Final

Groundwater Record of Decision
Installation Restoration Program Sites 1 and 2

FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

January 2012

Prepared for:
Base Realignment and Closure
Program Management Office West
San Diego, California

Prepared under:
Naval Facilities Engineering Command
Contract Number N62742-03-D-1837
Contract Task Order 0025
DCN: ET-1837-0025-0029

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ACRONYMS AND ABBREVIATIONS

§	section
µg/L	micrograms per liter
1,1,2-TCA	1,1,2-trichloroethane
1,2-DCA	1,2-dichloroethane
1,2-DCE	1,2-dichloroethene
1,2,3-TCP	1,2,3-trichloropropane
cis-1,2-DCE	cis-1,2-dichloroethene
ARAR	applicable or relevant and appropriate requirement
ARIC	Area requiring institutional control
bgs	below ground surface
BRAC	Base Realignment and Closure
Cal/EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CO	Carve-Out
COC	chemical of concern
COPC	chemical of potential concern
CTE	central tendency exposure
DO	dissolved oxygen
DTSC	Department of Toxic Substances Control
ECS	Enviro Compliance Solutions, Inc.
e.g.	for example (exempli gratia)
EOD	explosive ordnance disposal
EPC	exposure point concentration
ESD	Explanation of Significant Differences
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FBR	fluidized bed reactor
$feet^2$/day	square feet per day
FFA	Federal Facility Agreement
FOSL	Finding of Suitability for Lease
FS	feasibility study
FS smoke	sulfur-trioxide chlorosulfonic acid
HI	Hazard Index
IC	institutional control
ID	identification
i.e.	that is (id est)
ILCR	incremental lifetime cancer risk
IRP	Installation Restoration Program
ISB	in-situ bioremediation
ISCO	in-situ chemical oxidation
IX	Ion Exchange
J&E	Johnson and Ettinger
LIFOC	Lease in Furtherance of Conveyance
LRA	Local Reuse Authority
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MNA	monitored natural attenuation

MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
msl	mean sea level
NAPL	non-aqueous phase liquid
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDMA	n-nitrosodimethylamine
NPL	National Priorities List
OB/OD	open burn/ open detonation
OCHCA	Orange County Health Care Agency
OCWD	Orange County-Water District
OUs	operable units
O&M	operation and maintenance
PAL	preliminary action level
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pH	negative log of the hydrogen ion concentration
PMO	Project Management Office
PRB	permeable reactive barrier
PRG	preliminary remediation goal
RAO	remedial action objective
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
Res.	Resolution
RG	remediation goal
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SER	Sustainable Environmental Remediation
SRA	screening risk assessment
SVOC	semivolatile organic compound
SWRCB	State Water Resources Control Board
TCE	trichloroethene
tit.	title
U.S.	United States
U.S.C.	United States Code
U.S. EPA	United States Environmental Protection Agency
VI	vapor intrusion
VOC	volatile organic compound

1. DECLARATION

This Record of Decision (ROD) presents the selected remedial actions for groundwater associated with Installation Restoration Program (IRP) Site 1 (former Explosive Ordnance Disposal [EOD] Training Range) and IRP Site 2 (Magazine Road Landfill) at former Marine Corps Air Station (MCAS) El Toro, located in Orange County, California. MCAS El Toro was placed on the National Priorities List (NPL) in 1990 (United States Environmental Protection Agency [U.S. EPA] ID: CA6170023208). The remedies for IRP Site 1 and IRP Site 2 groundwater were selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (Title 42 United States Code [U.S.C] Section [§] 9601, et seq.), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 Code of Federal Regulations [CFR] Part 300). This decision is based on information contained in the Administrative Record (**Attachment 1**) for the two Sites. Information not specifically summarized in this ROD or its references but contained in the Administrative Record File has been considered and is relevant to the selection of the remedies for IRP Site 1 and IRP Site 2 groundwater. Therefore, this ROD is based upon and relies on the entire Administrative Record File in making the decision.

The Department of the Navy (Navy) and U.S. EPA jointly selected the remedies for groundwater associated with IRP Site 1 and IRP Site 2, and the California Environmental Protection Agency's (Cal/EPA's) Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board, Santa Ana Region (RWQCB) concur on the remedies. The Navy provides funding for site cleanups at former MCAS El Toro on behalf of the Marine Corps. The Federal Facility Agreement (FFA) for former MCAS El Toro was signed in 1990 and documents how the Navy and Marine Corps intend to meet and implement CERCLA in partnership with the U.S. EPA, DTSC, and the RWQCB.

The investigation of groundwater at IRP Sites 1 and 2 is complete. The Groundwater Feasibility Study concluded that cleanup is required for perchlorate-impacted groundwater associated with IRP Site 1 and volatile organic compound (VOC)-impacted groundwater associated with IRP Site 2.

A total of 25 IRP sites have been investigated at former MCAS El Toro. One site (IRP Site 23) was eliminated as an environmental concern; the remaining 24 sites were grouped into 6 operable units (OUs) including OU-1, OU-2A, OU-2B, OU-2C, OU-3A, and OU-3B. IRP Site 1 is included in OU-3B, and IRP Site 2 is included in OU-2B. This ROD addresses only impacted groundwater associated with IRP Site 1 and IRP Site 2. The soil at IRP Site 1 is currently being evaluated and the remedial action (if required) will be addressed in a separate ROD. The selected remedial action for soil at IRP Site 2 was documented in an interim ROD signed in July 2000, which was finalized through an Explanation of Significant Difference (ESD) in June 2009. The remedial action for IRP Site 2 soil included the construction of a landfill cap, which was completed in February 2008 and is currently in the operation and maintenance (O&M) phase. A second ESD in May 2011 documented a reduction in the buffer zone from 1,000 to **100 feet**.

1.1 SELECTED REMEDY

Major Components

The CERCLA remedial actions selected in this ROD are necessary to protect the public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment. Remedial alternatives were developed to protect human-health and the environment from perchlorate-impacted groundwater at IRP Site 1 and VOC-impacted groundwater at IRP Site 2. The final Selected Remedies for IRP Sites 1 and 2 include the following components which are described in more detail in **Section 2.9.2.**

IRP Site 1 Perchlorate-Impacted Groundwater Remedy:

- In-situ bioremediation (ISB) at the perchlorate Source Area,
- ISB downgradient of the perchlorate Source Area between IRP Sites 1 and 2,
- ISB near the former MCAS El Toro Boundary, and
- Groundwater monitoring and institutional controls (ICs)

Implementing ISB will include injection of an electron donor or substrate, and/or specific strains of microorganisms into the subsurface. ISB stimulates indigenous/augmented microorganisms to grow and multiply by using injected substrate as a carbon and energy source, thereby degrading perchlorate into innocuous end products such as chloride ions and oxygen.

Groundwater monitoring will be conducted to evaluate the effectiveness of ISB in treating perchlorate. ICs, including groundwater use restrictions, will also be implemented to limit potential human exposure to perchlorate-impacted groundwater until the remediation goal (RG) established for perchlorate is achieved. Once the RG (the State of California drinking water maximum contaminant level [MCL]) is achieved, the ICs will be terminated.

IRP Site 2 VOC-Impacted Groundwater Remedy:

- Monitored natural attenuation (MNA) and ICs

MNA will include groundwater monitoring to evaluate potential migration and decreases in concentrations of the chemicals of concern (COCs) due to natural attenuation processes such as dispersion, dilution, sorption, and volatilization. ICs including groundwater use restrictions will also be implemented to limit potential human exposure to VOC-impacted groundwater until the concentrations of COCs are reduced to their respective RGs. Once the RGs (Federal or more stringent State of California drinking water MCLs) are achieved, the ICs will be terminated.

Statutory Determinations

The Selected Remedies for the Sites are protective of human-health and the environment; comply with substantive Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action; are cost-effective; and utilize permanent solutions to the maximum extent practicable.

The Selected Remedy for IRP Site 1 perchlorate-impacted groundwater satisfies the preference for treatment as a principal element of the remedy. However, since no active treatment is proposed under the Selected Remedy for IRP Site 2 VOC-impacted groundwater, it does not satisfy the statutory preference for treatment as a principal element of the remedy. Although active treatment is not proposed for IRP Site 2 VOC-impacted groundwater, the Selected Remedy is protective of human-health and the environment, and based on the groundwater modeling would reduce COC concentrations to their respective RGs in a reasonable time-frame. In addition, in-situ bioremediation near the former MCAS El Toro Boundary proposed for IRP Site 1 perchlorate-impacted groundwater would also enhance the biodegradation of VOCs in IRP Site 2 groundwater. Therefore, the Selected Remedy for IRP Site 1 perchlorate-impacted groundwater would complement and enhance the Selected Remedy for IRP Site 2 VOC-impacted groundwater.

At completion, the Selected Remedies presented in this ROD will decrease concentrations of hazardous substances, pollutants, or contaminants in site groundwater to levels that allow for unlimited use and unrestricted exposure. However, until these objectives are met, five-year reviews will be conducted in order to evaluate performance and continued protectiveness of the remedial actions.

1.2 DATA CERTIFICATION CHECKLIST

Data	Section in ROD – IRP Site 1 Groundwater	Section in ROD – IRP Site 2 Groundwater
COCs and their respective concentrations	2.3.2.1	2.3.2.2
Risk represented by the COCs	2.5.1	2.5.2
Cleanup levels established for COCs and the basis for these levels	2.7	2.7
How source materials constituting principal threats are addressed	2.6	2.6
Current and reasonably anticipated future land-use assumptions used in the risk assessment	2.5.1.1	2.5.2.1
Potential land and groundwater use that will be available at the Sites as a result of the Selected Remedy	2.9.3	2.9.3
Estimated capital, O&M , and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected	Table 2-6	Table 2-7
Key factors that led to selecting the remedy	2.9.1	2.9.1

COC = chemical of concern
IRP = Installation Restoration Program
O&M = operation and maintenance
ROD = Record of Decision

If previously unknown contamination posing an unacceptable risk to human-health or the environment resulting from Navy activities is discovered after execution of this ROD, the Navy will conduct any necessary actions to ensure continued protection of human-health and the environment, consistent with CERCLA § 120(h) (42 U.S.C. § 9620[h]).

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1.3 AUTHORIZING SIGNATURES

This signature sheet documents the Navy and U.S. EPA's co-selection of the Selected Remedies in this ROD for groundwater at IRP Sites 1 and 2 at former MCAS El Toro. This signature sheet also documents the State of California's (DTSC and RWQCB) concurrence with this ROD. The respective parties may sign this sheet in counterparts.

James T. Callian

Date: JAN 10, 2012

Mr. James T. Callian
BRAC Environmental Coordinator
Former MCAS El Toro

Date: Feb 10, 2012

Mr. Michael M. Montgomery
Assistant Director of Federal Facilities
And Site Cleanup Branch, Region 9
U. S. Environmental Protection Agency

The State of California, Department of Toxic Substances Control and Regional Water Quality Control Board, had an opportunity to review and comment on the Record of Decision and their comments were addressed.

Date: 1/18/12

Mr. Thomas M. Cota
Performance Manager
Schools Evaluation and Brownfields Outreach
Department of Toxic Substances Control

Date: 1/13/12

Mr. Kurt V. Berchtold
Executive Officer
California Regional Water Quality Control Board, Santa Ana Region

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2. DECISION SUMMARY

2.1 SITE DESCRIPTION AND HISTORY

Former MCAS El Toro is situated in south central Orange County, California, approximately 8 miles southeast of Santa Ana and 12 miles northeast of Laguna Beach (Figure 2-1) and comprises approximately 4,740 acres. Former MCAS El Toro provided materials and support for Marine Corps aviation activities until the Station was closed in July 1999 under the Base Realignment and Closure (BRAC) Act.

IRP Site 1 (the former EOD Training Range) is located in the northeast portion of former MCAS El Toro in the foothills of the Santa Ana Mountains (Figure 2-1). IRP Site 2 (Magazine Road Landfill) is located on the eastern portion of former MCAS El Toro (Figure 2-1).

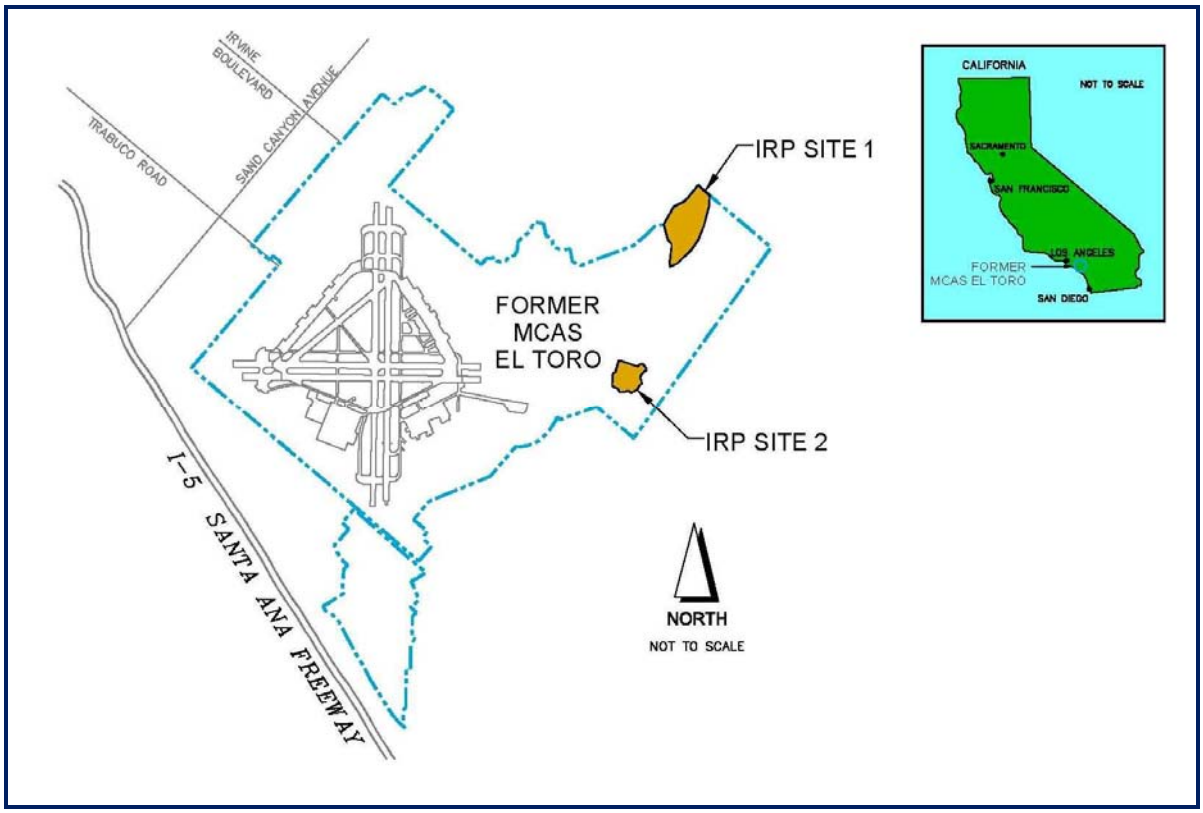


Figure 2-1: Locations of IRP Sites 1 and 2

2.1.1 IRP Site 1

IRP Site 1 is situated within a tributary canyon of Borrego Canyon Wash at elevations ranging from approximately 610 feet to 760 feet above mean sea level (msl) (**Figure 2-2**). **EOD training** was conducted at IRP Site 1 from 1952 until closure of former MCAS El Toro on 2 July 1999. Military ordnance used at the Site included hand grenades, land mines, cluster bombs, smoke bombs, and rocket propelled munitions. Civilian commercial-grade explosives, such as dynamite, and plastic and gelatinous explosives have also been used at IRP Site 1. Trenches and pits were periodically excavated and munitions were detonated. The trenches and pits were then filled with soil and then subsequently reexcavated to conduct additional munitions detonation activities. Limited historical information suggests that rocket motors or Jet-Assisted Take-Off units were handled at IRP Site 1. In 1982, approximately 2,000 gallons of sulfur trioxide chlorosulfonic acid (FS smoke) were

reportedly burned in trenches located in the northern portion of the Site. An estimated 300,000 gallons of petroleum fuels were burned from 1952 through 1993. In addition, there are unconfirmed reports that **low-level radioactive material** was handled at the Site. The potential presence of radionuclides at the Site was investigated and based on the investigation findings the site received **unrestricted release** from the California Department of Public Health in September 2007.

IRP Site 1 includes the Northern EOD Training Range (16.9 acres), the Southern EOD Training Range (16.6 acres), a Buffer Zone (37 acres), and a Subparcel (3.3 acres), among other features, for a total area of approximately 74 acres. The majority of recent military EOD training took place at the Northern EOD Training Range. The Southern EOD Training Range was used for EOD training by the Orange County Sheriff's Department and various Federal agencies. Several demolition pits, and a range building, are present at IRP Site 1. In addition, a former observation bunker constructed from metal ammunition cans was present at IRP Site 1 prior to the 2007 Santiago Fire. In 2008, **munitions characterization activities** were conducted, and as part of those activities, the soil in the ammunition cans was characterized and properly disposed.

The Department of Justice, Federal Bureau of Investigation **(FBI) used IRP Site 1 for training purposes.** The FBI's activities at IRP Site 1 included bomb technician training, post-blast investigation training, and emergency response operations. These activities involved the use of explosive devices and products.

2.1.2 IRP Site 2

IRP Site 2 was used as a landfill, shown as Areas A and B on **Figure 2-3**, from the late 1950s until about 1980; although some unauthorized disposal may have occurred on an intermittent basis at Areas C1, C2, and D2. During the 1970s, all solid waste from former MCAS El Toro and some waste from MCAS Tustin were disposed in this landfill. Previous reports estimate 800,000 to 1,000,000 cubic yards of waste were placed in the landfill during its operation. The **suspected types of waste** include construction debris, municipal waste, batteries, waste oils, hydraulic fluids, paint residues, transformers, and waste solvents.

The **remedial action for soil** at IRP Site 2 was completed in February 2008. This remedial action included consolidation of wastes from Areas C1/C2, and D2, and construction of an evapotranspiration cap. The O&M of this evapotranspiration cap is currently in progress.

2.2 PREVIOUS INVESTIGATIONS

Various environmental investigations have been conducted at IRP Sites 1 and 2 as a part of the CERCLA process to characterize the physical attributes including the geology and hydrogeology, the nature and extent of contamination, potential risks to human-health and the environment, and the feasibility of potential remedial technologies. The environmental media investigated at IRP Sites 1 and 2 included soil, surface water, groundwater, and/or air. The following subsections present a summary of the investigations performed for groundwater at IRP Sites 1 and 2. The FFA signatories reviewed and concurred with the primary documents associated with these Sites.

2.2.1 IRP Site 1

Table 2-1 presents a summary of key groundwater investigations conducted at IRP Site 1.

