	Rpt	4.2	788
042-002	Draft Final Feasibility Study for Site 9-Operable Unit 1-Volume 1 of 2	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	21-Sep-94	Rpt	4.2	448
042-003	Draft Final Feasibility Study for Site 9-Operable Unit 1-Volume 2 of 2	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	21-Sep-94	Rpt	4.2	405
043-001	Draft Proposed Plan Operable Unit #1, MCBCP	Ed Dias, SOUTHWESTNAVFACENGCOM	FFA Parties	3-Nov-94	Ltr	4.3	5
043-002	Final Proposed Plan for Operable Unit 1	Ed Dias, SOUTHWESTNAVFACENGCOM	EPA, DTSC, SDRWQCB, AC/S, ES, and Public	30-Nov-94	Rpt	4.3	9

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
045-001	Comments on Site 9 Draft FS Dated 15 March 1994	John Turner, Department of Fish & Game	Ed Dias, SOUTHWESTNAVFACENGCOM	10-Mar-94	Ltr	4.5	2
045-002	Comments on Draft Feasibility Study for Group A Site 9	Sheryl Lauth, US EPA Region IX	Ed Dias, SOUTHWESTNAVFACENGCOM	13-May-94	Ltr	4.5	3
045-003	Review and Comments on IR, Draft Site 9 RI/FS	John Anderson, SDRWQCB	Omoruyi Patrick, DTSC	19-May-94	Ltr	4.5	12
045-004	Comments on Draft Feasibility Study (FS) for Group A Site 9	Omoruyi Patrick, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	19-May-94	Ltr	4.5	4
045-005	ARARs Comments on Draft FS for Group A Site 9	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	8-Jul-94	Ltr	4.5	2
045-006	Site 9 Leachability Results	Mary Parker, IT Corp	SOUTHWESTNAVFACENGCOM	25-Jul-94	Corresp	4.5	18
045-007	Response to Comments on Draft Feasibility Study, Including ARARs, for Site 9	Mary Parker, John Gleason, IT Corp	SOUTHWESTNAVFACENGCOM	26-Sep-94	Corresp	4.5	50
045-008	Review of MCB Camp Pendleton Draft Proposed Plan for OU#1 Group A Site 9	J. Anderson, CRWQCB	DTSC	25-Oct-94	Ltr	4.5	2
045-009	Comments on the Draft Proposed Plan for OU#1 Site 9, Dated October 11, 1994	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	28-Oct-94	Corresp	4.5	5
045-010	Minutes of Telephone Conference Call Regarding Proposed Plan for OU#1 Site 9	Ed Minugh, IT Corp	SOUTHWESTNAVFACENGCOM	2-Dec-94	Corresp	4.5	3
051-001	Record of Decision for Operable Unit 1, Site 9, and Group A No Action Sites	SOUTHWESTNAVFACENGCOM	FFA Parties	31-Mar-95	Rpt	5.1	150