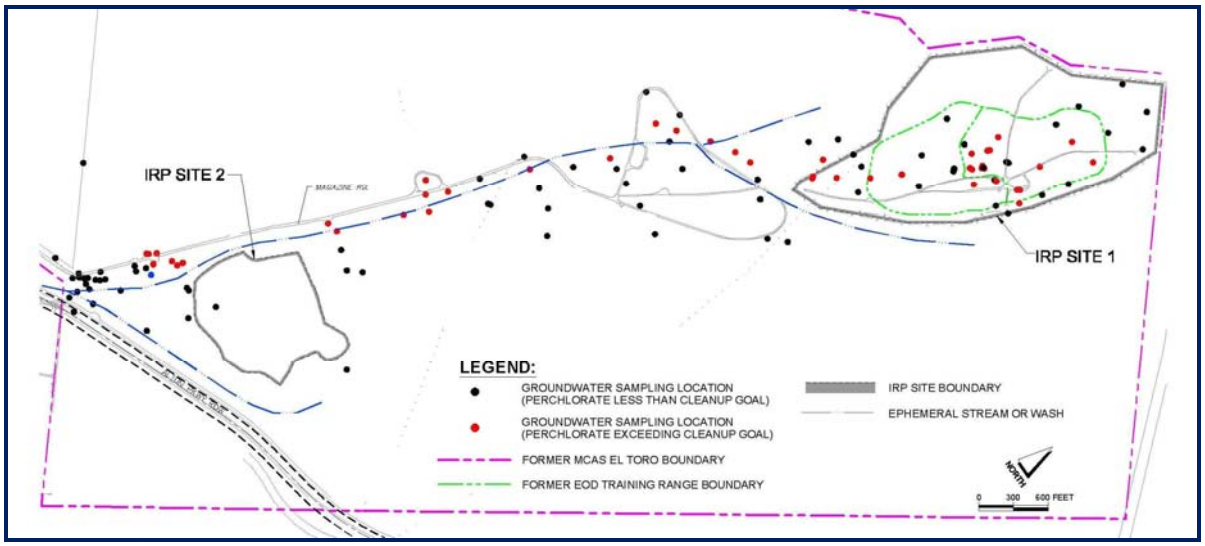


Figure 2-2: IRP Site 1 Perchlorate-Impacted Groundwater

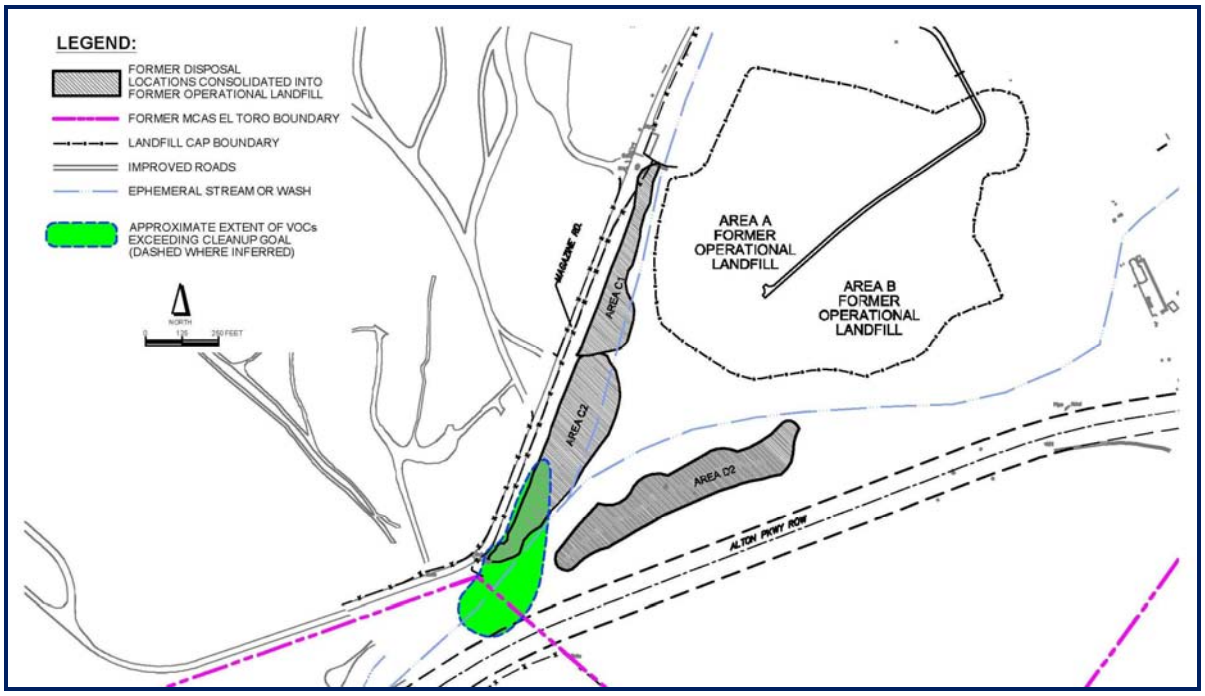


Figure 2-3: IRP Site 2 VOC-Impacted Groundwater

Table 2-1: Previous Groundwater Investigations at IRP Site 1

Study/Investigation	Year(s) Conducted	Investigation Activities
Phase I Remedial Investigation (RI)	1993	Limited soil and groundwater sampling was conducted. No further investigation was recommended at IRP Site 1 until Station closure. Results indicated that human-health or ecological risk thresholds were not exceeded.
Stationwide Perchlorate Investigation	1999	Existing groundwater monitoring wells at IRP Site 1 were sampled. Results indicated the presence of perchlorate exceeding the State Provisional Action Level (PAL) (in effect in 1999) in one well (01-MW201) at IRP Site 1. Further evaluation of IRP Site 1 was recommended.
Verification of Perchlorate at IRP Site 1	1999-2000	Six groundwater monitoring wells were installed and shallow and deep soil samples were collected and analyzed. Soil and groundwater samples were collected from new and existing wells were analyzed for perchlorate. Results confirmed the presence of perchlorate exceeding the State and Federal PAL (in effect in 1999) in one well (01-MW201). All reported concentrations of perchlorate in the soil were below residential preliminary remediation goals (PRGs).
Phase II Stationwide Evaluation of Radionuclides	2001	Investigation was conducted to confirm whether radionuclides in groundwater at former MCAS El Toro were due to anthropogenic or naturally occurring sources. In addition to selected wells at former landfill sites, three wells within IRP Site 1 were sampled. Investigation concluded that that the origin of radionuclides reported in groundwater is natural.
Phase II RI	2002-2005	More than 30 groundwater monitoring wells/piezometers were installed and extensive Hydropunch sampling was conducted. Multiple groundwater monitoring rounds were conducted. A conceptual site model was developed that included site physical characteristics, nature and extent of perchlorate in groundwater, and risks to human-health and the environment.
Aquifer Characterization and Bench-Scale Treatability Testing	2005	15 extraction wells/piezometers were installed in the central portion of IRP Site 1. Short- and long-term pumping tests were conducted to characterize the hydrogeology. In addition, laboratory scale microcosm studies were conducted to evaluate the biodegradation of perchlorate. These studies indicated that rapid and complete degradation of perchlorate occurred when the oxidation-reduction potential was reduced by adding a carbon source to the subsurface.
Stationwide Semi-Annual Groundwater Monitoring	1992 to Present	Monitoring is conducted to periodically evaluate perchlorate and VOC concentration trends in groundwater.
ISB Pilot Study	2009-2010	Investigation included field-scale evaluation of ISB of perchlorate in groundwater at and downgradient of IRP Site 1. Groundwater injection/monitoring wells were installed and bioremediation substrate was injected. Substrate injections were performed following hydraulic fracturing, which increased the permeability of the subsurface. A primary conclusion of the pilot study was that naturally occurring perchlorate-degrading bacteria can be readily stimulated using commercially available bioremediation amendments to reduce concentrations of perchlorate to less than its MCL of 6 micrograms per liter (µg/L).
Groundwater Feasibility Study (FS)	2011	This study developed and evaluated remedial alternatives for perchlorate-impacted groundwater at IRP Site 1.

Note: The documents listed are available at the Administrative Record File; they provide detailed information used to support remedy selection at IRP Site 1.

2.2.2 IRP Site 2

Table 2-2 presents a summary of significant previous investigations performed for groundwater at IRP Site 2.

Table 2-2: Previous Groundwater Investigations at IRP Site 2

Study/Investigation	Year(s) Conducted	Investigation Activities
Phase I RI	1993	Investigations included installing and sampling groundwater monitoring wells upgradient and downgradient of the IRP Site 2 landfill. VOCs, including trichloroethene (TCE) and tetrachloroethene (PCE) were reported in groundwater at concentrations exceeding their respective MCLs.
Phase II RI	1996	Investigations included soil, groundwater, surface water, and air sampling and analyses. A conceptual site model was developed that included site physical characteristics, nature and extent of VOCs in groundwater, and risks to human-health and the environment. VOCs, including TCE and PCE, were reported in groundwater at concentrations exceeding their respective MCLs.
Phase II Feasibility Study (FS)	1997	This study developed and evaluated remedial alternatives for the landfill and associated impacted groundwater.
Final Interim ROD	2000	Presented the selected remedy for the vadose zone of IRP Site 2. The selected remedy included construction of a landfill cap and land-use restrictions. The selection of groundwater remedy for IRP Site 2 was postponed to a later date.
Phase II Stationwide Evaluation of Radionuclides	2001	Conducted to confirm whether radionuclides in groundwater at former MCAS El Toro were due to anthropogenic or naturally occurring sources. In addition to selected wells at former landfill sites, three wells within IRP Site 1 were sampled. Investigation concluded that origin of radionuclides reported in groundwater is natural.
Microcosm Study	2005	Measured the rate and extent of biodegradation of VOCs and perchlorate in groundwater under anaerobic conditions. The study concluded that limited degradation of tetrachloroethene (PCE) and trichloroethene (TCE) would occur provided the oxidation-reduction potentials were artificially reduced below ambient levels.
Long-term Aquifer Test	2006	Multiple groundwater monitoring wells/piezometers were installed and sampled. Long-term aquifer test was conducted to characterize the hydrogeology.
Draft Final FS Addendum	2005	This Addendum incorporated supplemental results from the long-term aquifer test and developed and evaluated remedial alternatives for VOC-impacted groundwater.
Stationwide Annual Groundwater Monitoring	1992 to Present	Monitoring is conducted to periodically monitor VOC and perchlorate concentration trends in groundwater.
ISB Pilot Study	2009-2010	Included field-scale evaluation of ISB of TCE in groundwater. Groundwater injection/monitoring wells were installed and bioremediation substrates were injected. Substrate injections were performed using hydraulic fracturing to increase the permeability of the subsurface. A primary conclusion of the pilot study was that naturally occurring TCE-degrading bacteria can be stimulated using commercially available bioremediation amendments to reduce TCE concentrations to less than its MCL of 5 µg/L.
Groundwater FS	2011	This study developed and evaluated remedial alternatives for VOC-impacted groundwater at IRP Site 2.

Note: The documents listed are available at the Administrative Record File; they provide detailed information used to support remedy selection at IRP Site 2.

2.3 SITE CHARACTERISTICS

2.3.1 Physical Characteristics

2.3.1.1 IRP SITE 1 GEOLOGY AND HYDROGEOLOGY

The geology in the vicinity of IRP Site 1 is predominantly poorly consolidated massive marine sandstone (bedrock) of the Oso Member of the Capistrano Formation beneath alluvial sediments. The overlying alluvium consists of fine- to medium-grained sand, silty sand, and clayey sand derived from the bedrock, and varies in thickness from 0 feet (bedrock exposed at the surface) to 40 feet. The upper layer of bedrock is weathered and is generally more porous and permeable than the underlying competent (moderately indurated sandstone) bedrock.

A review of borehole logs from monitoring wells indicates that the cross-section profile of the alluvium and the saturated weathered bedrock within the IRP Site 1 boundary approximates a "V", indicating a buried channel. This buried channel is relatively narrow within the boundary of IRP Site 1; however, its size and extent increases south of or downgradient of IRP Site 1 (i.e., in the area between IRP Sites 1 and 2 [see **Figure 2-2**]). The buried channel strongly influences the flow of groundwater and perchlorate transport from the central portion of IRP Site 1. Downgradient of the IRP Site 1 boundary, the saturated alluvial thickness along the axis of the buried channel is about 40 to 50 feet.

Groundwater Flow and Hydraulic Conductivity: Within the boundary of IRP Site 1, under seasonally low rainfall/dry conditions, groundwater is primarily present in the bedrock. Water level elevations generally reflect a south-southwest groundwater flow direction within the saturated bedrock at an average horizontal hydraulic gradient of 0.05 feet per foot. Depths to groundwater at and downgradient of IRP Site 1 vary seasonally. Based on the March 2009 Stationwide groundwater monitoring round, the depth to groundwater within and south of IRP Site 1 boundary ranged from approximately 26 to 113 feet below ground surface (bgs), and from 35 feet to 42 feet bgs, respectively.

Based on the **pump tests conducted in 2005 and 2006,** two primary hydraulic conductivity zones were identified near the central portion of IRP Site 1. The hydraulic conductivities for these two zones were estimated at $1x10^{-5}$ centimeters per second (cm/s) and $3x10^{-4}$ cm/s. Secondary porosity near the central portion of IRP Site 1 was estimated to be 0.4 percent.

2.3.1.2 IRP SITE 2 GEOLOGY AND HYDROGEOLOGY

The geology in the vicinity of IRP Site 2 consists of alluvial deposits overlying sandstone from the Topanga and Vaqueros Formations. The alluvial deposits consist primarily of fine- to medium-grained sands with silt, and silty sands. Sandstone from both Formations exhibits various degrees of calcium cementation and weathering by depth and location. The upper portion of the bedrock is weathered, thus complicating the identification/location of the bedrock-alluvium contact.

Groundwater Flow and Hydraulic Conductivity: The predominant groundwater flow direction within IRP Site 2 and up to the former Station Boundary is toward the southwest. Depths to groundwater vary seasonally and generally range from 40 feet to 70 feet bgs. Previous investigations using the wells south and southwest of IRP Site 2 have shown that, as the groundwater flows from IRP Site 2, the flow direction changes abruptly toward the northwest as the depth to groundwater increases to approximately 130 feet bgs.

Based on water levels obtained during March and June 2009, the average horizontal hydraulic gradient at and downgradient of IRP Site 2 and upgradient of the former Station Boundary was estimated at 0.11 feet per foot. Groundwater occurs in the porous alluvial sediments and in bedrock sandstones and siltstones and ranges from being unconfined to confined. Due to the interlayered heterogeneous nature of the bedrock, water bearing units within the bedrock range from being laterally and vertically isolated to partially isolated. The hydraulic properties of the saturated alluvium/bedrock at IRP Site 2 were estimated as part of **pump tests conducted in 2002 and 2003.** Based on these pump test results, the alluvium has relatively high transmissivity (4,400 square feet per day [feet^2/day]) and the bedrock has relatively low transmissivity (3.0 to 240 feet^2/day).

2.3.2 Nature and Extent of Groundwater Releases

2.3.2.1 IRP Site 1

The investigations conducted to define the **nature and extent of releases in IRP Site 1 groundwater** are summarized in **Table 2-1**. As part of these investigations, groundwater samples were collected and analyzed for VOCs, semivolatile organic compounds (SVOCs), perchlorate, explosives residues, n-nitrosodimethylamine (NDMA), petroleum hydrocarbons, metals, pesticides/ polychlorinated biphenyls (PCBs), dioxins/furans, radionuclides, and general chemistry (including nitrate, nitrite, sulfate, alkalinity, and negative log of the hydrogen ion concentration [pH]). With the exception of perchlorate, none of the other chemicals (VOCs, SVOCs, petroleum, radionuclides, metals and explosives) were reported above the thresholds that warranted further evaluation in the FS.

Perchlorate was reported in groundwater in the central portion of IRP Site 1 in the Northern EOD Training Range at concentrations exceeding the drinking water equivalent level (DWEL, a U.S. EPA health advisory) of 24.5 µg/L and the California MCL of 6 µg/L by more than one order of magnitude. An analysis of historical operations and soil sampling results indicates that this area (hereinafter interchangeably referred to as perchlorate Source Area or central Source Area) is likely the source of perchlorate for areas located south of IRP Site 1, including the area between IRP Site 1 and IRP Site 2. At IRP Site 2, perchlorate in groundwater at concentrations exceeding the California MCL of 6 µg/L extends south to approximately the former Station Boundary where it commingles with VOC-impacted groundwater from the former outlying waste areas at the landfill. Perchlorate was reported in three off-Station wells below its California MCL of 6 µg/L. Based on the data collected during IRP Site 2 investigations and during the IRP Site 1 RI, it was concluded that perchlorate in groundwater at IRP Site 2 was related to the release of perchlorate at IRP Site 1.

2.3.2.2 IRP Site 2

The investigations conducted to define the **nature and extent of releases in IRP Site 2 groundwater** are summarized in **Table 2-2**. As part of these investigations, groundwater samples were collected and analyzed for VOCs, SVOCs, perchlorate, petroleum hydrocarbons, metals, pesticides, and radionuclides. Results from these investigations indicated that only VOCs exceeded their respective regulatory thresholds and required further consideration within the CERCLA process. **TCE exceeded its Federal MCL** for drinking water of 5 µg/L in several monitoring wells at IRP Site 2. Based on the spatial distribution of TCE the source of TCE appears to have originated from point sources in the unauthorized disposal Area C2, downgradient of the former operational landfill areas. Perchlorate originating from IRP Site 1 is present in groundwater at IRP Site 2 at concentrations exceeding the California MCL.

Some of the other VOCs reported at concentrations exceeding their respective Federal or California MCLs included PCE; cis-1,2-dichloroethene (cis-1,2- DCE); 1,1,2-trichloroethane (1,1,2-TCA); and 1,2- dichloroethane (1,2-DCA).

2.4 CURRENT AND PROPOSED FUTURE LAND AND RESOURCE USES

2.4.1 Land Use

Former MCAS El Toro was closed on 2 July 1999. From 1994 to 2002, the County of Orange, the designated Local Reuse Authority (LRA), proposed a commercial aviation reuse for former MCAS El Toro. This proposal was submitted as a BRAC Reuse Plan. In March 2002, County voters overturned those planning efforts with the passage of Measure W, a referendum that changed the Orange County General Plan for former MCAS El Toro to a non-aviation use and recreational theme, with limited development intensities. After the March 2002 vote, the LRA decided that it would not prepare another BRAC Reuse Plan for the property. Consequently, the Navy decided not to dispose of the property with any particular reuse or redevelopment plan and that reuse would ultimately be determined by local zoning applicable at the time of sale.

In November 2003, the City of Irvine annexed the former Station property. The City of Irvine has not prepared a BRAC Reuse Plan. However, a conceptual Reuse Plan entitled "Orange County Great Park" was prepared and approved by the City of Irvine; calling for mixed uses of residential, commercial, and recreational open space.

In July 2005, the Navy completed the process of conveying the former Station through public sale to a private developer. Although the sale resulted in a majority of the property being transferred by deed, areas that required further environmental investigation and/or response actions were retained by the Navy. These areas, known as carve-outs (COs), were leased to the developer in accordance with the Finding of Suitability to Lease (FOSL) under a Lease in Furtherance of Conveyance (LIFOC). Upon meeting the environmentally suitable for transfer requirements, the COs are deeded to the buyer.

Prior to the public sale, approximately 975 acres were excluded from being determined as surplus property and were instead retained by the government. As such, an approximately 900-acre area south of IRP Site 1, including IRP Site 2, was conveyed to another Federal agency, the Federal Aviation Administration (FAA). The remaining acreage, which encompasses IRP Site 1, has been retained by the Navy. The Navy intends to transfer IRP Site 1 with the anticipated future use as "like-use" or an EOD Training Range.

2.4.2 Groundwater Use

Former MCAS El Toro is located within the Irvine Management Zone (formally known as the Irvine Groundwater Forebay), which has been designated by the RWQCB as a public water supply source. The aquifer located directly beneath former MCAS El Toro is not currently used for municipal water supply; however, groundwater near the former Station is used for agricultural purposes.

2.5 SUMMARY OF SITE RISKS

Human-health risk assessments for **IRP Site 1** and **IRP Site 2** were prepared as part of the RIs to evaluate potential impacts to human-health from the COPCs in groundwater at IRP Sites 1 and 2. Detailed risk assessment methodologies and results are presented in the RI Reports for IRP Sites 1 and 2. A brief summary of these risk assessments is presented in the following sections.

Characterization of risk addresses potential cancer and noncancer risks. Cancer risk is an upper-bound estimate of individual excess probability of increased incidence of cancer as a result of exposure to a potential carcinogen. A cancer risk of $1x10^{-6}$ means that the estimated increase in an individual above normal or baseline cancer risk does not exceed 1 in 1,000,000 for a lifetime of exposure, and it may be considerably less. Non-cancer risk is expressed as a hazard index (HI). Because an HI value of 1 indicates that lifetime exposure has limited potential for causing an adverse effect in sensitive populations, values of less than 1 can generally be considered acceptable. Values exceeding 1 are usually given closer attention.

2.5.1 IRP Site 1 Human-Health Screening Risk Assessment

2.5.1.1 Summary of Methodology

A human-health screening risk assessment (SRA) was conducted as part of the Phase II RI to evaluate the potential for adverse human-health effects due to exposure to groundwater impacted by past operations at IRP Site 1. Based on the current and potential future land use, risk-based screening evaluation for potential exposure to groundwater was conducted for hypothetical residents, including adults and children. The risk screening included a comparison of the calculated exposure point concentrations (EPCs) for chemicals of potential concern (COPCs) to their respective tap water **preliminary remediation goals (PRGs)** established by the U.S. EPA Region 9 (U.S. EPA 2004). In addition, the potential risks due to inhalation of VOCs in indoor air were evaluated using U.S. EPA's Johnson and Ettinger (J&E) Model.

The DTSC, Human and Ecological Risk Division has established different toxicity values (known as California-modified toxicity values) than those used by U.S. EPA Region 9 for several chemicals identified at IRP Site 1. Therefore, cancer risk and noncancer hazard estimates were also calculated using the California-modified toxicity values. Risks were estimated under both a high-end level of exposure (reasonable maximum exposure [RME]) and an average level of exposure (central tendency exposure [CTE]).

2.5.1.2 Summary of Results

Groundwater was evaluated as a source for drinking water with tap water PRGs being developed under a residential land use scenario. Table 2-3 presents a summary of the risk assessment results for IRP Site 1 groundwater conducted using U.S. EPA toxicity values. Potential cancer risk from exposure to impacted groundwater associated with IRP Site 1 was estimated to be $1x10^{-3}$ (under RME scenario), which exceeds the U.S. EPA's action level (10^{-4}) typically associated with remediation requirements. The cancer risk due to potential vapor intrusion (VI) into indoor air as a result of volatilization of VOCs from IRP Site 1 groundwater was estimated to be within the U.S. EPA's risk management range of 10^{-4} to 10^{-6}. Further explanation of these results and a summary of risk management considerations are presented in Section **2.5.3**. Based on the 2006 RI, the risk due to potential exposure to groundwater using California-modified toxicity values resulted in lower estimates of cancer risk when compared to estimates using U.S. EPA Region 9 toxicity values. This difference was primarily due to lower assigned cancer potency factor for TCE by the State of California.

Table 2-3: Summary of Risk Assessment Results for Groundwater, IRP Site 1 – Residential Use Scenario*

Type	RME	CTE
Groundwater		
ILCR	$1x10^{-3}$	$5x10^{-5}$
Contributors:	88% TCE	60% - TCE
	9% - arsenic	34% - arsenic
HI	10	5
Contributors:	31% - perchlorate	31% - perchlorate
	21% - trichloroethene	19% - trichloroethene
	13% - nickel	13% - nickel
	13% - thallium	13% - thallium
	11% - chromium	11% - chromium

Table 2-3: Summary of Risk Assessment Results for Groundwater, IRP Site 1 – Residential Use Scenario*

Type	RME	CTE
Indoor Air – Vapor Emission from Groundwater		
ILCR	$3x10^{-5}$	$7x10^{-6}$
Contributors:	99% - TCE	99% - TCE
HI	<0.01	<0.01

Notes:
* Risks summarized are for U.S. EPA toxicity values.
% = percent
< = less than
CTE = central tendency exposure
HI = Hazard Index
ILCR = incremental lifetime cancer risk
RME = reasonable maximum exposure
TCE = trichloroethene

2.5.2 IRP Site 2 Human-Health Baseline Risk Assessment

2.5.2.1 Summary of Methodology

A baseline human-health risk assessment was prepared as part of the RI to evaluate potential impacts from contaminants at the Site on human-health if no remedial actions are taken. Based on the current and potential land use, and existing site conditions (i.e., presence of a landfill at IRP Site 2), the potential receptors identified for impacted groundwater included hypothetical off-site residents (adults and children) living at the boundary of IRP Site 2. The exposure to COPCs in groundwater was assumed to occur via the following pathways:

- Ingestion of impacted groundwater
- Dermal contact with impacted groundwater
- Inhalation of VOCs during household use of impacted groundwater

The potential risk due to inhalation of VOCs in indoor air was not evaluated during the RI. The risk associated with this exposure pathway at IRP Site 2 groundwater was estimated as part of the **FS**.

2.5.2.2 Summary of Results

Table 2-4 presents a summary of the human-health risk assessment results for IRP Site 2 groundwater. The cancer risk for adult residential use of groundwater downgradient from IRP Site 2 was estimated to be $3x10^{-4}$. The primary risk driver was arsenic, which contributes 99 percent of the total risk. The HI for residential groundwater use immediately downgradient of IRP Site 2 was estimated to be 6.1. The primary contributors to the HI were arsenic (46 percent), fluoride (21 percent), manganese (13 percent), and nickel (8 percent). Further explanation of these results and a summary of risk management considerations are presented in Section **2.5.3**.

2.5.2.3 Vapor Intrusion Screening-level Assessment

A screening level evaluation of potential risks due to VI into indoor air at IRP Site 2 was prepared as part of the FS. This evaluation estimated VI risks to human-health assuming construction and occupancy of structures over the VOC-impacted groundwater. This is the only potential pathway for the area overlying VOC-impacted groundwater, because ICs will prohibit domestic use of impacted groundwater.

A VI screening-level risk assessment was prepared for IRP Site 2 based upon data reported in the **2009 Annual Groundwater Monitoring Report**, and pre-baseline monitoring conducted as part of

the pilot study in June 2009. The site-specific screening evaluation of VI risks was conducted using the U.S. EPA's J&E Model. A residential land-use was assumed for the VI risk evaluation for a conservative estimation of risk.

The cancer risk due to potential VI into indoor air as a result of volatilization of VOCs from IRP Site 2 groundwater was estimated to be $3x10^{-6}$. Further explanation of these results and a summary of risk management considerations are presented in Section 2.5.3.

Table 2-4: Summary of Risk Assessment Results for Groundwater, IRP Site 2 – Residential Use Scenario [a]

Type		RME
Groundwater		
ILCR		$3x10^{-4}$
	Contributors:	99% - arsenic
HI		6.1[b]
		(6.6 [Child] and 2.8 [Adult])
	Contributors:	46% - arsenic
		21% - fluoride
		13% - manganese
		8% - nickel
Indoor Air – Vapor Emission from Groundwater		
ILCR		$3x10^{-6}$
	Contributors:	53% -TCE
		42% - PCE
		4% - bromodichloromethane
HI		0.02

Notes:
[a] Risks summarized are for U.S. EPA toxicity values.
[b] Age-adjusted HI as reported in the **Final Interim ROD for IRP Sites 2 and 17**.
% = percent
< = less than
HI = Hazard Index
ILCR = incremental lifetime cancer risk
RME = reasonable maximum exposure
PCE = tetrachloroethene
TCE = trichloroethene

2.5.3 NCP Point of Departure Analysis

The NCP provides a range of cancer risks from 10^{-6} to 10^{-4} for the Navy as lead agency along with its regulatory partners to use when making decisions on remedies for contaminated sites. Cancer risks less than 10^{-6} are not considered to warrant a cleanup response. Cancer risks greater than 10^{-4} excess cancer risk typically warrant action to reduce exposure. NCP §300.430(e)(2)(A) provides factors that must be considered when making decisions regarding remedial action objectives (RAOs) and remedial alternatives in the context of the NCP Risk Management Range as follows:

"Preliminary remediation goals for carcinogens are set at a 10^{-6} excess cancer risk as a point of departure, but may be revised to a different risk level within the acceptable risk range based on the consideration of appropriate factors including but not limited to exposure factors, uncertainty, and technical limitations (NCP preamble at 55 Fed. Reg. 8717, March 8, 1990)."

The following sections present a summary of technical limitations and uncertainties associated with risk estimates for IRP Sites 1 and 2 groundwater.

2.5.3.1 IRP SITE 1

The two chemicals contributing a majority of the cancer risk due to residential use of groundwater were TCE and arsenic. TCE also contributed to a majority of the potential cancer risk due to VI. Although TCE was reported in some IRP Site 1 monitoring wells during January 2002, it has not been reported in any monitoring well at the Site since January 2002. The estimated cancer risk attributable to TCE (including due to VI) is therefore not considered to represent actual site conditions and no response action is required for TCE in IRP Site 1 groundwater.

In addition, the maximum reported concentration of arsenic in groundwater did not exceed its MCL of 10 µg/L and was within the range of background concentrations observed at former MCAS El Toro. Therefore, no response action is required for arsenic.

Under the RME scenario, the cumulative noncancer hazard associated with potential exposure to groundwater expressed as HI was estimated to be 10. The cumulative HI under the CTE scenario was estimated to be 5. Perchlorate contributes approximately one-third of the total HI (under the RME scenario) with lesser contribution from TCE, chromium, nickel, and thallium. As discussed, the continued presence of TCE in IRP Site 1 monitoring wells could not be confirmed. Chromium, nickel, and thallium were reported at concentrations exceeding their respective MCLs only sporadically and at isolated locations. These data are not indicative of a release to groundwater. Therefore, no response action is required for chromium, nickel, and thallium in IRP Site 1 groundwater.

2.5.3.2 IRP SITE 2

Groundwater ingestion was estimated to be a dominant pathway contributing to risk due to residential use of groundwater. The primary risk drivers were metals including arsenic. Metal concentrations in groundwater are consistent with ambient (background) concentrations and are not attributable to waste-placement activities or releases associated with the impacted groundwater; therefore, no response action is required to address the metals in groundwater.

During the RI, 1,2,3-trichloropropane (1,2,3-TCP) was not identified as a COPC. This chemical has been reported at IRP Site 2, therefore, a qualitative evaluation of the potential risk due to 1,2,3-TCP was performed during the FS using the receptor scenarios evaluated in the RI. This evaluation concluded that 1,2,3-TCP was not reported in any downgradient monitoring wells; therefore, 1,2,3-TCP does not contribute to the risk to any downgradient residential receptors.

The potential risks due to VI into indoor air at IRP Site 2 were estimated to be within the risk management range. Based on the risk evaluation results, IRP Site 2 groundwater does not pose unacceptable risks to human-health via an indoor air inhalation exposure pathway because risks are acceptable or may be acceptable depending upon site-specific and other factors considered appropriate for risk point of departure analysis per the NCP. Therefore, no action is required and no restrictions on reuse are necessary corresponding to VI pathway at IRP Site 2. Factors that support this recommendation include the following:

- The ILCR due to VI into indoor air at maximum detected concentrations in groundwater at IRP Site 2 is within the NCP-defined risk management range of 10^{-6} to 10^{-4}.
- Maximum concentrations of COPCs in groundwater were used to estimate chemical concentrations in indoor air. These maximum detected concentrations do not accurately reflect the concentrations present across the entire Site. Therefore, the use of maximum concentrations to estimate chemical concentrations in indoor air is likely to be conservative and may contribute to overestimation of risks.

- Residential land use was assumed to estimate VI risks. However, since IRP Site 2 VOC-impacted groundwater is overlain by the area encompassing Borrego Canyon Wash, residential use is unlikely.
- The assumptions and values used in the J&E Model were selected to provide a health-protective assessment in the event that site-specific values/information were not available. These assumptions and values are likely to over-estimate potential indoor air concentrations and their subsequent risks and are summarized below.
- The J&E model assumes that all vapors from underlying groundwater will enter the hypothetical building through gaps and openings in the walls, floor, and foundation. This implies that a constant pressure field is generated between the interior spaces and the soil surface and that the vapors are intercepted within the pressure field and transported into the building. This assumption is inherently conservative in that it neglects periods of near zero pressure differentials (e.g., during mild weather when windows are left open).
- The J&E model estimates risk based on an infinite source and a lifetime exposure duration. However, the actual VI risk will diminish overtime as concentrations of VOCs are reduced due to implementation of the remedial action.
- Although it is unlikely that a residential building will be constructed in an area overlying IRP Site 2 VOC-impacted groundwater, a conservative set of building-related parameters were used in the model that are likely to overestimate risk
- HI estimated for IRP Site 2 for residential scenario is less than 1, indicating little potential for adverse non-cancer health effects via indoor air inhalation pathway.

2.5.4 Basis for Response Action

The response actions selected in this ROD for IRP Sites 1 and 2 are necessary to protect the public health, welfare, and the environment from actual or potential releases of hazardous substances into the environment. Based on previous investigation findings, an adequate characterization of the nature and extent of releases has been completed. Human-health risks have been quantified for groundwater at IRP Sites 1 and 2.

Based on the results from the risk assessments, potential exposure to impacted groundwater associated with IRP Site 1 poses an unacceptable risk to human-health under a residential scenario due to the presence of perchlorate. In addition, reported concentrations of perchlorate in groundwater at and downgradient of IRP Site 1 exceed its State of California MCL of 6 µg/L (chemical-specific applicable or relevant and appropriate requirement [ARAR]). Therefore, remedial action for groundwater at IRP Site 1 has been determined to be necessary due to the unacceptable risk from potential human consumption of impacted groundwater and the MCL exceedance.

For IRP Site 2, previous investigations indicate that the following chemicals exceeded their respective Federal and/or State MCLs (chemical-specific ARAR) in groundwater and therefore remedial action for groundwater at IRP Site 2 is necessary:

- TCE
- PCE
- cis-1,2-DCE
- 1,1,2-TCA
- 1,2-DCA

Perchlorate in IRP Site 2 groundwater is addressed as part of IRP Site 1 perchlorate-impacted groundwater.

2.6 PRINCIPAL THREAT WASTE

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment, should exposure occur. Contaminated groundwater generally is not considered to be a source material although non-aqueous phase liquids (NAPLs) may be viewed as source materials. Groundwater monitoring conducted to date did not identify NAPLs in groundwater at either IRP Site 1 or IRP Site 2. Therefore, it can be concluded that principal threat wastes are not present in groundwater at IRP Sites 1 or 2.

2.7 REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific goals for protecting human-health and the environment. The **RAOs** for the remediation of IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater were developed during the IRP Sites 1 and 2 Groundwater FS, which screened remedial technologies and developed and evaluated remedial alternatives. These RAOs included the following:

- Minimize the potential for domestic use of groundwater with concentrations of COCs exceeding the established respective RGs.
- Minimize migration of groundwater with concentrations of COCs exceeding the established respective RGs beyond the former MCAS El Toro Boundary.

These RAOs are consistent with the provisions of 40 C.F.R. § 300.430 (e)(2)(i), since they identify COCs, media of concern (groundwater), potential exposure pathways (domestic use), and RGs. The NCP further specifies that RGs shall establish acceptable exposure levels that are protective of human-health and the environment, and shall be developed by considering several factors including ARARs, cancer risk/non-cancer hazards, factors related to technical limitations such as detection/quantification limits, factors related to uncertainty, and other pertinent information (40 C.F.R. § 300.430 [e][2][i]). The RGs for the COCs in groundwater at IRP Sites 1 and 2 were therefore established at the concentrations that comply with chemical-specific ARARs, and are protective of human-health and the environment. COCs identified for groundwater at IRP Sites 1 and 2 and their respective RGs are presented in **Table 2-4**.

The chemical-specific ARARs for groundwater remedial action at IRP Sites 1 and 2 include Federal MCLs, Federal non-zero maximum contaminant level goals (MCLGs), and State MCLs (see **Attachment 3**). In order to comply with ARARs and protect human-health, the RGs for COCs for remediation of perchlorate-impacted groundwater at IRP Site 1 and VOC-impacted groundwater at IRP Site 2, were set at the values that represent the most stringent of the Federal MCL, Federal non-zero MCLGs, and State of California MCL (see Table 2-5).

Table 2-5: Remediation Goals – IRP Sites 1 and 2 Groundwater

COC	Selected RG (µg/L)[a]
IRP Site 1	
Perchlorate	6
IRP Site 2	
TCE	5

Table 2-5: Remediation Goals – IRP Sites 1 and 2 Groundwater

COC	Selected RG (µg/L)[a]
PCE	5
cis-1,2-DCE	6
1,2-DCA	0.5
1,1,2-TCA	3

Note:
[a] The most stringent of the following values: Federal MCL, non-zero Federal MCLG, and the State of California MCL.
µg/L = micrograms per liter
COC = chemical of concern
IRP = Installation Restoration Program
RG = remediation goal

2.8 Description and Comparative Analysis of Alternatives

The development and individual and comparative analysis of remedial alternatives was conducted separately for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater in the FS. A detailed **screening of technologies and process options** was conducted with respect to their effectiveness, implementability, and cost. Based on this screening, representative technologies/process options were selected and combined to develop remedial alternatives summarized in the following subsection.

2.8.1 Description of Remedial Alternatives

2.8.1.1 IRP Site 1 Perchlorate-Impacted Groundwater

The six **remedial alternatives developed for IRP Site 1 perchlorate-impacted groundwater** are summarized in Table 2-6.

Table 2-6: Remedial Alternatives – IRP Site 1 Perchlorate-Impacted Groundwater

Alternative	Description	Cost / Time-Frame
Alternative G1-1: No Action	The NCP requires that the No-Action Alternative be developed and evaluated. This alternative provides no monitoring, treatment, remediation, or restrictions on the use of groundwater.	Not applicable
Alternative G1-2: MNA and ICs	• This alternative would rely on natural attenuation processes and monitoring for remediation of perchlorate-impacted groundwater. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that, under favorable conditions, would act without human intervention to reduce concentrations of perchlorate in groundwater. • Groundwater monitoring would be conducted to demonstrate that natural attenuation is occurring and to evaluate migration of perchlorate beyond the former MCAS El Toro Boundary. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The **areas requiring ICs (ARICs)** presented in the FS would be finalized in the Remedial Design to be issued at a later date. • The protectiveness of the remedy would be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	Capital Cost[a]: $366,000 O&M Cost[b]: $8,901,000 Total Cost[c]:$9,267,000 **Present Worth Cost[d]: $3,223,000** **Timeframe[e]: Greater than 200 years**
Alternative G1-3: ISB Near the former Station Boundary,	• ISB would be implemented near the former Station Boundary to minimize the potential for migration of perchlorate at concentrations exceeding its RG.	Capital Cost[a]: $1,650,000 O&M Cost[b]: $24,709,000

Alternative	Description	Cost / Time-Frame
Monitoring, and ICs	• ISB would include injecting commercially available bioremediation compounds (e.g., food-grade vegetable oil) into groundwater to stimulate naturally-occurring bacteria to degrade perchlorate. The number, spacing, and frequency of injections would be determined in the Remedial Design to be issued at a later date. • Groundwater monitoring would be implemented to evaluate the effectiveness of ISB and to track changes in perchlorate concentrations in groundwater. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The conceptual boundaries of the ARICs presented in the FS would be finalized in the Remedial Design to be issued at a later date. • The protectiveness of the remedy would be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	Total Cost[c]:$26,358,000 **Present Worth Cost[d]:$9,378,000** **Timeframe[e]: Greater than 200 years**
Alternative G1-4: ISB at the Source Area and Near the former Station Boundary, Monitoring, and ICs	• ISB would be implemented at the perchlorate Source Area to treat relatively elevated concentrations of perchlorate. • In addition, ISB would also be implemented near the former Station Boundary to minimize the potential for migration of perchlorate at concentrations exceeding its RG. • ISB would include injecting commercially available bioremediation compounds (e.g., food-grade vegetable oil) into groundwater to stimulate naturally-occurring bacteria to degrade perchlorate. The number, spacing, and frequency of injections would be determined in the Remedial Design to be issued at a later date. • Groundwater monitoring would be implemented to evaluate the effectiveness of ISB and to track changes in perchlorate concentrations in groundwater. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The conceptual boundaries of the ARICs presented in the FS would be finalized in the Remedial Design to be issued at a later date. • The protectiveness of the remedy would be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	Capital Cost[a]: $4,646,000 O&M Cost[b]: $25,107,000 Total Cost[c]:$29,753,000 **Present Worth Cost[d]: $12,479,000** **Timeframe[e]: Greater than 200 years**
Alternative G1-5: ISB at the Source Area, Downgradient of the Source Area and Near the former Station Boundary, Monitoring, and ICs	• ISB would be implemented at and downgradient of the perchlorate Source Area to treat relatively elevated concentrations of perchlorate. • In addition, ISB would be implemented near the former Station Boundary to minimize the potential for migration of perchlorate at concentrations exceeding its RG. • ISB would include injecting commercially available bioremediation compounds (e.g., food-grade vegetable oil) into groundwater to stimulate naturally-occurring bacteria to degrade perchlorate. The number, spacing, and frequency of injections would be determined in the Remedial Design to be issued at a later date. • Groundwater monitoring would be implemented to evaluate the effectiveness of ISB and to track changes in perchlorate concentrations in groundwater. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The conceptual boundaries of the ARICs presented in the FS would be finalized in the Remedial Design to be issued at a later	Capital Cost[a]: $5,258,000 O&M Cost[b]: $5,929,000 Total Cost[f]: $11,187,000 **Present Worth Cost[g]: $9,218,000** **Timeframe[e]: 19 years**

Alternative	Description	Cost / Time-Frame
Alternative G1-5 (continued)	date. • The protectiveness of the remedy would be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	
Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs	• Under this alternative, groundwater would be extracted aboveground using extraction wells distributed across the estimated extent of perchlorate impacted groundwater. • The extracted groundwater would be treated aboveground using technologies such as fluidized bed reactor or ion exchange resin. • Groundwater monitoring would be implemented to evaluate the effectiveness of the remedy and to track changes in perchlorate concentrations in groundwater. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The conceptual boundaries of the ARICs presented in the FS would be finalized in the Remedial Design to be issued at a later date. • The protectiveness of the remedy would be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	Capital Cost[a]: $7,878,000 O&M Cost[b]: $32,504,000 Total Cost[h]: $40,383,000 **Present Worth Cost[i]: $24,280,000** **Timeframe[e]: 49 years**

Notes:
[a] Costs rounded-off to nearest thousands.
[b] Costs include periodic costs.
[c] Based on the O&M period of 100 years.
[d] The present worth analysis was performed assuming an O&M period of 100 years and discount rate of 2.8 percent.
[e] Predicted time-frame for perchlorate concentrations to attenuate to 6 μg/L (RG) along the estimated extent of perchlorate-impacted groundwater.
[f] Based on the O&M period of 19 years.
[g] The present worth analysis was performed assuming an O&M period of 19 years and a discount rate of 2.8 percent.
[h] Based on the O&M period of 49 years.
[i] The present worth analysis was performed assuming an O&M period of 49 years and a discount rate of 2.8 percent.

2.8.1.2 IRP Site 2 VOC-Impacted Groundwater

The four **remedial alternatives developed for IRP Site 2 VOC-impacted groundwater** are summarized in Table 2-7.