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063-001	First and Second Round Groundwater Sampling at the Box Canyon Landfill	Arthur L. Coe, SDRWQCB	Commanding General, MCB Camp Pendleton	7-Mar-91	Ltr	6.3	1
063-002	Update Proposed State ARARs for MCB Camp Pendleton	Albert A. Arellano, Jr., CA DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	6-Apr-92	Ltr	6.3	7
063-003	Notification of New San Diego RWQCB Project Manager	John Anderson, SDRWQCB	Ed Dias, SOUTHWESTNAVFACENGCOM	15-Apr-94	Ltr	6.3	1
063-004	DTSC Remedial Project Manager for MCBCP	Milasol Gaslan, DTSC	Ed Dias, SOUTHWESTNAVFACENGCOM	16-Jun-94	Ltr	6.3	1
076-001	Contamination as a Result of Contract N68711-87-C-2833 Providing for Solid Waste Collection & Disposal Services	James Pawlisch, SOUTHWESTNAVFACENGCOM	Carl Weber, Professional Waste Systems	3-May-94	Ltr	7.6	4
076-002	PWS Response Dated 3 May 1994 Regarding Contamination as a Result of Contract N68711-87-C-2833	James Pawlisch, SOUTHWESTNAVFACENGCOM	Carl Weber, Professional Waste Systems	5-Aug-94	Ltr	7.6	5
076-003	Contamination at Pesticide and POL Handling Areas at San Clemente Ranch, Camp Pendleton	James Pawlisch, SOUTHWESTNAVFACENGCOM	Scott Deardorff, Deardorff-Jackson Company	5-Aug-94	Ltr	7.6	4
076-004	Alleged Contamination of Pesticide and POL Handling Areas of San Clemente Ranch, MCBCP	William Bruce; Klien, Wegis, DeNatale, Goldner & Muir	James Pawlisch, SOUTHWESTNAVFACENGCOM	6-Sep-94	Ltr	7.6	1
076-005	PWS and Contract N68711-87-C-2833	Joshua Presseisen, Presseisen & Reidelback, Attorneys at Law	James Pawlisch, SOUTHWESTNAVFACENGCOM	16-Sep-94	Ltr	7.6	2
076-006	Contamination of Pesticide & POL Handling Areas of San Clemente Ranch, MCBCP IR Site #37	Lauryne Harvey, SOUTHWESTNAVFACENGCOM	William Bruce; Klien, Wegis, DeNatale, Goldner, & Muir, Lawyers	15-Dec-94	Ltr	7.6	22
076-007	Contamination as a Result of Contract N68711-87-C-2833 Providing for Solid Waste Collection & Disposal Services	Lauryne Harvey, SOUTHWESTNAVFACENGCOM	Joshua Presseisen, Presseisen & Reidelbach, Attorneys at Law	24-Jan-95	Ltr	7.6	3

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076-008	Response to Request for Specific Information Regarding Borings Taken Adjacent to the Concrete Wash Pad	SOUTHWESTNAVFACENGCOM	Pressein, Reidelbach, Attorneys at Law	24-Jan-95	Ltr	7.6	2
076-009	PWS and Contract N68711-87-0-2833	Joshua Presseisen, Presseisen,Reidelbach Attorneys at Law	Lauryne Harkey, SOUTHWESTNAVFACENGCOM	27-Feb-95	Ltr	7.6	2
076-010	Federal Natural Resource Trustees Points of Contact	Roberta Blank, EPA	SOUTHWESTNAVFACENGCOM	31-Oct-90	Ltr	9.4	1
102-001	Draft Final Community Relations Plan for RI/FS	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	24-May-91	Plan	10.2	119
102-002	Draft Community Relations Plan	Jacobs Engineering Group	SOUTHWESTNAVFACENGCOM	14-Dec-90	Plan	10.2	108
103-001	MCBCP Public Meeting, Environmental Clean-up Program	Joint Public Affairs Office, Camp Pendleton	Ad in The Blade Citizen	22-Mar-92	Rpt	10.3	1
103-002	MCBCP Public Meeting, Environmental Clean-up Program	Joint Public Affairs Office, Camp Pendleton	Ad in The Daily Sun	24-Mar-92	Rpt	10.3	1
103-003	MCBCP Public Meeting, Environmental Clean-up Program	Joint Public Affairs Office, Camp Pendleton	Ad in The Blade Citizen	25-Mar-92	Rpt	10.3	1
103-004	MCBCP Basewide Meeting, Environmental Clean-up Program	Joint Public Affairs Office, Camp Pendleton	Public Flier	25-Mar-92	Rpt	10.3	1
103-005	MCBCP Public Meeting, Environmental Clean-up Program	Joint Public Affairs Office, Camp Pendleton	Public Flier	26-Mar-92	Rpt	10.3	1
103-006	Notice of Availability for Site 5 EE/CA	MCB, Camp Pendleton	Public	22-Aug-94	Rpt	10.3	2