Table 2-7: Remedial Alternatives – IRP Site 2 VOC-Impacted Groundwater

Alternative	Description	Cost / Time-Frame
Alternative G2-1: No Action	The NCP requires that the No-Action Alternative be developed and evaluated. This alternative provides no monitoring, treatment, remediation, or restrictions on the use of groundwater.	Not applicable
Alternative G2-2: MNA and ICs	• This alternative would rely on natural attenuation processes and monitoring for remediation of VOC-impacted groundwater. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and sorption that, under favorable conditions, would act without human intervention to reduce concentrations of VOCs in groundwater. • Groundwater monitoring would be conducted to demonstrate that natural attenuation is occurring and to evaluate migration of COCs beyond the former MCAS El Toro Boundary. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The **ARICs** presented in the FS would be finalized in the Remedial Design to be issued at a later date.	Capital Cost[a]: $230,000 O&M Cost[b]: $2,538,000 Total Cost[c]:$2,768,000 **Present Worth Cost[d]: $1,755,000** **Timeframe[e]: 30 years**

Alternative	Description	Cost / Time-Frame
Alternative G2-2 (continued)	• The protectiveness of the remedy will be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	
Alternative G2-3: In-Plume Treatment, Monitoring, and ICs	• This alternative would include remediation of hot-spots defined by TCE concentrations exceeding 40 µg/L. Hot-spot remediation would be conducted using ISB, in-situ chemical oxidation, or in-situ chemical reduction. • Groundwater monitoring would be implemented to evaluate the effectiveness of hot-spot remediation and to track changes in COC concentrations in groundwater. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The conceptual boundaries of the ARICs presented in the FS would be finalized in the Remedial Design to be issued at a later date. • The protectiveness of the remedy will be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	Capital Cost[a]: $1,912,000 O&M Cost[b]: $2,735,000 Total Cost[f]:$4,646,000 **Present Worth Cost[g]: $3,665,000** **Timeframe[e]: 29 Years**
Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs	• Impacted groundwater would be extracted aboveground using extraction wells. Extracted groundwater would be treated using technologies such as granular activated carbon and/or air stripping. • Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation. • Groundwater monitoring would be implemented to evaluate the effectiveness of the remedy and to track changes in COC concentrations in groundwater. • ICs including groundwater use restrictions would be implemented to minimize the potential for exposure to impacted groundwater and to protect the remedy components such as monitoring wells. The conceptual boundaries of the ARICs presented in the FS would be finalized in the Remedial Design to be issued at a later date. • The protectiveness of the remedy will be evaluated as part of the 5-year review and as data from groundwater monitoring are collected.	Capital Cost[a]: $586,000 O&M Cost[b]: $2,334,000 Total Cost[h]:$2,920,000 **Present Worth Cost[i]: $2,167,000** **Timeframe[e]: 21 Years**

Notes:
[a] Costs rounded-off to nearest thousands.
[b] Costs include periodic costs.
[c] Based on the O&M period of 32 years.
[d] The present worth analysis was performed assuming an O&M period of 32 years and discount rate of 2.8 percent.
[e] Predicted time-frame for TCE (primary COC) concentrations to attenuate to 5 µg/L (RG) along the estimated extent of VOC-impacted groundwater.
[f] Based on the O&M period of 29 years.
[g] The present worth analysis was performed assuming an O&M period of 29 years and a discount rate of 2.8 percent.
[h] Based on the O&M period of 21 years.
[i] The present worth analysis was performed assuming an O&M period of 21 years and a discount rate of 2.8 percent.

2.8.2 Comparative Analysis of Alternatives

2.8.2.1 IRP Site 1 Perchlorate-Impacted Groundwater

The **individual and comparative analyses of IRP Site 1 groundwater remedial alternatives** with respect to the **nine evaluation criteria identified in the NCP** (40 C.F.R. § 300.430 [e][9][iii]) are presented in the Groundwater FS Report. The results of these analyses are summarized in **Table 2-8**.

Table 2-8: Summary of Individual and Comparative Analysis of Alternatives – IRP Site 1 Perchlorate-Impacted Groundwater

U.S. EPA Criteria	G1-1	G1-2	G1-3	G1-4	G1-5	G1-6
Overall Protection of Human-Health and the Environment	Does not Meet the Criterion	Meets the Criterion	Meets the Criterion	Meets the Criterion	Meets the Criterion	Meets the Criterion
Compliance with ARARs	Not Applicable	Meets the Criterion	Meets the Criterion	Meets the Criterion	Meets the Criterion	Meets the Criterion
Long-Term Effectiveness	○	◔	◑	◕	●	●
Reduction in Toxicity, Mobility, and Volume through Treatment	○	○	◔	◑	●	◕
Short-Term Effectiveness	●	◑	◔	◔	◕	○
Implementability	●	◕	◑	◑	◔	○
Cost	Not Applicable	●	◕	◔	◕	○
State Acceptance	The State of California concurs with the Selected Remedy.					
Community Acceptance	No significant comments were received from community members.					

Notes:
Relative Performance in Satisfying Criteria

○ Poor ◔ Poor - Fair ◑ Fair ◕ Fair - Good ● Good

Threshold Criteria

Overall Protection of Human-Health and the Environment: This criterion evaluates how each remedial alternative protects human-health and the environment, in both the short-term and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the Site. All alternatives, except Alternative G1-1 (No Action) provide adequate protection of human-health and the environment. Alternatives G1-2 through G1-6 protect human-health by providing varying degrees of treatment to reduce perchlorate concentrations in groundwater, and by providing ICs and monitoring to minimize the potential for exposure to perchlorate-impacted groundwater.

Alternative G1-2 would rely on natural attenuation processes to reduce concentrations of perchlorate in groundwater. Alternative G1-3 includes implementation of ISB near the former Station Boundary to minimize further migration of perchlorate at concentrations exceeding its RG. In addition to bioremediation near the former Station Boundary, Alternatives G1-4 and G1-5 include the treatment of the perchlorate Source Area to reduce and minimize downgradient migration of relatively high concentrations of perchlorate. Alternative G1-5 also includes implementation of ISB for remediation of perchlorate between the Source Area and the former Station Boundary. Alternatives G1-6 would protect human-health by extraction and treatment of perchlorate-impacted groundwater.

All active alternatives (Alternatives G1-2 through G1-6) would include implementation of ICs including groundwater use restrictions until the remedial alternatives reduce concentrations of perchlorate to its respective RG.

Compliance With ARARs: Since Alternative G1-1 includes no remedial action, ARARs would not be triggered. Alternatives G1-2 through G1-6 would comply with **all identified ARARs**.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence: This criterion evaluates the residual risk at the completion of remedial actions along with the adequacy and reliability of remedial alternatives for ensuring the continued protection of human-health and the environment. The more active remedial alternatives such as Alternatives G1-5 and G1-6 would provide a high degree of long-term effectiveness since they include comprehensive remediation of the IRP Site 1 perchlorate-impacted groundwater. Alternatives G1-5 and G1-6 are also expected to be more reliable and minimize migration of perchlorate-impacted groundwater at concentrations exceeding the RG beyond the former MCAS El Toro Boundary. Groundwater modeling suggests that active remediation measures implemented as part of Alternatives G1-5 and G1-6 would significantly shorten the time required to remediate perchlorate-impacted groundwater than its RG compared to other remedial alternatives. Alternatives G1-3 and G1-4 include a relatively lesser degree of active remediation than Alternatives G1-5 and G1-6 and attain perchlorate RG over a much longer time period. Similarly, Alternative G1-2 relies on natural processes to reduce the risk and does not actively control the migration of perchlorate. As a result, Alternatives G1-2, G1-3, and G1-4 place a higher reliance on ICs to protect human-health and the environment as compared to Alternatives G1-5 and G1-6. The ICs are generally adequate and reliable; however, they do not offer the same degree of certainty, reliability and long-term protectiveness as afforded by active remedial technologies like those proposed under Alternatives G1-5 and G1-6. Alternative G1-1 is expected to be the least effective in the long-term since it includes no monitoring or controls for minimizing or reducing exposure to perchlorate-impacted groundwater.

Reduction of Toxicity, Mobility, and Volume through Treatment: Under this criterion, remedial alternatives are evaluated based on the degree to which they employ recycling or treatment that reduces toxicity, mobility, or volume. Alternatives G1-5 and G1-6 are expected to achieve a higher degree of reduction in toxicity, mobility, or volume/mass of perchlorate as compared to the other alternatives since they include remediation at the Source Area, the area between IRP Sites 1 and 2, and the area near the former Station Boundary. For Alternative G1-5, ISB would destroy perchlorate into innocuous end products. Alternative G1-6 includes comprehensive ex-situ treatment of the IRP Site 1 perchlorate-impacted groundwater and would achieve a high degree of reduction in toxicity, mobility, or volume/mass of perchlorate. However, the type and quantity of treatment residuals generated under Alternative G1-6 would be greater, compared to Alternative G1-5.

Alternatives G1-3 and G1-4 would provide a lesser degree of reduction in toxicity, mobility, or volume/mass of perchlorate compared to Alternatives G1-5 and G1-6 since these alternatives involve less aggressive remediation options. Since Alternative G1-4 includes ISB of relatively high concentrations of perchlorate in the Source Area, it is expected to reduce toxicity, mobility, and volume/mass of perchlorate to a greater degree compared to Alternative G1-3. Alternatives G1-2 would rely primarily on natural attenuation mechanisms to reduce perchlorate concentrations and toxicity in groundwater.

Short-Term Effectiveness: The short-term effectiveness criterion includes risks to workers/community, or the environmental impacts during the construction and implementation phase of the remedial action, and the time required to achieve protectiveness. Since no remedial action would be implemented as part of Alternative G1-1, there would be no short-term risks to workers/community, or adverse environmental impacts due to remedial action implementation. For

the remaining alternatives, the short-term effectiveness would be a function of risks to workers/community and environmental impacts during the remedial construction phase (e.g., drilling and substrate injection), and the O&M phase (e.g., transportation of personnel/equipment, treatment system operation, and potential for exposure to impacted groundwater). The risks to workers and environmental impacts associated with the alternatives were evaluated through a qualitative Sustainable Environmental Remediation (SER) analysis. The scope of construction operations would be the largest for Alternative G1-6 as compared to other alternatives. In addition, environmental impacts during the O&M phase are also expected to be relatively high for Alternative G1-6 due to the operation of groundwater extraction, conveyance, and treatment systems. The short-term risks, associated with Alternatives G1-2 through G1-4 during the O&M phase are expected to be similar since they have similar O&M operations, and remediation timeframes. Based on the scope of remedial construction operations and resultant potential risks to workers/community and environmental impacts, Alternatives G1-2 would have relatively less impact as compared to Alternatives G1-3 and G1-4. Alternative G1-5 would have relatively less impact (i.e., provide a higher degree of short-term effectiveness) compared to all other active remediation alternatives (i.e., Alternatives G1-2 through G1-4, and Alternative G1-6). Although the scale of construction operations for Alternative G1-5 would be larger compared to Alternative G1-2 through G1-4, the risks to workers and environmental impacts during the O&M phase are expected to be considerably less due to a much shorter remediation time frame.

Implementability: This criterion primarily addresses the ability to construct and operate the alternative, the reliability and ability to monitor the alternative, and the availability of equipment and specialists necessary to implement the alternatives. There is no action associated with Alternative G1-1 therefore implementation considerations are deemed to be good. For the active alternatives, Alternative G1-2 would be the simplest to construct and operate. Alternatives G1-3, G1-4, and G1-5 include ISB of perchlorate. Alternative G1-6 includes ex-situ treatment of perchlorate-impacted groundwater using a fluidized bed reactor (FBR) or ion exchange (IX). Groundwater modeling indicates that a large number of extraction wells would be required under Alternative G1-6 for the treatment of perchlorate-impacted groundwater. Therefore, Alternative G1-6 is expected to be more complex to construct and operate compared to alternatives proposing ISB (Alternatives G1-3 through G1-5). The in-situ pilot studies provided valuable data for full-scale design and implementation of ISB proposed under Alternatives G1-3 through G1-5. Since the implementation of Alternative G1-5 involves more components and construction activities it would be more complex compared to Alternatives G1-3 and G1-4.

Cost: Under this criterion, remedial alternatives are evaluated based on their capital, O&M, and periodic costs. There are no costs associated with Alternative G1-1. A comparison of present-worth costs for the remaining alternatives indicates that the remedial alternative involving ex-situ treatment (i.e., Alternative G1-6) is most expensive. In comparison, the present-worth costs for in-situ treatment alternatives (i.e., Alternatives G1-3 through G1-5) that are expected to remediate perchlorate-impacted groundwater to its RG are relatively cheaper. The present-worth costs for Alternative G1-2 are the lowest.

Modifying Criteria

State Acceptance: Under this criterion, remedial alternatives are evaluated based on their acceptance by the State regulatory agencies. Regulatory involvement has been solicited throughout the CERCLA process. Review and State concurrence has been obtained on preceding documents including the RI and FS Reports for IRP Sites 1 and 2. The State of California concurs with the Selected Remedy for groundwater at IRP Site 1.

Community Acceptance: Under this criterion, remedial alternatives are evaluated based on their acceptance by the community. The Proposed Plan was issued for public review from 20 April to 20

May 2011 and was discussed at a public meeting on 27 April 2011. A summary of public comments and responses is included in the Responsiveness Summary presented in **Attachment 4**.

2.8.2.2 IRP Site 2 VOC-Impacted Groundwater

The **individual and comparative analyses of IRP Site 2 groundwater remedial alternatives** with respect to the nine evaluation criteria identified in the NCP (40 C.F.R. § 300.430 [e][9][iii]) are presented in the Groundwater FS. The results of these analyses are summarized in Table 2-9.

Table 2-9: Summary of Individual and Comparative Analysis of Alternatives – IRP Site 2 VOC-Impacted Groundwater

U.S. EPA Criteria	G2-1	G2-2	G2-3	G2-4
Overall Protection of Human-Health and the Environment	Does not Meet the Criterion	Meets the Criterion	Meets the Criterion	Meets the Criterion
Compliance with ARARs	Not Applicable	Meets the Criterion	Meets the Criterion	Meets the Criterion
Long-Term Effectiveness	○	◑	◕	●
Reduction in Toxicity, Mobility, and Volume through Treatment	○	○	◑	●
Short-Term Effectiveness	●	◕	◑	○
Implementability	●	◕	◑	○
Cost	Not Applicable	●	◑	◕
State Acceptance	The State of California concurs with the Selected Remedy.			
Community Acceptance	No significant comments were received from community members.			

Notes:
Relative Performance in Satisfying Criteria

○ Poor ◔ Poor - Fair ◑ Fair ◕ Fair - Good ● Good

Threshold Criteria

Overall Protection of Human-Health and the Environment: This criterion evaluates how each remedial alternative protects human-health and the environment, in both the short-term and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the Site. All alternatives, except Alternative G2-1 (No Action) provide adequate protection of human-health and the environment. Alternatives G2-2 through G2-4 protect human-health by providing varying degrees of treatment and/or MNA to reduce VOC concentrations in groundwater, and ICs to minimize the potential for exposure to VOC-impacted groundwater.

Alternative G2-2 would rely on natural attenuation mechanisms such as dispersion, dilution, sorption, volatilization, and biodegradation to reduce concentrations of VOCs in groundwater.

Alternatives G2-3 and G2-4 include implementation of in-situ remediation and ex-situ treatment of extracted groundwater, respectively, to treat VOCs in groundwater. All active alternatives (Alternatives G2-2 through G2-4) would include implementation of ICs including groundwater use restrictions until the remedial alternatives reduce concentrations of VOCs to their respective RGs.

Compliance With ARARs: Since Alternative G2-1 entails no remedial action, ARARs would not be triggered. Alternatives G2-2 through G2-4 would comply with all identified ARARs.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence: This criterion evaluates the residual risk at the completion of remedial actions along with the adequacy and reliability of remedial alternatives for ensuring the continued protection of human-health and the environment. Alternative G2-4 would provide a high degree of long-term effectiveness since it would include comprehensive remediation of the IRP Site 2 VOC-impacted groundwater. Alternative G2-4 would also minimize migration of VOC-impacted groundwater. The reliability of groundwater extraction and ex-situ treatment for remediation of VOCs proposed under Alternative G2-4 is high compared to other alternatives that include a relatively lesser degree of active remediation. Alternative G2-3 would include active treatment of relatively elevated concentrations of TCE using ISB, in-situ chemical oxidation (ISCO), or in-situ chemical reduction. Therefore, Alternative G2-3 would provide a high degree of reliability to treat VOCs to their respective RGs compared to Alternative G2-2. Alternative G2-2 would rely on natural processes such as dispersion and dilution to reduce concentrations of VOCs in groundwater.

Reduction of Toxicity, Mobility, and Volume through Treatment: Under this criterion, remedial alternatives are evaluated based on the degree to which they employ recycling or treatment that reduces toxicity, mobility, or volume. Alternative G2-2 would rely on natural attenuation mechanisms for reduction in concentrations, toxicity, mobility, or volume of VOCs in groundwater. Alternatives G2-3 and G2-4 employ active treatment technologies to permanently reduce toxicity, mobility or volume of VOCs in groundwater. Alternatives G2-3 would include implementation of in-situ remediation for the hot-spot area and would rely on natural attenuation mechanisms for remediation of the residual VOCs. Alternative G-4 would involve implementation of ex-situ treatment for the extracted, impacted groundwater to reduce concentrations of VOCs to their respective RGs. Therefore, Alternative G2-4 would provide a high degree of reduction in toxicity, mobility, and/or volume of VOCs through treatment compared to Alternative G2-3.

Short-Term Effectiveness: The short-term effectiveness criterion includes risks to workers/community, or the environment impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Since no remedial action would be implemented as part of Alternative G2-1, there would be no short-term risks to workers/community or adverse environmental impacts due to remedial action implementation. For the remaining alternatives, the short-term effectiveness would be a function of potential risks to workers and environmental impacts during the remedial construction phase (e.g., drilling and substrate injection), and during the O&M phase (e.g., transportation of personnel/equipment, treatment system operation, and potential for exposure to impacted groundwater). The risks to workers/community and environmental impacts associated with different remedial alternatives were evaluated through a qualitative SER analysis. The scope of construction operations would be the greatest for Alternative G2-4 compared to other alternatives. In addition, environmental impacts during the O&M phase are also expected to be relatively high for Alternative G2-4 due to the operation of groundwater extraction, conveyance, and treatment systems. Therefore, Alternative G2-4 would provide a lower degree of short-term effectiveness compared to Alternatives G2-1, G2-2, and G2-3. The scope of remedial construction operations and resultant potential risks to

workers/community and environmental impacts are expected to be higher for Alternative G2-3 compared to Alternative G2-2. Therefore, Alternatives G2-2 would provide a higher short-term effectiveness compared to Alternatives G2-3.

Implementability: This criterion primarily addresses the ability to construct and operate the alternative, the reliability and ability to monitor the alternative, and the availability of equipment and specialists necessary to implement the alternative. There are no implementability concerns associated with Alternative G2-1 since no action would be taken. Alternative G2-2 would be the next simplest to construct and operate. Alternative G2-3 would include active remediation of relatively elevated TCE concentrations using ISB, ISCO, or in-situ chemical reduction. Alternative G2-4 would include installation of groundwater extraction wells, and aboveground conveyance and treatment systems for remediation of VOC-impacted groundwater. The pilot studies conducted at IRP Site 2 for both in-situ and ex-situ remediation technologies provide valuable data for full-scale design and implementation of Alternatives G2-3 and G2-4. However, since the implementation of Alternative G2-4 involves more components and construction activities, it would be more complex compared to Alternatives G2-3.

Cost: Under this criterion, remedial alternatives are evaluated based on their capital, O&M, and periodic costs. There are no costs associated with Alternative G2-1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative G2-2 is the least expensive and Alternative G2-3 is the most expensive.

Modifying Criteria

State Acceptance: Under this criterion, remedial alternatives are evaluated based on their acceptance by the State regulatory agencies. Regulatory involvement has been solicited throughout the CERCLA process. Review and State concurrence has been obtained on preceding documents including the RI and FS Reports for IRP Sites 1 and 2. The State of California concurs with the Selected Remedy for groundwater at IRP Site 2.

Community Acceptance: Under this criterion, remedial alternatives are evaluated based on their acceptance by the community. The Proposed Plan was issued for public review from 20 April to 20 May 2011 and was discussed at a public meeting on 27 April 2011. A summary of public comments and responses is included in the Responsiveness Summary presented in **Attachment 4**.

2.9 SELECTED REMEDIES

The Proposed Plan, released for public comment on 20 April 2011, identified Alternative G1-5 (ISB at the Source Area, Downgradient of the Source Area and Near the former Station Boundary, Monitoring, and ICs) and Alternative G2-2 (MNA and ICs) as preferred alternatives for IRP Site 1 perchlorate-impacted groundwater, and IRP Site 2 VOC-impacted groundwater, respectively. The Navy reviewed all written and oral comments submitted during the public comment period on the Proposed Plan. It was determined that no significant changes to the preferred alternatives, as originally identified in the Proposed Plan, were necessary or appropriate. Alternative G1-5 and Alternative G2-2 were therefore selected as the final remedies for IRP Site 1 perchlorate-impacted groundwater, and IRP Site 2 VOC-impacted groundwater, respectively.

2.9.1 Rationale for Remedy Selection

Alternatives G1-5 and G2-2 were selected for remediation of groundwater at IRP Sites 1 and 2, respectively, because they meet the RAOs, and the threshold NCP criteria, and provide the best balance of tradeoffs with respect to the balancing and modifying NCP criteria.

Alternative G1-5 provides protection of human-health and the environment. The implementation of ISB at the perchlorate Source Area, downgradient of the Source Area, and near the former Station Boundary will reduce perchlorate concentrations and minimize migration of perchlorate at concentrations exceeding its RG. ICs including groundwater use restrictions will minimize the potential for exposure to perchlorate-impacted groundwater until perchlorate concentrations are reduced to its RG. Alternative G1-5 provides a high degree of reduction in toxicity, mobility, or volume/mass of perchlorate through treatment, and will be effective in both the short- and long-term.