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103-007	Notice of Availability & Public Comment Period & Public Meeting	Tracy Sahagun, MCB Camp Pendleton	Ad in The Blade Citizen	11-Dec-94	Rpt	10.3	2
103-008	Invitation to Attend the IRP Public Meeting	J. Joy, MCB Camp Pendleton	Distribution	14-Dec-94	Ltr	10.3	1
103-009	Notice of Availability & Public Comment Period & Public Meeting	Tracy Sahagun, MCB Camp Pendleton	Ad in The San Clemente Sun	29-Dec-94	Rpt	10.3	1
104-001	Transcript of Public Meeting	Elana Fitzgerald, California Depostition Reporters	SOUTHWESTNAVFACENGCOM	4-Jan-95	Rpt	10.4	30
106-001	Installation Restoration Program Fact Sheet No. 1	MCB Camp Pendleton	Public	1-Mar-92	Rpt	10.6	4
106-002	Meetings Set for Pendleton Toxic Cleanup	MCB Camp Pendleton	Newspaper Article, The Blade Citizen	22-Mar-92	Rpt	10.6	1
106-003	Pendleton May be First County Site on Superfund Toxic Waste Risk List	San Diego Union	Newspaper Article, The San Diego Union	4-Jul-89	Ltr	10.6	1
106-004	Base Water 'safe'	Terry Rodgers	Newspaper Article, The Blade Citizen	15-Jul-89	Rpt	10.6	1
106-005	The Pendleton Preserve	Tom Gorman	Newspaper Article, Los Angeles Times Magazine	10-Dec-89	Rpt	10.6	9
106-006	Edwards, Pendleton Bases Proposed for Additon to List of Toxic Cleanup Sites	Alan Miller	Newspaper Article, Los Angeles Times	24-Feb-90	Rpt	10.6	1
106-007	C3 Leader Works to Preserve Vision of Local Paradise	Rick Dower	Newspaper Article, San Diego Business Journal	30-Apr-90	Rpt	10.6	2

Record Number	Title	Author	Recipient	Date	Doc Type	Category	No. of Pages
106-008	Green Corps	Noel Osment	Newspaper Article, The San Diego Union	17-Jul-90	Rpt	10.6	2
106-009	Pendleton Toxic Cleanup Pact OKd	Ray Tessler	Newspaper Article, Los Angeles Times	25-Oct-90	Rpt	10.6	1
106-010	Pendleton - The Marines are Sitting on a Few Good Acres	Ray Westberg	Newspaper Article, San Diego Reader	8-Nov-90	Rpt	10.6	7
106-011	Six Sites Added to CP Toxic Cleanup	Phil Diehl	Newspaper Article, The Blade Citizen	5-Dec-91	Rpt	10.6	1
106-012	"Pollution Concerns Prompt Meeting" to Inform Residents of Investigation of Potential Groundwater Contamination	The Scout	Newspaper Article, The Scout	19-Mar-92	Rpt	10.6	1
106-013	Pendleton Officials Say Water Safe	Phil Diehl	Newspaper Article, The Blade Citizen	27-Mar-92	Rpt	10.6	1
106-014	Marines Agree to Follow Waste Rules: Signing of a Compliance Agreement	K. Balint	Newspaper Article, The San Diego Union	25-Jun-92	Rpt	10.6	1
106-015	Base Studies Waste Sites	P. Diehl	Newspaper Article, The Blade Citizen	23-Mar-93	Rpt	10.6	2
106-016	MCB Camp Pendleton Cleanup Program Update Fact Sheet No. 2	MCB Camp Pendleton	Public	1-Jul-93	Rpt	10.6	6
106-017	Ground Water Protection Through Environmental Management: U. S. MCBCP, CA	John Odermatt	Groundwater Monitoring Review	1-Sep-93	Rpt	10.6	4
106-018	Base Cleanup May Begin in Fall	Phil Diehl	Newspaper Article, The Blade Citizen	12-Jun-94	Rpt	10.6	2