Alternative G2-2 provides protection of human-health and the environment. This alternative restricts use of on-site groundwater; thereby protecting human-health by minimizing the potential for exposure to VOC-impacted groundwater. Alternative G2-2 relies on natural processes such as dilution and dispersion to reduce VOC concentrations in groundwater. Because of limited remedial construction activities, Alternative G2-2 will be effective in the short-term and will result in minimal impacts to workers/environment. Effective implementation of ICs will ensure the long-term effectiveness of Alternative G2-2.

2.9.2 Description of the Selected Remedy

2.9.2.1 IRP Site 1 Perchlorate-Impacted Groundwater

The Selected Remedy for IRP Site 1 perchlorate-impacted groundwater is Alternative G1-5 (ISB at the Source Area, Downgradient of the Source Area and Near the former Station Boundary, Monitoring, and ICs). Alternative G1-5 consists of the following components:

- ISB at the perchlorate Source Area,
- ISB downgradient of the perchlorate Source Area between IRP Sites 1 and 2,
- ISB near the former Station Boundary,
- Groundwater monitoring, and
- ICs

The conceptual descriptions of these individual components are provided below.

In-Situ Bioremediation at the Perchlorate Source Area, Between IRP Sites 1 and 2, and Near the Former Station Boundary

The implementation of ISB at the Source Area will treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize downgradient migration. The perchlorate Source Area includes the central portion of IRP Site 1 (see **Figure 2-2**). The permeable reactive barrier (PRB) installed between IRP Sites 1 and 2 will further reduce perchlorate concentrations downgradient of the Source Area. In addition, ISB near the former Station Boundary will minimize the potential for off-Station migration of perchlorate at concentrations exceeding its RG.

The implementation of ISB will include injection of an electron donor or substrate, and/or specific strains of microorganisms into the subsurface. The indigenous/augmented microorganisms are stimulated to grow and multiply by using injected substrate as carbon and energy source. In this process, the naturally occurring chemical species such as oxygen, nitrate, and sulfate will be used as electron acceptors. After the oxygen is depleted and the redox conditions of the aquifer become anoxic/anaerobic, perchlorate-degrading bacteria will use perchlorate as an electron acceptor and in this process degrade it to innocuous end products such as chloride ions and oxygen. The microcosm

and pilot studies conducted for IRP Site 1 clearly demonstrate that indigenous perchlorate-degrading bacteria are capable of rapidly degrading perchlorate under reducing conditions.

The **design configurations** for the implementation of ISB at the Source Area may include a PRB, direct injection, or groundwater recirculation. The design configurations for the implementation of ISB between IRP Sites 1 and 2, and near the former Station Boundary may include a PRB (with or without groundwater recirculation). The design parameters including but not limited to the type and quantity of substrate, injection strategy (e.g., regular pressurized injection or using hydraulic fracturing), locations, treatment area dimensions, injection geometry, and treatment thickness will be finalized during the remedial design phase. The design will be based on the most recent groundwater monitoring data available at the time, and the 2009-2010 ISB pilot study.

Groundwater Monitoring

Groundwater monitoring will be conducted as a component of Alternative G1-5 to evaluate the effectiveness of ISB at the Source Area, the intermediate area, and at the former Station Boundary to treat perchlorate. In addition, groundwater monitoring would also be used to track the distribution of perchlorate between the Source Area and the intermediate PRB, between the intermediate PRB and the former Station Boundary, and beyond. The groundwater monitoring well network will be finalized during the remedial design phase. The groundwater monitoring details will be finalized in the Long-Term Monitoring/O&M Plan and will include collection of groundwater samples and analyses for perchlorate, and geochemical parameters such as dissolved oxygen (DO), and nitrate to monitor the progress of bioremediation.

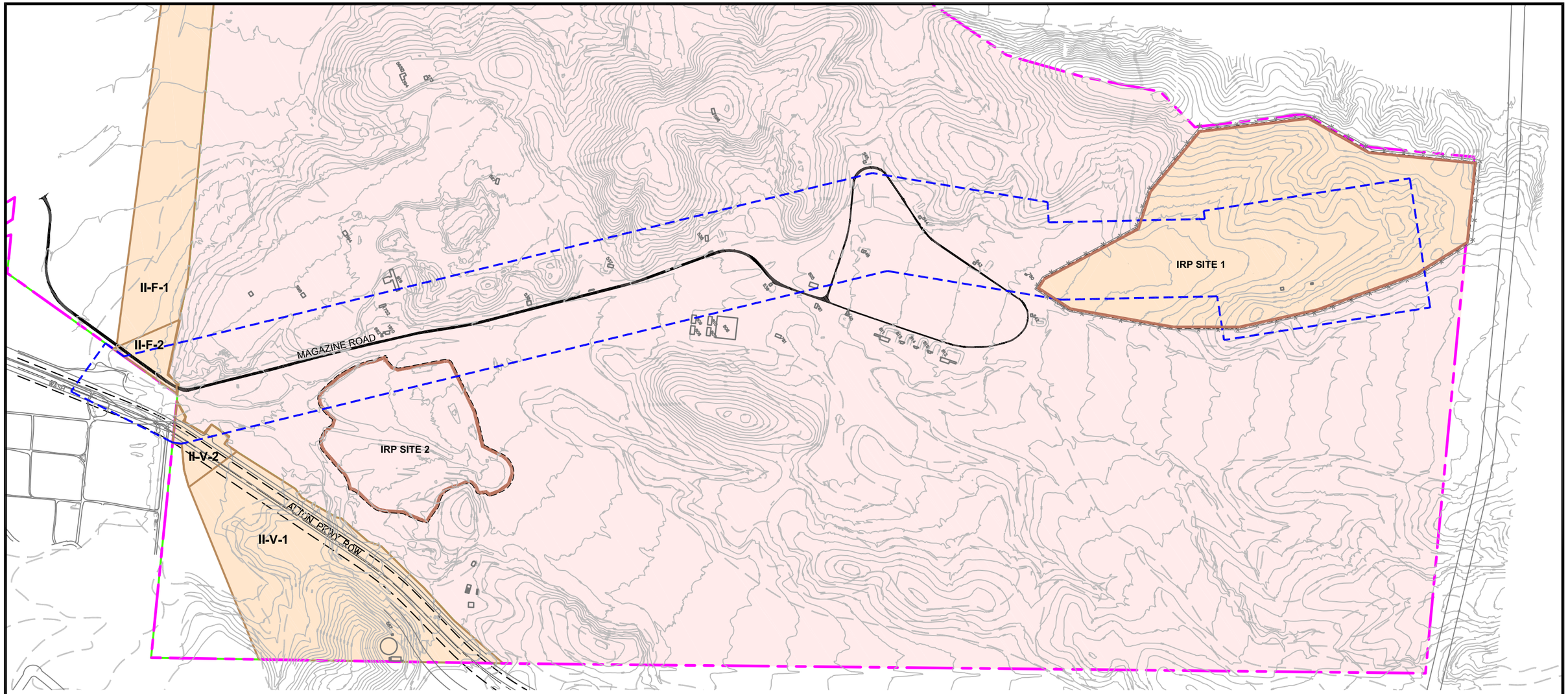
Institutional Controls

ICs include legal and administrative mechanisms to limit potential human exposure to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced to its RG. The final boundaries of ARICs will be presented in the Land-Use Control Remedial Design. The ARICs for IRP Site 1 perchlorate-impacted groundwater (**Figure 2-4**) consist of the following:

- A 74-acre area constituting IRP Site 1 currently owned by the Navy (also referred to as IRP Site 1 Property)
- Property downgradient of IRP Site 1 currently owned by the FAA
- Leased property consisting of portions of COs II-V-2 and/or II-F-2
- Off-Station property

The IC objectives and general land-use restrictions pertaining to each of these are discussed in the following subsections.

IC Objectives and General Land-Use Restrictions: The ICs will be implemented to limit exposure of future landownwer(s) and/or user(s) to impacted groundwater and to maintain the integrity of the remedial action components such as monitoring wells. Regardless of the implementation mechanism, the land-use restrictions will achieve the following objectives:



NORTH

0 350 700 FEET

SCALE: 1" = 700'

LEGEND:

- AREA REQUIRING INSTITUTIONAL CONTROLS
- NAVY OWNED
- FAA OWNED
- II-V-1 CARVE-OUT BOUNDARY
- NAVY SALE PARCEL BOUNDARY
- FORMER MCAS EL TORO BOUNDARY
- EOD RANGE BOUNDARY
- IRP SITE BOUNDARY (1 AND 2)
- EXISTING FENCE

NOTES:

1. AREA REQUIRING INSTITUTIONAL CONTROLS WILL BE FINALIZED IN THE REMEDIAL DESIGN.

EOD EXPLOSIVE ORDNANCE DISPOSAL
FAA FEDERAL AVIATION ADMINISTRATION
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION
ROW RIGHT OF WAY

Record of Decision — Final

Area Requiring Institutional Controls for Groundwater, IRP Sites 1 and 2

IRP Sites 1 & 2

Date: 01-12	Former MCAS El Toro	Figure
Project No. 95653	AECOM	2-4

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- Prevent activities that present unacceptable risk to human-health due to impacted groundwater; and
- Protect site security and remedial action components, such as monitoring wells, fences, and signs.

The land-use restrictions in general would prohibit the following until the concentrations of COCs in groundwater are reduced to their respective RGs:

- Alteration, disturbance, or removal of any component of a response or cleanup action including groundwater extraction, injection, and monitoring wells and associated piping and equipment; without the prior review and written concurrence of the Navy and the other FFA signatories.
- The extraction of groundwater and installation of new groundwater wells without prior review and written concurrence from the Navy and the other FFA signatories.
- The installation of any well that has the potential to affect migration of COCs without prior review and written concurrence from the Navy and the other FFA signatories.
- The removal of or damage to security features (e.g., fences, locks on monitoring wells, signs, or monitoring equipment and associated pipelines and appurtenances) without prior written approval by the Navy.

The final land-use restrictions will be documented in the Land-Use Control Remedial Design, which will be submitted to the FFA signatories for review (see subsection "ICs Implementation" below).

IRP Site 1 Property: The use restrictions for IRP Site 1 property will be included in the Memorandum of Understanding (MOU), if the property is transferred to a Federal entity. In the event that the property is transferred to a non-Federal entity, the Navy will rely on proprietary controls ICs in the form of environmental restrictive covenants as provided in the **Memorandum of Agreement (MOA)** between the Navy and the DTSC and attached covenant models. More specifically, IC objectives will be achieved through land use/activity restrictions, which will be incorporated into two separate legal instruments as provided in the Navy/DTSC MOA:

1. Restrictive covenants included in one or more "quitclaim deed(s)" from the Navy to the property recipient.
2. Restrictive covenants included in one or more "Covenant(s) to Restrict Use of Property" entered into by the Navy and the DTSC as provided in the Navy/DTSC MOA and consistent with the substantive provisions of California Code of Regulations, title 22, Section 67391.1.

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

Property Downgradient of IRP Site 1 Owned by FAA: The major portion of the property overlying the perchlorate-impacted groundwater downgradient of IRP Site 1 that also includes IRP Site 2 is owned by the FAA. The Navy transferred this property to the FAA in accordance with the MOU finalized on 3 December 2001. This MOU will be modified to include land-use restrictions to protect potential receptors from exposure to perchlorate-impacted groundwater and to achieve the IC objectives discussed above.

The current MOU documents the following restriction that prohibits:

- exposing or extracting groundwater from the shallow or principal aquifer at IRP Site 2 without prior approval of the Navy.

Leased Property Downgradient of IRP Site 1: Portions of ARICs for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater include portions of former MCAS El Toro that were leased in 2005 to Heritage Fields, LLC (Orange County Great Park Corporation and Lennar Corporation), a private developer. These areas are referred to as COs II-V-2 and II-F-2, and will be leased until the title is conveyed to a non-Federal entity, following concurrence of the FFA signatories.

The interim land-use restrictions will be administratively handled through a LIFOC, until the time COs II-V-2 and II-F-2 are transferred by deed to the Lessee. The LIFOC for Parcel II at former MCAS El Toro is currently in place and includes the following land use restrictions:

- Lessee shall not conduct any subsurface excavation, digging, drilling or other disturbance of the ground surface without prior Navy approval.
- Lessee shall not install new groundwater wells of any type and shall not use contaminated groundwater without prior written Navy approval.
- Lessee shall not install any well that has the potential to affect plume migration.
- Lessee shall not alter, disturb or remove groundwater monitoring wells, remedial action equipment (e.g., pumps), or associated utilities without prior written Navy approval.
- Removal of or damage to security features (e.g., locks on monitoring wells, survey monuments, signs or monitoring equipment and associated pipelines and appurtenances) is prohibited without prior written Navy approval.
- The construction of structures within 1,000 feet of the edge of the landfill is prohibited without prior Navy approval. Therefore, construction of structures within COs II-F-2 and II-V-2 is prohibited without prior Navy approval.

In addition to the above restrictions, the LIFOC includes the provisions for ensuring that the Navy and regulatory agencies have access to the leased premises including COs II-F-2 and II-V-2.

In the event of transfer of COs II-F-2 and II-V-2 to a non-Federal entity, the Navy will rely on proprietary controls in the form of environmental restrictive covenants as provided in the Navy/DTSC MOA, and as described under subsection "IRP Site 1 Property" above. The ICs will achieve the objectives discussed under subsection "**IRP Site 1 Property**" above.

Off-Station Property: ICs will be implemented to provide protection of human-health for the potential off-Station receptors. The ICs for the off-Station portion of the aquifer would be based on local permit programs administered by the Orange County Health Care Agency (OCHCA) and the Orange County-Water District (OCWD). The details of these ICs will be presented in the remedial design/remedial action work plan.

Access: The deed(s) and covenant(s) shall provide that the Navy and FFA signatories and their authorized agents, employees, contractors, and subcontractors shall have the right to enter the property overlying IRP Site 1 perchlorate-impacted groundwater to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary under the cleanup program, including but not limited to groundwater monitoring wells, pumping wells, and/or treatment facilities.

ICs Implementation: The Navy shall address and describe IC implementation and maintenance actions including periodic inspections and reporting requirements in the draft and final Remedial Design Reports to be developed and submitted to the FFA signatories for review pursuant to the FFA (see "Navy Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions" attached to the 16 January 2004 Department of Defense memorandum entitled "Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Record of Decision [ROD] and Post-ROD Policy").

The Navy is responsible for implementing, inspecting, maintaining, reporting on, and enforcing the land use restrictions selected in this ROD. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for the remedy integrity. Should any of the IC objectives fail, the Navy shall ensure that appropriate actions are taken to reestablish the protectiveness of the remedy and may initiate legal action to either compel action by a third party(ies) and/or recover the Navy's costs for mitigating any discovered IC violations(s).

2.9.2.2 IRP Site 2 VOC-Impacted Groundwater

The Selected Remedy for IRP Site 2 VOC-impacted groundwater is Alternative G2-2 (MNA and ICs). The two components of Alternative G2-2 are presented in detail below.

Monitored Natural Attenuation

Alternative G2-2 will rely on natural attenuation processes and monitoring for remediation of IRP Site 2 VOC-impacted groundwater. Based on the methodology presented in the *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater*, inadequate evidence exists to confirm anaerobic biodegradation of VOCs (primarily TCE) is occurring. However, the consistent presence of cis-1,2-DCE in wells with elevated TCE concentrations indicates that some biodegradation may have occurred within the TCE-impacted groundwater.

Since the extent of the TCE-impacted groundwater has remained relatively stable and the concentrations of TCE have decreased over time, it appears that the TCE-impacted groundwater is contained in a relatively small area at IRP Site 2 and is slowly naturally attenuating. In addition to anaerobic biodegradation, natural attenuation processes, such as dispersion, dilution, sorption, and volatilization, may be contributing to the containment and slow reduction of the TCE-impacted groundwater.

The historic concentrations of PCE show that the extent of the PCE-impacted groundwater and concentrations have declined over time. Similar to the TCE-impacted groundwater, natural attenuation processes, such as dispersion, dilution, sorption, and volatilization, may be contributing to the containment and slow reduction of the PCE-impacted groundwater. As indicated in the 2005 Contaminant Distribution in Groundwater & Microcosm Study Findings, reductive dechlorination is not an active natural attenuation process; the impacted groundwater has remained stable and dilution/dispersion is the primary concentration reduction mechanism.

Groundwater monitoring will be conducted as a component of Alternative G2-2 to evaluate the effectiveness of natural attenuation processes to reduce the concentrations of COCs and evaluate their potential migration. The groundwater monitoring well network will be finalized during the remedial design phase. The groundwater monitoring details will be finalized in the Long-Term Monitoring/O&M Plan and will include collection of groundwater samples and analyses for COCs and geochemical parameters such as DO.

Contingency Remedy: U.S. EPA guidance on MNA recommends identifying a contingency remedy, which is a cleanup technology or approach that functions as a backup remedy if MNA fails to perform as anticipated. The protectiveness of the Selected Remedy (Alternative G2-2, MNA and

ICs) will be evaluated as part of the 5-year review. If this evaluation indicates that the Selected Remedy is not protective (e.g., a documented unacceptable risk to human-health and/or the environment), the need for implementing a contingency remedy will be evaluated.

In accordance with the U.S. EPA's MNA guidance, contingency remedies may specify a technology (or technologies) that is (are) different from the Selected Remedy and should generally be flexible-allowing for the incorporation of new information about site risks and technologies. The contingency remedy for groundwater at IRP Site 2 is ISB which would be implemented near the Station Boundary. Results from the pilot study indicate that ISB implemented for treating perchlorate near the Station Boundary also creates conditions in groundwater that enhance the biodegradation of VOCs, and as a result, would complement and enhance the MNA remedy implemented for IRP Site 2. No triggers are necessary to be established for the contingency remedy at IRP Site 2, since ISB will be implemented concurrently near the Station Boundary as a component of Alternative G1-5.

Institutional Controls

ICs include legal and administrative mechanisms established to limit potential human exposure to VOC-impacted groundwater until the concentrations of COCs are reduced to their respective RGs. The ICs objectives will be as described in Section 2.9.2.1.

IC Objectives and General Land-Use Restrictions. The final boundaries of ARICs will be presented in the Land-Use Control Remedial Design. The ARICs for IRP Site 2 VOC-impacted groundwater (see **Figure 2-4**) consist of the following:

- Property currently owned by FAA
- Leased property consisting of COs II-V-2 and II-F-2
- Off-Station property

Property Currently Owned by FAA: The major portion of property overlying VOC-impacted groundwater at IRP Site 2 is owned by the FAA. The Navy transferred this property to the FAA in accordance with the MOU finalized on 3 December 2001. The discussion of ICs included in the current MOU for this property is presented in **Section 2.9.2.1**. The current MOU will be modified to include land-use restrictions to protect potential receptors from exposure to COC-impacted groundwater and to achieve the IC objectives discussed in **Section 2.9.2.1**.

Leased Property: Portion of VOC-impacted groundwater is overlain by COs II-V-2 and/or II-F-2. COs II-V-2 and II-F-2 are portions of former MCAS El Toro that were leased in 2005 to Heritage Fields, LLC (Orange County Great Park Corporation and Lennar Corporation), a private developer. The interim land-use restrictions pertaining to COs II-V-2 and II-F-2 are incorporated in the LIFOC and are discussed in detail in **Section 2.9.2.1**. These interim land-use restrictions will be in effect, until the time COs II-V-2 and II-F-2 are conveyed by deed to the Lessee.

Following transfer of the leased property, the Navy will rely on proprietary controls ICs in the form of environmental restrictive covenants as provided in the MOA between the Navy and the DTSC and attached covenant models. The mechanisms for implementation, objectives, and general restrictions will be the same as those discussed for "IRP Site 1 Property" in **Section 2.9.2.1**.

Off-Station Property: ICs will be implemented to provide protection of human-health for the potential off-Station receptors. The ICs for the off-Station portion of the aquifer would be based on local permit programs administered by the OCHCA and the OCWD. The details of these ICs will be presented in the remedial design/remedial action work plan.

Access: The deed(s) and covenant(s) shall provide that the Navy and FFA signatories and their authorized agents, employees, contractors, and subcontractors shall have the right to enter the property overlying IRP Site 2 VOC-impacted groundwater to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain any response or remedial action as required or necessary under the cleanup program, including but not limited to groundwater monitoring wells, pumping wells, and/or treatment facilities.

ICs Implementation: The Navy shall address and describe IC implementation and maintenance actions including periodic inspections and reporting requirements in the draft and final Remedial Design Reports to be developed and submitted to the FFA signatories for review pursuant to the FFA (see "Navy Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions" attached to the 16 January 2004 Department of Defense memorandum entitled "Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Record of Decision [ROD] and Post-ROD Policy").

The Navy is responsible for implementing, inspecting, maintaining, reporting on, and enforcing the land use restrictions selected in this ROD. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for the remedy integrity. Should any of the IC objectives fail, the Navy shall ensure that appropriate actions are taken to reestablish the protectiveness of the remedy and may initiate legal action to either compel action by a third party(ies) and/or recover the Navy's costs for mitigating any discovered IC violations(s).

2.9.3 Expected Outcomes of the Selected Remedy

The Selected Remedies for groundwater at IRP Sites 1 and 2 are intended to achieve the RAOs and RGs presented in **Section 2.7** of this ROD. The RGs are based on the Federal or more stringent State drinking water MCLs. Upon achieving the RGs, the groundwater at IRP Sites 1 and 2 would be available for domestic/drinking water use. Groundwater modeling conducted as part of the FS indicates the following regarding the remediation time-frames:

- Under Alternative G1-5, perchlorate concentrations would be reduced to its RG for the estimated extent of IRP Site 1 perchlorate-impacted groundwater in approximately 19 years.
- Under Alternative G2-2, TCE (primary COC) concentrations would dissipate to its RG for the IRP Site 2 VOC-impacted groundwater in approximately 30 years.

The Selected Remedies for groundwater at IRP Sites 1 and 2 will reduce concentrations of COCs and minimize their migration beyond the former MCAS El Toro Boundary. In addition, the Selected Remedies also reduce potential unacceptable risks to human-health by reducing the COC concentrations and through implementation of ICs until the COC concentrations are reduced to their respective RGs. Lastly, the selected remedy for IRP Site 1 groundwater complements and enhances the Selected Remedy for IRP Site 2 groundwater.

2.9.4 Statutory Determinations

Under CERCLA, the Navy's primary responsibility is to 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 must comply with ARARs, unless a statutory waiver is justified. The Selected Remedy also must be cost-effective and use permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that, as their principal element, permanently and significantly reduce the volume, toxicity,

or mobility of hazardous waste. The following subsections discuss how the Selected Remedies meet these statutory requirements and preferences.

2.9.4.1 IRP Site 1 Perchlorate-Impacted Groundwater

Protection of Human-Health and the Environment

The Selected Remedy will protect human-health and the environment by reducing perchlorate concentrations in groundwater through implementation of ISB at the Source Area, downgradient of the Source Area, and near the former Station Boundary. ISB will also minimize migration of perchlorate at concentrations exceeding its RG beyond the former MCAS El Toro Boundary. Following remedial action, the exposure levels due to site groundwater will be reduced to protective chemical-specific ARARs. In addition, ICs including groundwater use restrictions will minimize the potential for exposure to perchlorate-impacted groundwater until perchlorate concentrations are reduced to its RG. There are no short-term threats associated with the Selected Remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the remedy.

Compliance with ARARs

Section 121(d) of the CERCLA of 1980 (42 U.S.C. § 9621[d]), as amended, states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any Federal or more stringent State environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. The Selected Remedy will meet all Federal or State standards, requirements, criteria, or limitations that have been determined to be ARARs for the remedial action for IRP Site 1 perchlorate-impacted groundwater. These ARARs are presented in **Attachment 3** and documentation of Navy and regulatory agency positions on the ARAR status of a few significant regulations is provided below.

Navy and DTSC's Position Regarding Resource Conservation and Recovery Act (RCRA) Permit and Closure Requirements at IRP Site 1: The State of California (DTSC) maintains that the Navy operated an open burn/open detonation (OB/OD) facility within the IRP Site 1 investigation area. DTSC stated in the letter to the Navy (dated 19 March 2001) that the OB/OD facility received interim status authorization between 8 June 1988 and 31 December 1991. It further stated that OB/OD facility operated without any authorization from DTSC between 1 January 1992 to July 1999, in violation of State law; therefore, RCRA closure and post-closure requirements specified in Chapter 6.5 of the California Health and Safety Code and Cal. Code Regs., tit. 22, § 66265.112 apply to the OB/OD unit.

The Navy used munitions at the EOD Training Range for their intended purpose, including the training of military personnel, and explosives and emergency response specialists, and such training is neither waste treatment nor disposal. Therefore, the Navy maintains that activities conducted at the former EOD Training Range were not regulated under the RCRA.

Both the Navy's and DTSC's positions have been documented in the Phase II RI Work Plan and Phase II RI for IRP Site 1. To facilitate resolution of the differing positions, the Navy indicated that it would incorporate the substantive provisions of the State's RCRA closure and post-closure requirements into the CERCLA related documentation for IRP Site 1. This position was acknowledged by the DTSC in a letter dated 19 March 2001. In accordance with this resolution, the Groundwater FS evaluated RCRA closure and post-closure requirements identified by the State in letters dated 19 March 2001 and 21 June 2006 as potential "relevant and appropriate" ARARs. The final ARARs for the IRP Site 1 groundwater remedial action are presented in **Attachment 3**.

Navy's Position Regarding State Water Resources Control Board (SWRCB) Resolutions (Res.) 92-49 and 68-16: The Navy recognizes that the key substantive requirements of Cal. Code Regs. tit. 22, § 66264.94 (and the identical requirements of Cal. Code Regs tit. 23, § 2550.4 and Section III.G of

SWRCB Res. 92-49) require cleanup to background levels of constituents unless such restoration proves to be technologically or economically infeasible and an alternative cleanup level of constituents will not pose a substantial present or potential hazard to human-health or the environment. In addition, the Navy recognizes that these provisions are more stringent than corresponding provisions of Title 40 of the C.F.R. § 264.94 and, although they are federally enforceable via the RCRA program authorization, they are also independently based on State law to the extent that they are more stringent than the Federal regulations.

The Navy has also determined that SWRCB Res. 68-16 is not a chemical-specific ARAR for determining response action goals. However, SWRCB Res. 68-16 is a potential action-specific ARAR for regulating new discharges, such as treated groundwater, into the aquifer. The Navy has determined that further migration of already-contaminated groundwater is not a discharge governed by the language in Res. 68-16. More specifically, the language of SWRCB Res. 68-16 indicates that it is prospective in intent, applying to new discharges in order to maintain existing high quality waters. It is not intended to apply to restoration of waters that are already degraded.

The Navy's position is that SWRCB Res. 92-49 and 68-16 and Cal. Code Regs. tit. 23, § 2550.4 do not constitute chemical-specific ARARs for remedial action because they are State requirements and are not more stringent than federal ARAR provisions of Cal. Code Regs. tit. 22, § 66264.94. The NCP set forth in 40 C.F.R. § 300.400(g)(4) provides that only State standards more stringent than federal standards may be ARARs (see also CERCLA Section 121(d)(2)(A)(ii) [42 U.S.C. § 9621(d)(2)(A)(ii)]).

The substantive technical standard in the equivalent State requirements (i.e., Cal. Code Regs. tit. 23, division (div.) 3, chapter (ch). 15 and SWRCB Res. 92-49 and 68-16) is identical to the substantive technical standard in Cal. Code Regs. tit. 22, § 66264.94. This section of Cal. Code Regs. tit. 22 will likely be applied in a manner consistent with equivalent provisions of other regulations, including SWRCB Res. 92-49 and 68-16.

State of California's Position Regarding SWRCB Res. 92-49 and 68-16: The State does not agree with the Navy's determination that SWRCB Res. 92-49 and 68-16 and certain provisions at Cal. Code Regs. tit. 23, div. 3, ch. 15 are not ARARs for this response action. SWRCB has interpreted the term "discharges" in the California Water Code to include the movement of waste from soils to groundwater and from contaminated to uncontaminated water (SWRCB 1994). However, the State agrees that the proposed action would comply with SWRCB Res. 92-49 and 68-16, and compliance with the Cal. Code Regs. tit. 22 provisions should result in compliance with the Cal. Code Regs. tit. 23 provisions. The State does not intend to dispute the ROD, but reserves its rights if implementation of the Cal. Code Regs. tit. 22 provisions is not as stringent as State implementation of Cal. Code Regs. tit. 23 provisions. Because Cal. Code Regs. tit. 22 regulation is part of the State's authorized hazardous waste control program, it is also the State's position that Cal. Code Regs. tit. 22, § 66264.94 is a State ARAR and not a Federal ARAR (United States v. State of Colorado, 990 F.2d 1565 [1993]).

Whereas the Navy and the State of California have not agreed on whether SWRCB Res. 92-49 and 68-16 and Cal. Code Regs. tit. 23, § 2550.4 are ARARs for this response action, this ROD documents each party's position on the resolutions but does not attempt to resolve the issue.

Cost Effectiveness

The Selected Remedy will provide overall effectiveness proportional to its costs (present worth) and is therefore considered to be cost-effective. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness).

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The Navy has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human-health and the environment, and comply with ARARs, the Navy has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element.

Preference for Treatment as a Principal Element

By treating the impacted groundwater using ISB, the Selected Remedy addresses the principal threats posed by the site groundwater through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

Five-Year Review Requirements

The Selected Remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. However, five-year reviews will be conducted for the site in order to evaluate performance and continued protectiveness of the remedial action.

2.9.4.2 IRP Site 2 VOC-Impacted Groundwater

Protection of Human Health and the Environment

The Selected Remedy will protect human-health and the environment by restricting the use of groundwater with COCs at concentrations exceeding their respective RGs. These restrictions will be implemented until the natural processes such as dilution and dispersion reduce concentrations of COCs to their respective RGs. There are no short-term threats associated with the Selected Remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the remedy.

Compliance with ARARs

The Selected Remedy will meet all Federal or State standards, requirements, criteria, or limitations that have been determined to be ARARs for the remedial action for IRP Site 2 VOC-impacted groundwater. These ARARs are presented in **Attachment 3**. The documentation of Navy's and State of California's position regarding the ARAR status of SWRCB Res. 92-49 and 68-16 is provided in **Section 2.9.4.1**.

Cost Effectiveness

The Selected Remedy will provide overall effectiveness proportional to its costs (present worth) and is therefore considered to be cost-effective.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The Navy has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human-health and the environment, and comply with

ARARs, the Navy has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria.

Preference for Treatment as a Principal Element

Groundwater modeling results indicate that the remedial alternatives involving active groundwater treatment either do not reduce remediation time-frame significantly compared to the Selected Remedies, or do so at a higher cost. Therefore, active treatment does not add to the protectiveness of the remedies and the Selected Remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. However, it should be noted that ISB near the former Station Boundary implemented as part of the Selected Remedy for IRP Site 1 perchlorate-impacted groundwater will also lead to treatment of TCE in IRP Site 2 groundwater.

Five-Year Review Requirements

The Selected Remedies will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. However, 5-year reviews will be conducted for the Sites to evaluate performance and continued protectiveness of the remedial actions.

2.10 COMMUNITY PARTICIPATION

A Community Relations Plan has been developed for former MCAS El Toro that outlines the community involvement program. Community participation is supplemented by the Restoration Advisory Board (RAB), which is composed of local citizens and government representatives involved in the environmental cleanup program at former MCAS El Toro. The purpose of the RAB is to promote efficient and effective cleanup that results in the protection of human-health and the environment and the timely conversion of former MCAS El Toro. The RAB serves to increase community awareness by disseminating information about the IRP and to assure that opinions about the environmental restoration reflect the diverse interest of the community. The RAB functions in an advisory capacity to the Navy, U.S. EPA, and Cal/EPA by conducting regular and thorough reviews of environmental restoration plans and compiling constructive comments from these reviews for submittal to former MCAS El Toro.

Information on documents and relevant information relied upon in the remedy selection process are available for public review in the Administrative Record File (**Attachment 1**). Community members can find key support documents that pertain to IRP Sites 1 and 2 and a complete index of all former MCAS El Toro Administrative Record File documents, at the Information Repository located at:

- Heritage Park Regional Library
  14361 Yale Avenue
  Irvine, CA 92604
  Telephone#: (949) 936-4040

The Administrative Record File for all of former MCAS El Toro, including site-specific documents for IRP Sites 1 and 2 groundwater, is available for review at BRAC Office Building 307, former MCAS El Toro. To schedule a review time at former MCAS El Toro, please contact the document coordinator at (949) 859-6014.

A Proposed Plan was developed for groundwater remedial actions at IRP Sites 1 and 2 to fulfill public participation requirements of CERCLA § 117 (a), which specifies that the lead agency (Navy) must publish a plan outlining remedial alternatives evaluated for each site and identify the preferred alternatives. A significant and reasonable effort was made to inform the public of the proposed groundwater remedies outlined in this ROD. The public comment period for the Proposed Plan for

groundwater remedial actions at IRP Sites 1 and 2 was from 20 April to 20 May 2011. A Public Meeting was held on 27 April 2011 at the Irvine City Hall in Irvine, California. Public notices were placed in the newspapers (Orange County Register and Los Angeles Times, Orange County Edition) and posted on the BRAC Program Management Office (PMO) website (www.bracpmo.navy.mil). All interested parties were encouraged to attend to learn more about the alternatives for each site, and to submit comments on the Proposed Plan to the Navy.

3. RESPONSIVENESS SUMMARY

A public meeting for the IRP Sites 1 and 2 groundwater Proposed Plan was held on 27 April 2011 at the Irvine City Hall in Irvine, California. The participants in the Public Meeting included representatives of the Navy, U.S. EPA, and DTSC. Questions and/or concerns that were received during the public meeting were documented in the court reporter record of the Public Meeting (see **Attachment 4**). The public review period for the IRP Sites 1 and 2 groundwater Proposed Plan was from 20 April to 20 May 2011. Responses to Comments received at the Public meeting and during the public comment period are included in **Attachment 4**.

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Attachment 1 – Administrative Record

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EL TORO MCAS

DRAFT ENVIRONMENTAL RESTORATION RECORD INDEX - UPDATE (SORTED BY RECORD DATE/RECORD NUMBER)

ADMINISTRATIVE RECORD DOCUMENTS RELATED TO IR SITES 1 AND 2

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_000187 NONE CORRESPONDENCE NONE 3	**09-11-1985** 11-01-1993 5090.3.A. NONE	LEAP, J. MCAS EL TORO - SANTA ANA, CA NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY (NEESA) - PORT HUENEME, CA	REVIEW AND COMMENTS ON THE INITIAL ASSESSMENT STUDY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0006 30090141

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AR_M60050_001051 NONE CORRESPONDENCE NONE 17	**05-13-1987** 12-11-1995 5090.3.A. NONE	WILSON, A. SOUTH COAST AIR QUALITY MMANAGEMENT DISTRICT - EL MONTE, CA VAN CLEEF, B. MCAS EL TORO - SANTA ANA, CA	DEFINITION OF "FACILITY" FOR RULE 1107 FOR DISTRICT PURPOSES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_001808 NONE CORRESPONDENCE NONE 2	**03-14-1988** 03-21-1997 5090.3.A. NONE	GJETLEY, L. COUNTY OF ORANGE HEALTH CARE AGENCY - SANTA ANA, CA CERINI, E. NAVFAC - SOUTHWEST DIVISION	VERIFICATION STEP PLAN OF ACTION FOR THE CONFIRMATION STUDY (SEE RECORDS # 1809 - ORANGE COUNTY HEALTH DEPARTMENT COMMENTS, AND # 1811 - DEPARTMENT OF HEALTH SERVICES COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00005 SITE 00007	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_001836 NONE CORRESPONDENCE NONE 3	**03-14-1988** 03-24-1997 5090.3.A. NONE	GJETLEY, L. COUNTY OF ORANGE HEALTH CARE AGENCY - SANTA ANA, CA CERINI, E. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE VERIFICATION STEP PLAN OF ACTION FOR CONFIRMATION STUDY AND RESPONSE TO COMMENTS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00005 SITE 00007	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141

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AR_M60050_000788 NONE REPORT N62474-85-C-5592 250	**08-01-1988** 07-07-1995 5090.3.A. NONE	GOODELL, J. JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC. NAVFAC - WESTERN DIVISION	SITE INSPECTION PLAN OF ACTION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000028 BLDG 0000029 BLDG 0000090 BLDG 0000098 BLDG 0000191 BLDG 0000192 BLDG 0000193 BLDG 0000195 BLDG 0000196 BLDG 0000197 BLDG 0000245 BLDG 0000295 BLDG 0000369 BLDG 0000435 HANGAR 0001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00013 SITE 00014 SITE 00016 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20100702-3/8	

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					SITE 00019		
AR_M60050_000009 NONE REPORT N68711-89-D-9296 52	**01-01-1990** 10-29-1993 5090.3.A. CTO 0018	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	IMPLEMENTATION PLAN - WORK PLAN FOR A REMEDIAL INVESTIGATION /FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0001 30090141

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AR_M60050_000011 NONE REPORT N68711-89-D-9296 52	**02-01-1990** 10-29-1993 5090.3.A. CTO 0018	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	REVISED IMPLEMENTATION PLAN - WORK PLAN FOR A REMEDIAL INVESTIGATION/FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0001 30090141
AR_M60050_001011 NONE MINUTES NONE 1	**04-27-1990** 12-08-1995 5090.3.A. NONE	NUZUM, L. NAVFAC - SOUTHWEST DIVISION TECHNICAL REVIEW COMMITTEE	26 APRIL 1990 TECHNICAL REVIEW COMMITTEE MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000002B OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00010	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_001734 NONE MINUTES NONE 9	**06-25-1990** 03-04-1997 5090.3.A. NONE	U.S. EPA - SAN FRANCISCO, CA MULTIPLE AGENCIES	25 JUNE 1990 MCAS EL TORO FFA NEGOTIATIONS MEETING FOR TECHNICAL APPENDICES AND ATTACHMENTS (INCLUDES AGENDA AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 OU 0000004 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0040 30090141

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AR_M60050_002203 CLE-C01-01F018-I3-0002 MINUTES N68711-89-D-9296 17	**09-26-1990** 05-31-2001 5090.3.A. CTO 0018	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	AGENDA OF THE TECHNICAL REVIEW COMMITTEE PRESENTATION FOR THE REMEDIAL INVESTIGATION / FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0050 30090141

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AR_M60050_000190 NONE REPORT NONE 5	**11-01-1990** 03-03-1994 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION NAVFAC - SOUTHWEST DIVISION	INSTALLATION RESTORATION PROGRAM STATUS REPORT AND SITE HISTORY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 OU 0000004 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0006 30090141
AR_M60050_004591 NONE CORRESPONDENCE NONE 9	**11-15-1990** 06-23-2009 5090.3.A. NONE	ALONZO, M. CALIFORNIA DEPARTMENT OF HEALTH SERVICES - LONG BEACH, CA FAUNCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN [INCLUDES LIST OF STATE ARARS]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	

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AR_M60050_004595 NONE CORRESPONDENCE NONE 20	**11-15-1990** 06-23-2009 5090.3.A. NONE	ANDERSON-RUBIN, J. U.S. EPA - SAN FRANCISCO, CA NUZUM, L. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, SAMPLING AND ANALYSIS PLAN, AND COMMUNITY RELATIONS PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	
AR_M60050_004597 NONE CORRESPONDENCE NONE 5	**11-16-1990** 06-29-2009 5090.3.A. NONE	ALONZO, M. CALIFORNIA DEPARTMENT OF HEALTH SERVICES - LONG BEACH, CA FAUNCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT SITE SAMPLING AND ANALYSIS, QUALITY ASSURANCE PROJECT PLAN, COMPREHENSIVE REMEDIAL INVESTIGATION / FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00009 SITE 00016 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	
AR_M60050_000592 CLE-C01-01F018-I3-0016 MINUTES N68711-89-D-9296 5	**11-26-1990** 12-21-2000 5090.3.A. CTO 0018	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	SUMMARY OF MEETING WITH REGULATORY AGENCIES TO DISCUSS SAMPLING STRATEGIES (PROJECT NOTE NO. PN-0018-05)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141
AR_M60050_004593 NONE CORRESPONDENCE NONE 3	**12-21-1990** 06-23-2009 5090.3.A. NONE	ROSS, J. CITY OF SANTA ANA - SANTA ANA, CA NUZUM, L. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, SAMPLING AND ANALYSIS PLAN, AND COMMUNITY RELATIONS PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	

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AR_M60050_004594 NONE CORRESPONDENCE NONE 2	**12-21-1990** 06-23-2009 5090.3.A. NONE	DONOVAN, W. CITY OF GARDEN GROVE - GARDEN GROVE, CA NUZUM, L. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, SAMPLING AND ANALYSIS PLAN, AND COMMUNITY RELATIONS PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	
AR_M60050_002490 CLE-C01-01F018-I3-0021 MINUTES N68711-89-D-9296 13	**02-22-1991** 09-04-2001 5090.3.A. CTO 0018	ROGAN, E. JACOBS ENGINEERING GROUP, INC. NUZUM, L. NAVFAC - SOUTHWEST DIVISION	SUMMARY OF THREE PROJECT MANAGERS MEETINGS - 22, 23, 24 JANUARY 1991	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000003 SITE 00002 SITE 00007 SITE 00011 SITE 00016	FRC - PERRIS IMAGED TORO_019	L181-06-0125 BX 0057 30090141
AR_M60050_000903 NONE MINUTES N68711-89-D-9296 14	**02-26-1991** 07-19-1995 5090.3.A. CTO 0018	ROGAN, E. JACOBS ENGINEERING GROUP, INC. NUZUM, L. NAVFAC - SOUTHWEST DIVISION	MEETING MINUTES OF PROJECT MANAGERS MEETING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00009 SITE 00011 SITE 00016	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0022 30090141
AR_M60050_004599 NONE CORRESPONDENCE NONE 3	**04-05-1991** 06-29-2009 5090.3.A. NONE	HARPER, B. U.S. FISH AND WILDLIFE SERVICE - LAGUNA NIGUEL, CA FAUNCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE 1) DRAFT FINAL REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN, AND 2) DRAFT FINAL SAMPLING AND ANALYSIS PLAN	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	

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AR_M60050_000892 NONE FACT SHEET NONE 6	**11-01-1991** 07-19-1995 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA PUBLIC	FACT SHEET: ENVIRONMENTAL CLEANUP OF MCAS EL TORO	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0022 30090141

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AR_M60050_001834 NONE MINUTES NONE 11	**11-18-1991** 03-24-1997 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA PUBLIC	18 NOVEMBER 1991 PUBLIC FORUM MATERIALS (INCLUDES AGENDA AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000004 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141

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AR_M60050_000960 NONE REPORT N68711-89-D-9296 176	**12-14-1991** 08-18-1995 5090.3.A. CTO 0145	DOLEGOWSKI, J. JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WASTE MANAGEMENT PLAN IRP	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0024 30090141
AR_M60050_000467 MCAS EL TORO SER 1JG/5A.11 CORRESPONDENCE NONE 7	**04-09-1992** 07-06-1994 5090.3.A. NONE	LEE, W. MCAS EL TORO - SANTA ANA, CA ZOUESHTIAGH, N. U.S. EPA - SAN FRANCISCO, CA	EXPLOSIVE ORDNANCE DISPOSAL RANGE, CERCLA REMEDIAL INVESTIGATION.	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00004	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0011 30090141

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AR_M60050_001622 NONE CORRESPONDENCE NONE 7	**04-09-1992** 09-04-1996 5090.3.A. NONE	LEE, W. MCAS EL TORO - SANTA ANA, CA ZOUESHTIAGH, N. U.S. EPA - SAN FRANCISCO, CA	EXPLOSIVE ORDNANCE DISPOSAL RANGE TO BE PART OF CERCLA REMEDIAL INVESTIGATION (REF# H-3-3 ID#CA6170023208 LETTER DATED 03 JULY 1991)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00004	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0038 30090141
AR_M60050_001019 NONE MINUTES N68711-89-D-9296 10	**05-14-1992** 12-08-1995 5090.3.A. CTO 0145	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	MEETING MINUTES WITH REGULATORY AGENCIES ON THE RI/FS PHASE I	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_001020 NONE MINUTES N68711-89-D-9296 4	**06-02-1992** 12-08-1995 5090.3.A. CTO 0145	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	02 JUNE 1992 TRC MEETING MINUTES ON THE RI/FS PHASE I	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_001483 NONE MINUTES N68711-89-D-9296 8	**12-10-1992** 05-21-1996 5090.3.A. CTO 0145	FLAGG, C. JACOBS ENGINEERING GROUP, INC. PISZKIN, F. NAVFAC - SOUTHWEST DIVISION	MINUTES FROM REMEDIAL PROJECT MANAGER'S MEETING TO DISCUSS REMEDIAL INVESTIGATION/FEASIBILITY STUDY AND RCRA FACILITY ASSESSMENT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0035 30090141

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AR_M60050_001028 NONE MINUTES N68711-89-D-9296 26	**12-17-1992** 12-08-1995 5090.3.A. CTO 0145	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	17 DECEMBER 1992 TRC MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_001207 NONE CORRESPONDENCE N68711-93-D-1459 1	**12-24-1992** 01-30-1996 5090.3.A. DO 0024	BRODERICK, J. CRWQCB - RIVERSIDE, CA SERAFINI, L. MCAS EL TORO - SANTA ANA, CA	LETTER REQUESTING ABATEMENT AT SITE 2 LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0029 30090141
AR_M60050_000117 NONE CORRESPONDENCE NONE 2	**01-21-1993** 11-01-1993 5090.3.A. NONE	SERAFINI, L. MCAS EL TORO - SANTA ANA, CA NAVFAC - SOUTHWEST DIVISION	REMOVAL ACTION FOR MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0005 30090141

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AR_M60050_000867 NONE REPORT NONE 52	**02-08-1993** 07-18-1995 5090.3.A. NONE	AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY - ATLANTA, GA MCAS EL TORO - SANTA ANA, CA	HUMAN HEALTH RISK ASSESSMENT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0022 30090141

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AR_M60050_001023 NONE MINUTES N68711-89-D-9296 18	**02-10-1993** 12-08-1995 5090.3.A. CTO 0145	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	REMEDIAL PROJECT MANAGER MEETING MINUTES WITH REGULATORY AGENCIES ON THE RFA	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_001024 NONE MINUTES N68711-89-D-9296 67	**03-12-1993** 12-08-1995 5090.3.A. CTO 0145	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	REMEDIAL PROJECT MANAGER MEETING MINUTES WITH REGULATORY AGENCIES ON THE RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_000132 SWDIV SER 1831.AP/2679 CORRESPONDENCE NONE 3	**05-13-1993** 11-01-1993 5090.3.A. NONE	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION ZARNOCH, J. DTSC - LONG BEACH, CA	REQUEST FOR IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 SITE 00026 SITE 00027	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0005 30090141

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AR_M60050_001571 NONE CORRESPONDENCE NONE 11	**06-23-1993** 07-11-1996 5090.3.A. NONE	JIMENEZ, J. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	DTSC COMMENTS ON REVISED FIELD SAMPLING PLAN PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_004310 NONE CORRESPONDENCE NONE 14	**08-06-1993** 05-30-2008 5090.3.A. NONE	JACOBS ENGINEERING GROUP, INC. PISZKIN, F. NAVFAC - SOUTHWEST	MEMORANDUM SUMMARIZING THE PRELIMINARY ECOLOGICAL RISK ASSESSMENT CONDUCTED AS PART OF THE PHASE I REMEDIAL INVESTIGATION TECHNICAL MEMORANDUM	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00020 SITE 00021 SITE 00022	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	
AR_M60050_000849 NONE CORRESPONDENCE NONE 24	**08-20-1993** 07-18-1995 5090.3.A. NONE	ZARNOCH, J. DTSC - LONG BEACH, CA SERAFINI, L. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM I-IV PHASE I REMEDIAL INVESTIGATION	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00012 SITE 00022	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0021 30090141

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AR_M60050_001531 NONE CORRESPONDENCE NONE 3	**08-23-1993** 07-10-1993 5090.3.A. NONE	CHRISTOPHER, J. DTSC - SACRAMENTO, CA ZARNOCH, J. DTSC - LONG BEACH, CA	OFFICE OF SCIENTIFIC AFFAIRS COMMENTS ON POSITION PAPERS RELATED TO DATA QUALITY OBJECTIVES FOR THE PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141
AR_M60050_000147 NONE CORRESPONDENCE NONE 21	**08-27-1993** 11-01-1993 5090.3.A. NONE	ZARNOCH, J. DTSC - LONG BEACH, CA SERAFINI, L. MCAS EL TORO - SANTA ANA, CA	REVIEW AND PART ONE COMMENTS ON THE PHASE I REMEDIAL INVESTIGATION, DRAFT TECHNICAL MEMORANDUM	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00006 SITE 00007 SITE 00009 SITE 00010 SITE 00012 SITE 00022	FRC - PERRIS IMAGED TORO_001	L181-06-0125 BX 0005 30090141

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AR_M60050_000848 NONE CORRESPONDENCE NONE 12	**08-31-1993** 07-18-1995 5090.3.A. NONE	ZARNOCH, J. DTSC - LONG BEACH, CA SERAFINI, L. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM VOLUME I-IV PHASE I REMEDIAL INVESTIGATION	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00004 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0021 30090141
AR_M60050_001533 NONE CORRESPONDENCE NONE 3	**09-20-1993** 07-10-1993 5090.3.A. NONE	ZARNOCH, J. DTSC - LONG BEACH, CA NAVFAC - SOUTHWEST DIVISION	STATE OF CALIF DEPARTMENT OF TOXIC SUBSTANCES CONTROLS COMMENTS ON PRELIMINARY WORKING DRAFT: A2.0 DATA QUALITY OBJECTIVES FOR SITE 2 MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_001026 NONE MINUTES N68711-89-D-9296 19	**11-01-1993** 12-08-1995 5090.3.A. CTO 0145	DOLEGOWSKI, J. JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	DQO MEETING MINUTES WITH REGULATORY AGENCIES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_000890 NONE FACT SHEET NONE 10	**12-01-1993** 07-19-1995 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION PUBLIC	FACT SHEET "UPDATE OF THE ENVIRONMENTAL INVESTIGATION AT MCAS EL TORO"	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0022 30090141

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AR_M60050_001487 NONE CORRESPONDENCE NONE 38	**12-07-1993** 05-21-1996 5090.3.A. NONE	HAMILL, J. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. NAVFAC - SOUTHWEST DIVISION	US EPA LETTER REQUESTING 30 DAY EXTENSION ON REVIEW PERIOD FOR THE DRAFT PHASE II RI/FS WORK PLAN; US EPA COMMENTS DATED 17 DECEMBER 1993 INCLUDED	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0035 30090141

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AR_M60050_001534 NONE CORRESPONDENCE NONE 37	**12-17-1993** 07-10-1993 5090.3.A. NONE	HAMILL, J. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. NAVFAC - SOUTHWEST DIVISION	US ENVIRONMENTAL PROTECTION AGENCY'S COMMENTS ON MCAS EL TORO INSTALLATION RESTORATION PROGRAM PHASE II RI/FS STUDY DRAFT WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_002204 CLE-C01-01F145-I2-0073 MINUTES N68711-89-D-9296 6	**01-13-1994** 05-31-2001 5090.3.A. CTO 0145	FLAGG, C. JACOBS ENGINEERING GROUP, INC. PISZKIN, F. NAVFAC - SOUTHWEST DIVISION	13 JANUARY 1994 TECHNICAL REVIEW COMMITTEE/REMEDIAL ADVISORY BOARD MEETING SUMMARY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	CHOICE IMAGING SOLUTIONS SW-20100604-10/10	

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AR_M60050_001308 NONE CORRESPONDENCE NONE 7	**01-20-1994** 03-14-1996 5090.3.A. NONE	JIMENEZ, J. DTSC - LONG BEACH, CA LEE, W. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT DATA MANAGEMENT PLAN PORTION OF THE PHASE II REMEDIAL INVESTIGATION WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_000827 NONE MINUTES N68711-89-D-9296 10	**02-03-1994** 07-10-1995 5090.3.A. CTO 0145	GREEN, R. JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	REMEDIAL PROJECT MANAGERS MEETING RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0021 30090141

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AR_M60050_001030 NONE CORRESPONDENCE NONE 4	**02-08-1994** 12-08-1995 5090.3.A. NONE	DTSC - LONG BEACH, CA NAVFAC - SOUTHWEST DIVISION	REMEDIAL PROJECT MANAGER (RPM) MEETING ON FIELD SCREENING AT RI/FS STRATA - POTENTIAL CHANGES TO STRATEGIES PROPOSED IN THE DRAFT PHASE II RI WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00002 SITE 00003 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00012 SITE 00013 SITE 00019 SITE 00020 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141
AR_M60050_000756 NONE CORRESPONDENCE NONE 8	**03-04-1994** 06-15-1995 5090.3.A. NONE	DOS SANTOS, W. NAVFAC - SOUTHWEST DIVISION ZARNOCH, J. DTSC - LONG BEACH, CA	IDENTIFICATION OF STATE ARARS FOR THE RI/FS FOR OU 1	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 SITE 00001	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0020 30090141
AR_M60050_001031 NONE MINUTES N68711-89-D-9296 24	**03-21-1994** 12-08-1995 5090.3.A. CTO 0145	DOLEGOWSKI, J. JACOBS ENGINEERING GROUP, INC. GREEN, R. NAVFAC - SOUTHWEST DIVISION	REMEDIAL PROJECT MANAGERS MEETING RI/FS WITH REGULATORY AGENCIES (CAL-EPA,SRWQCB,DTSC,ORANGE COUNTY WATER DISTRICT (OCWD))	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00007 SITE 00012 SITE 00016 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141

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AR_M60050_000906 NONE MINUTES N68711-89-D-9296 2	**06-08-1994** 07-19-1995 5090.3.A. CTO 0145	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	RI/FS GROUNDWATER MONITORING MEETING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00008 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0022 30090141
AR_M60050_001536 NONE CORRESPONDENCE NONE 10	**06-15-1994** 07-10-1993 5090.3.A. NONE	HAMILL, J. U.S. EPA - SAN FRANCISCO, CA LEE, W. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT ENVIRONMENTAL BASELINE SURVEY REPORT (INCLUDES DTSC COMMENTS DATED 20 JUNE 1994)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_001034 CLE-J02-01F284-I3-0002 MINUTES N68711-89-D-9296 20	**06-28-1994** 12-08-1995 5090.3.A. CTO 0284	ARENDS, M. JACOBS ENGINEERING GROUP, INC. GREEN, R. NAVFAC - SOUTHWEST DIVISION	INTERVIEW WITH ACTIVE AND RETIRED PERSONNEL FROM MCAS EL TORO REGARDING PROCEDURES FOR STORAGE AND DISPOSAL OF HAZARDOUS MATERIALS AND WASTE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141
AR_M60050_001538 NONE CORRESPONDENCE NONE 1	**07-21-1994** 07-10-1993 5090.3.A. NONE	RENDE, B. COUNTY OF ORANGE ENVIRONMENTAL MANAGEMENT AGENCY - SANTA ANA, CA HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	LETTER TRANSMITTING DOCUMENTS RELATED TO THE ALTON PARKWAY PROJECT AND THE MAGAZINE ROAD LANDFILL TO BE USED AT MEETING; ATTACHMENTS NOT INCLUDED	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_001289 NONE MINUTES NONE 36	**08-19-1994** 03-13-1996 5090.3.A. NONE	LATAS, T. BECHTEL NATIONAL, INC. COWSER, D. BECHTEL NATIONAL, INC.	12 AUGUST 1994 MEETING MINUTES AND MEETING PRESENTATION MATERIALS FOR THE PROGRESS MEETING OF THE PHASE II RI/FS WORK PLANS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001541 NONE MINUTES NONE 36	**08-19-1994** 07-10-1996 5090.3.A. NONE	LATAS, T. KLEINFELDER COWSER, D. BECHTEL NATIONAL, INC.	12 AUGUST 1994 PROGRESS MEETING MINUTES FOR THE PHASE II RI/FS WORK PLANS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001191 NONE ANALYTICAL DATA N68711-89-D-9296 440	**09-30-1994** 01-22-1996 5090.3.A. CTO 0145	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST DIVISION	GROUNDWATER QUALITY DATA REPORT IRP RI/FS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0028 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001291 NONE MINUTES NONE 67	**10-12-1994** 03-13-1996 5090.3.A. NONE	LATAS, T. BECHTEL NATIONAL, INC. COWSER, D. BECHTEL NATIONAL, INC.	12-13 OCTOBER 1994 MEETING MINUTES FOR THE PROGRESS MEETING PHASE II RI/FS WORK PLANS DISCUSSED APPROACHES FOR RI/FS ACTIVITIES, FIELD SAMPLING PLAN AND QAPP	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001277 CTO-0059/0030 MINUTES N68711-92-D-4670 16	**10-24-1994** 03-13-1996 5090.3.A. CTO 0059	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	MINUTES OF PROGRESS MEETING FOR PHASE II REMEDIAL INVESTIGATION/ FEASIBILITY STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001290 NONE MINUTES NONE 21	**10-28-1994** 03-13-1996 5090.3.A. NONE	LATAS, T. BECHTEL NATIONAL, INC. COWSER, D. BECHTEL NATIONAL, INC.	28 OCTOBER 1994 MEETING MINUTES AND MEETING PRESENTATION MATERIALS FOR THE PROGRESS MEETING TO DISCUSS APPROACHES AND SAMPLING ACTIVITIES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001265 CTO-0059/0036 CORRESPONDENCE N68711-92-D-4670 3	**11-15-1994** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	SUBMITTAL OF THE DRAFT HEALTH AND SAFETY PLAN FOR PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY (SEE RECORD # 955)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141
AR_M60050_001543 NONE MINUTES NONE 5	**12-12-1994** 07-10-1996 5090.3.A. NONE	BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	MINUTES FROM 12 DECEMBER 1994 ALTON PARKWAY STRATEGY MEETING HELD TO DISCUSS POTENTIAL STRATEGIES FOR SITE 2, REGULATORY CONCERNS, FUNDING LIMITATIONS, & SCHEDULES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001307 NONE CORRESPONDENCE NONE 7	**12-20-1994** 03-14-1996 5090.3.A. NONE	JIMENEZ, J. DTSC - LONG BEACH, CA LEE, W. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE HEALTH AND SAFETY PLAN PORTION OF THE PHASE II REMEDIAL INVESTIGATION WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001545 SWDIV SER 183A/279 CORRESPONDENCE NONE 5	**12-29-1994** 07-10-1996 5090.3.A. NONE	PAWLISCH, J. NAVFAC - SOUTHWEST DIVISION SCANDURA, J. DTSC - LONG BEACH, CA	REQUEST FOR AN EXTENSION TO THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE FOR THE REMEDIAL INVESTIGATION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_001263 NONE CORRESPONDENCE N68711-92-D-4670 4	**01-20-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	SUBMITTAL OF DRAFT INVESTIGATION DERIVED WASTE MANAGEMENT PLAN FOR PHASE II RI/FS (REF. DOC# 001306)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001309 NONE CORRESPONDENCE NONE 5	**01-20-1995** 03-14-1996 5090.3.A. NONE	JIMENEZ, J. DTSC - LONG BEACH, CA LEE, W. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT HEALTH AND SAFETY PLAN FOR THE PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001189 NONE REPORT N68711-92-D-4670 87	**03-01-1995** 01-22-1996 5090.3.A. CTO 0059	LATAS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL HEATH AND SAFETY PLAN SUPPLEMENT PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0028 30090141

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AR_M60050_001261 CTO-0059/0062 CORRESPONDENCE N68711-92-D-4670 3	**03-01-1995** 02-09-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	SUBMITTAL OF DRAFT QUALITY ASSURANCE PROJECT PLAN FOR THE PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY (SEE RECORDS # 835 AND # 715 - QAPP)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_000917 NONE REPORT N68711-89-D-9296 485	**03-03-1995** 07-20-1995 5090.3.A. CTO 0284	ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. NAVFAC - SOUTHWEST DIVISION	BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP PLAN (BCP)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_007	L181-06-0125 BX 0023 30090141

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AR_M60050_004348 CLE-C01-01F284-I2-0011 MINUTES N68711-98-D-9296 7	**03-06-1995** 08-05-2008 5090.3.A. CTO 0284	JACOBS ENGINEERING GROUP, INC. NAVFAC - SOUTHWEST	06 MARCH 1995 MEETING MINUTES FOR COMMUNITY ENVIRONMENTAL RESPONSE FACILITATION ACT (CERFA) AND ENVIRONMENTAL BASELINE SURVEY (EBS) COMMENT RESOLUTION MEETING [INCLUDES LIST OF ATTENDEES]	ADMIN RECORD BASE INFO REPOSITORY	PARCEL CP-10 PARCEL CP-11 SITE 00002 SITE 00019 TANK 00398 TANK FARM 002 TANK FARM 005 TANK FARM 006	CHOICE IMAGING SOLUTIONS SW-20110214-7/7	
AR_M60050_001280 NONE CORRESPONDENCE NONE 8	**03-27-1995** 03-13-1996 5090.3.A. NONE	JIMENEZ, J. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT INVESTIGATION DERIVED WASTE MANAGEMENT PLAN (IDWMP)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001281 CTO-0059/0084 CORRESPONDENCE N68711-92-D-4670 5	**03-27-1995** 03-13-1996 5090.3.A. CTO 0059	LATAS, T. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	COMPILED RESPONSE TO COMMENTS ON THE DRAFT HEALTH AND SAFETY PLAN SUPPLEMENT PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001258 NONE REPORT N68711-92-D-4670 12	**03-31-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	FINAL HEALTH AND SAFETY SUPPLEMENT PHASE II RI/FS AND RESPONSE TO COMMENTS ON HEALTH AND SAFETY SUPPLEMENT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001282 NONE CORRESPONDENCE NONE 155	**03-31-1995** 03-13-1996 5090.3.A. NONE	LATAS, T. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESPONSE TO COMMENTS ON THE REVISED DRAFT WORK PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001555 CTO-0059/0090 CORRESPONDENCE N68711-92-D-4670 51	**04-05-1995** 07-10-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	COMPILED RESPONSE TO REGULATORY AGENCY COMMENTS TO THE DRAFT DATA MANAGEMENT PLAN, PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141
AR_M60050_001286 NONE MINUTES NONE 5	**04-25-1995** 03-13-1996 5090.3.A. NONE	WISSLER, S. BECHTEL NATIONAL, INC. JOYCE, J. MCAS EL TORO - SANTA ANA, CA	14 APRIL 1995 MEETING MINUTES MEETING CONCERNING ALTON PARKWAY EXTENSION AND THE RI/FS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001367 NONE MINUTES NONE 78	**05-02-1995** 03-19-1996 5090.3.A. NONE	WIEGAND, J. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	COPY OF 02 MAY 1995 MEETING HANDOUT: "RECOMMENDED NO FURTHER ACTION AND REMOVAL ACTION OU-3 SITES, PHASE II RI/FS"	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001254 NONE MINUTES N68711-92-D-4670 8	**05-03-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	25 APRIL 1995 MEETING MINUTES FOR CTO-0059	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0030 30090141

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AR_M60050_001255 NONE MINUTES N68711-92-D-4670 10	**05-03-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	24 APRIL 1995 MEETING MINUTES FOR CTO-0059	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0030 30090141

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AR_M60050_001256 NONE CORRESPONDENCE N68711-92-D-4670 10	**05-05-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO REGULATORY AGENCY COMMENTS TO THE DRAFT DATA MANAGEMENT PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0030 30090141

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AR_M60050_001283 NONE MINUTES N68711-92-D-4670 6	**05-08-1995** 03-13-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	02 MAY 1995 MEETING MINUTES REGARDING VISIT TO OU-3 SITES PROPOSED FOR RECLASSIFICATION TO NO FURTHER ACTION AT THIS TIME OR REMOVAL ACTION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001336 NONE CORRESPONDENCE N68711-92-D-4670 6	**05-08-1995** 03-18-1996 5090.3.A. CTO 0080	COWSER, D. BECHTEL NATIONAL, INC. GARELICK, G. NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF FIVE REVISED PAGES TO BE INSERTED IN THE HANDOUT "RECOMMENDED NO FURTHER ACTION AND REMOVAL ACTION OU-3 SITES"	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001310 NONE CORRESPONDENCE NONE 2	**05-11-1995** 03-14-1996 5090.3.A. NONE	TURNER, J. CALIFORNIA DEPARTMENT OF FISH AND GAME - SACRAMENTO, CA JIMENEZ, J. DTSC - LONG BEACH, CA	RESPONSE TO REQUEST FOR INFORMATION ON APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141
AR_M60050_001567 NONE CORRESPONDENCE NONE 3	**05-11-1995** 07-11-1996 5090.3.A. NONE	WERNER, J. RESTORATION ADVISORY BOARD MEMBER JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS FROM RAB MEMBER OF THE OPERABLE UNIT (OU) 2 SUBCOMMITTEE ON THE REVISED DRAFT WORK PLAN AND DRAFT FIELD SAMPLING PLAN/PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 SITE 00002 SITE 00003 SITE 00005 SITE 00015 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_001375 NONE CORRESPONDENCE N68711-92-D-4670 19	**05-22-1995** 03-19-1996 5090.3.A. CTO 0080	TEDALDI, D. BECHTEL NATIONAL, INC. VITALE, L. CRWQCB - RIVERSIDE, CA	BECHTEL'S TECHNICAL REVIEW COMMENTS ON THE DRAFT WORK PLAN AND FIELD SAMPLING PLAN FOR PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001376 NONE CORRESPONDENCE N68711-92-D-4670 19	**05-22-1995** 03-19-1996 5090.3.A. CTO 0080	TEDALDI, D. BECHTEL NATIONAL, INC. ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA	BECHTEL'S TECHNICAL REVIEW COMMENTS ON THE DRAFT WORK PLAN AND FIELD SAMPLING PLAN FOR PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001565 NONE CORRESPONDENCE NONE 8	**05-22-1995** 07-11-1996 5090.3.A. NONE	VITALE, L. CRWQCB - RIVERSIDE, CA JIMENEZ, J. DTSC - LONG BEACH, CA	REVIEW AND COMMENTS ON THE PHASE II DRAFT REMEDIAL INVESTIGATION WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_001292 NONE CORRESPONDENCE NONE 14	**05-23-1995** 03-13-1996 5090.3.A. NONE	JIMENEZ, J. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE REVISED DRAFT WORK PLAN PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_000945 NONE CORRESPONDENCE NONE 42	**05-24-1995** 08-07-1995 5090.3.A. NONE	ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE REVISED DRAFT WORK PLAN PHASE II RI/ FS STUDY AND DRAFT FIELD SAMPLING PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00017 SITE 00022 SITE 00023 SITE 00024	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0023 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001293 NONE CORRESPONDENCE NONE 42	**05-24-1995** 03-13-1996 5090.3.A. NONE	ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE REVISED DRAFT WORK PLAN PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY WORK PLAN AND DRAFT FIELD SAMPLING PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141
AR_M60050_001294 NONE CORRESPONDENCE NONE 4	**05-25-1995** 03-13-1996 5090.3.A. NONE	MCVICKER, R. IRVINE RANCH WATER DISTRICT - IRVINE, CA RUDOLPH, M. RESTORATION ADVISORY BOARD MEMBER	REVIEW AND COMMENTS ON THE REVISED DRAFT WORK PLAN AND DRAFT FIELD SAMPLING PLAN PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY, ON BEHALF OF THE RESTORATION ADVISORY BOARD OU-2 SUBCOMMITTEE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001566 NONE CORRESPONDENCE NONE 1	**05-25-1995** 07-11-1996 5090.3.A. NONE	MCVICKER, R. IRVINE RANCH WATER DISTRICT - IRVINE, CA RUDOLPH, M. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS FROM THE OPERABLE UNIT (OU) 2 RAB SUBCOMMITTEE ON THE REVISED DRAFT WORK PLAN AND DRAFT FIELD SAMPLING PLAN/PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141
AR_M60050_001348 NONE CORRESPONDENCE N68711-92-D-4670 10	**06-09-1995** 03-18-1996 5090.3.A. CTO 0080	TEDALDI, D. BECHTEL NATIONAL, INC. JOYCE, J. NAVFAC - SOUTHWEST DIVISION	BECHTEL'S TECHNICAL REVIEW COMMENTS ON DRAFT RI/FS EVALUATION OF BACKGROUND CONCENTRATIONS OF INORGANIC CONSTITUENTS IN GROUNDWATER PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001251 NONE MINUTES N68711-92-D-4670 5	**06-15-1995** 02-09-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	31 MAY 1995 MEETING MINUTES FOR CTO-0059	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001194 NONE REPORT N68711-92-D-4670 1067	**07-01-1995** 01-22-1996 5090.3.A. CTO 0059	LATAS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0029 30090141

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AR_M60050_001233 NONE REPORT N68711-92-D-4670 1064	**07-01-1995** 01-31-1996 5090.3.A. CTO 0059	LATAS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141
AR_M60050_001572 NONE CORRESPONDENCE NONE 8	**07-11-1995** 07-11-1996 5090.3.A. NONE	JONES, P. JOHN M. TETTEMER & ASSOCIATES, LTD. DOTSON, A. MCAS EL TORO - SANTA ANA, CA	PROPOSED CONSTRUCTION FOR EROSION CONTROL IMPROVEMENTS ON MCAS EL TORO PROPERTY IN BORREGO WASH	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141

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AR_M60050_001246 NONE REPORT N68711-92-D-4670 12	**07-19-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001248 CTO-0059/0186 CORRESPONDENCE N68711-92-D-4670 6	**07-19-1995** 02-09-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS FINAL HEALTH AND SAFETY PLAN SUPPLEMENT, PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001249 NONE CORRESPONDENCE N68711-92-D-4670 3	**07-19-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	FINAL INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001253 NONE MINUTES N68711-92-D-4670 6	**07-19-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	02 MAY 1995 MEETING MINUTES FOR CTO-0059	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001573 CTO-0059/0186 CORRESPONDENCE N68711-92-D-4670 7	**07-19-1995** 07-11-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS FROM DTSC ON THE FINAL HEALTH AND SAFETY PLAN SUPPLEMENT, PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141
AR_M60050_000966 NONE MINUTES NONE 16	**07-27-1995** 08-29-1995 5090.3.A. NONE	RESTORATION ADVISORY BOARD RESTORATION ADVISORY BOARD	27 JULY 1995 RESTORATION ADVISORY BOARD MEETING MATERIALS (INCLUDES AGENDA, MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002 OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0024 30090141

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AR_M60050_000970 NONE MINUTES NONE 16	**07-27-1995** 08-29-1995 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	27 JULY 1995 RESTORATION ADVISORY BOARD MEETING MATERIALS (INCLUDES AGENDA, MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002 OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0024 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001067 NONE MINUTES NONE 7	**07-27-1995** 12-11-1995 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	27 JULY 1995 RESTORATION ADVISORY BOARD MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0026 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001193 NONE REPORT N68711-92-D-4670 944	**08-01-1995** 01-22-1996 5090.3.A. CTO 0059	LATAS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL FIELD SAMPLING PLAN PHASE II REMEDIAL INVESTIGATION (RI) / FEASIBILITY STUDY (FS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0028 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001244 NONE REPORT N68711-92-D-4670 3	**08-01-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	FINAL QUALITY ASSURANCE PROJECT PLAN, PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001245 NONE CORRESPONDENCE N68711-92-D-4670 19	**08-01-1995** 02-09-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	COMPILED RESPONSE TO COMMENTS ON THE DRAFT QUALITY ASSURANCE PROJECT PLAN PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY (SEE RECORD # 931 - EPA COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001373 NONE REPORT N68711-92-D-4670 105	**08-01-1995** 03-19-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	FINAL QUALITY ASSURANCE PROJECT PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001465 NONE REPORT N68711-92-D-4670 184	**08-01-1995** 05-21-1996 5090.3.A. CTO 0059	LATAS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL RISK ASSESSMENT WORK PLAN (DOCUMENT SIGNED 29 AUGUST 1995)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0035 30090141

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AR_M60050_001575 NONE CORRESPONDENCE NONE 1	**08-07-1995** 07-11-1996 5090.3.A. NONE	MURPHY, D. RESTORATION ADVISORY BOARD MEMBER JOYCE, J. MCAS EL TORO - SANTA ANA, CA	LETTER FROM RAB MEMBER TO MARINE CORPS/NAVY RAB CO- CHAIR REQUESTING LISTING OF REPORTS AND STUDIES ON THEMAGAZINE ROAD LANDFILL - SITE 2	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0037 30090141
AR_M60050_001243 NONE CORRESPONDENCE N68711-92-D-4670 3	**08-09-1995** 02-08-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS FOR WORK PLAN AND FIELD SAMPLING PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001296 NONE CORRESPONDENCE N68711-92-D-4670 1	**08-09-1995** 03-13-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. JIMENEZ, J. DTSC - LONG BEACH, CA	BECHTEL'S RESPONSE TO DTSC REVIEW QUESTIONS CONCERNING FINALINVESTIGATION DERIVED WASTE MANAGEMENT PLAN FOR PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001372 NONE REPORT N68711-92-D-4670 137	**08-09-1995** 03-19-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO VARIOUS REGULATORS' COMMENTS FOR WORK PLAN AND FIELD SAMPLING PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001242 NONE REPORT N68711-92-D-4670 3	**08-16-1995** 02-08-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	FINAL FIELD SAMPLING PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001297 NONE CORRESPONDENCE NONE 2	**08-25-1995** 03-13-1996 5090.3.A. NONE	ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	EPA LETTER STATING CONCERN OVER PLANS TO CONDUCT CPT SOIL GAS TESTING AND HYDROPUNCH SAMPLING BEFORE APPROVAL OF PHASE II RI/FS, QAPP AND FSP	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001068 NONE MINUTES NONE 10	**08-31-1995** 12-11-1995 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	31 AUGUST 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0026 30090141

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AR_M60050_001069 NONE MINUTES NONE 9	**08-31-1995** 12-11-1995 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	RESTORATION ADVISORY BOARD (RAB) MAILING LIST	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0026 30090141

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AR_M60050_001446 NONE MINUTES NONE 50	**08-31-1995** 04-08-1996 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	31 AUGUST 1995 RESTORATION ADVISORY BOARD MEETING MATERIALS (INCLUDES AGENDA, MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0034 30090141

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AR_M60050_001055 NONE CORRESPONDENCE NONE 1	**09-05-1995** 12-11-1995 5090.3.A. NONE	HURLEY, G. BROWN, PISTONE, HURLEY & VAN VLEAR JOYCE, J. NAVFAC - SOUTHWEST DIVISION	REQUEST FOR APPLICATION FOR MEMBERSHIP IN THE RESTORATION ADVISORY BOARD (RAB)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0026 30090141

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AR_M60050_001239 NONE CORRESPONDENCE N68711-92-D-4670 3	**09-06-1995** 02-08-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS DOCUMENT, PREPARED IN CONJUNCTION WITH THE FINAL RISK ASSESSMENT WORK PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001240 NONE CORRESPONDENCE N68711-92-D-4670 3	**09-06-1995** 02-08-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	FINAL RISK ASSESSMENT WORK PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001370 NONE REPORT N68711-92-D-4670 185	**09-06-1995** 03-19-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	FINAL RISK ASSESSMENT WORK PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001371 NONE CORRESPONDENCE N68711-92-D-4670 25	**09-06-1995** 03-19-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	RESPONSES TO VARIOUS AGENCIES COMMENTS ON THE FINAL RISK ASSESSMENT WORKPLAN FOR PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001337 CTO-0076/0028 MINUTES N68711-92-D-4670 20	**09-11-1995** 03-18-1996 5090.3.A. CTO 0076	DALYRYMPLE, M. BECHTEL NATIONAL, INC. ASHMAN, J. NAVFAC - SOUTHWEST DIVISION	11 SEPTEMBER 1995 MEETING MINUTES REGARDING THE INFORMAL CONSULTATION FOR THE PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY FIELD ACTIVITIES IN THE CONSERVATION AREA	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001057 NONE CORRESPONDENCE N68711-92-D-4670 9	**09-14-1995** 12-11-1995 5090.3.A. CTO 0063	COWSER, D. BECHTEL NATIONAL, INC. NUZUM, L. NAVFAC - SOUTHWEST DIVISION	DRAFT AGENDA AND PUBLIC NOTICE 28 SEPTEMBER 1995 WITH RESTORATION ADVISORY BOARD (RAB) MAILING LIST (DOCUMENT MADE DISCLOSABLE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0026 30090141

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AR_M60050_001300 NONE CORRESPONDENCE NONE 2	**09-15-1995** 03-14-1996 5090.3.A. NONE	U.S. EPA - SAN FRANCISCO, CA COWSER, D. BECHTEL NATIONAL, INC.	US EPA COMMENTS ON THE MCAS EL TORO FINAL WORK PLAN AND FIELD SAMPLING PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

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AR_M60050_001356 NONE CORRESPONDENCE N68711-92-D-4670 16	**09-20-1995** 03-18-1996 5090.3.A. CTO 0080	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	SUBMITTAL OF BECHTEL'S FINAL NOTES REGARDING RESPONSE TO COMMENTS DOCUMENT PREPARED IN CONJUNCTION WITH THE FINAL RISK ASSESSMENT WORK PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141
AR_M60050_002153 CTO-0076/0028 MINUTES N68711-92-D-4670 21	**09-25-1995** 04-15-1998 5090.3.A. CTO 0076	COWSER, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	11 SEPTEMBER 1995 MEETING MINUTES REGARDING THE INFORMAL CONSULTATION FOR THE PHASE II REMEDIAL INVESTIGATION / FEASIBILITY STUDY ACTIVITIES IN THE EL TORO CONSERVATION AREA	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0049 30090141

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AR_M60050_001062 NONE MINUTES NONE 12	**09-28-1995** 12-11-1995 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	28 SEPTEMBER 1995 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES [WITH ATTENDANCE LIST]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0026 30090141

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AR_M60050_001447 NONE MINUTES NONE 81	**09-28-1995** 04-08-1996 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	28 SEPTEMBER 1995 RESTORATION ADVISORY BOARD MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA, MINUTES, PUBLIC NOTICES, AND VARIOUS HANDOUTS) [CONTAINS PRIVACY ACT INFORMATION]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0034 30090141
AR_M60050_001232 NONE CORRESPONDENCE N68711-92-D-4670 61	**10-04-1995** 01-31-1996 5090.3.A. CTO 0059	KLEUSENER, J. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON TECHNICAL REVIEW OF EE/CA FOR VARIOUS SITES PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001070 NONE MINUTES NONE 9	**10-12-1995** 12-11-1995 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	NOTICE OF RESTORATION ADVISORY BOARD (RAB) MEETING FOR 26 OCTOBER 1995 AND RAB MAILING LIST	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0026 30090141

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AR_M60050_001377 NONE CORRESPONDENCE N68711-92-D-4670 6	**10-18-1995** 03-19-1996 5090.3.A. CTO 0080	TEDALDI, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	SUBMITTAL OF BECHTEL'S REVIEW COMMENTS ON DRAFT QAPP, SAP, AND DATA MANAGEMENT PLAN FOR GROUNDWATER MONITORING	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141

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AR_M60050_001363 CTO-0076/0054 CORRESPONDENCE N68711-92-D-4670 1	**10-23-1995** 03-18-1996 5090.3.A. CTO 0076	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	LETTER INITIATING ECOLOGICAL RISK ASSESSMENT AS PART OF THE PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0032 30090141
AR_M60050_001448 NONE MINUTES NONE 87	**10-26-1995** 04-08-1996 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	26 OCTOBER 1995 RESTORATION ADVISORY BOARD MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA, PUBLIC NOTICES, MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0034 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001237 NONE CORRESPONDENCE N68711-92-D-4670 4	**11-06-1995** 02-08-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS FOR FINAL QUALITY ASSURANCE PROJECT PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001228 CTO-0063/0181 CORRESPONDENCE N68711-92-D-4670 21	**11-21-1995** 01-31-1996 5090.3.A. CTO 0063	MASRI, H. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS FOR MCAS TUSTIN AND MCAS EL TORO DRAFT REVISED COMMUNITY RELATIONS PLAN	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001236 NONE CORRESPONDENCE N68711-92-D-4670 4	**11-27-1995** 02-08-1996 5090.3.A. CTO 0059	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS FOR DRAFT FINAL WORKPLAN AND FIELD SAMPLING PLAN PHASE II RI/FS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0030 30090141

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AR_M60050_001433 CTO-0063/0210 MINUTES N68711-92-D-4670 21	**01-12-1996** 04-03-1996 5090.3.A. CTO 0063	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	DRAFT MINUTES FROM THE 30 NOVEMBER 1995 RESTORATION ADVISORY BOARD (RAB) MEETING; INCLUDES: SIGN-IN SHEETS, FLIER, AND RAB MAILING LIST	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0033 30090141

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AR_M60050_001395 NONE CORRESPONDENCE NONE 10	**02-23-1996** 03-20-1996 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL ADDENDUM TO THE RCRA FACILITY ASSESSMENT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0032 30090141

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AR_M60050_001273 NONE MINUTES N68711-92-D-4670 5	**02-26-1996** 03-07-1996 5090.3.A. CTO 0103	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	MEETING MINUTES - 20 FEBRUARY 1996 BRAC CLEANUP PLAN MEETING HELD TO DISCUSS COMMENTS ON THE BCP AND DISTRIBUTION OF THE BCP	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0031 30090141

UIC No. _ Rec. No. Doc. Control No. Record Type Contract No. Approx. # Pages	Record Date Prc. Date SSIC No. CTO No.	Author Author Affil. Recipient Recipient Affil.	Subject	Distribution	Sites	Location SWDIV Box No(s) CD No.	FRC Accession No. FRC Warehouse FRC Box No(s)
AR_M60050_001402 NONE PUBLIC NOTICE NONE 39	**02-27-1996** 03-20-1996 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA COLEMAN, B. BECHTEL NATIONAL, INC.	DOCUMENTS FOR 23 AND 24 FEBRUARY 1996 MCAS EL TORO RESTORATION ADVISORY BOARD TOUR (INCLUDES TOUR INFORMATION, PUBLIC NOTICE AND TOWN HALL FLIER)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0033 30090141

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AR_M60050_001401 CTO-0103/0058 MINUTES N68711-92-D-4670 504	**03-01-1996** 03-20-1996 5090.3.A. CTO 0103	COWSER, D. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	BASE REALIGNMENT AND CLOSURE (BRAC) PLAN (BCP) [SIGNED 20 FEBRUARY 1996]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0033 30090141

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AR_M60050_001419 NONE CORRESPONDENCE N68711-92-D-4670 22	**03-28-1996** 04-03-1996 5090.3.A. CTO 0063B	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	LETTER TRANSMITTING COPY OF MATERIALS FOR "CURRENT STATUS MCAS EL TORO ENVIRONMENTAL INVESTIGATION INSTALLATION RESTORATION PROGRAM" PRESENTATION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0033 30090141

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AR_M60050_004084 NONE CORRESPONDENCE NONE 2	**04-30-1996** 10-04-2007 5090.3.A. NONE	JANICKI, P. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA MAHMOUD, T. DTSC - LONG BEACH, CA	REVIEW AND COMMENTS ON THE DRAFT PHASE II REMEDIAL INVESTIGATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_000347 CTO-0076/0252 CORRESPONDENCE N68711-92-D-4670 82	**05-01-1996** 04-13-2000 5090.3.A. CTO 0076	MULTIPLE AGENCIES JOYCE, J. NAVFAC - SOUTHWEST DIVISION	BECHTEL'S CONSOLIDATED RESPONSE TO COMMENTS (TRANSMITTAL LETTER DATED 09 SEPTEMBER 1996) - DRAFT PHASE II REMEDIAL INVESTIGATION REPORT, FOR THE MAGAZINE ROAD LANDFILL (REF. #1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1637)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_004079 NONE CORRESPONDENCE NONE 2	**05-02-1996** 10-03-2007 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT VACUUM ASSISTED AND CONVENTIONAL GROUNDWATER EXTRACTION PILOT STUDY WORK PLAN, MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_001048 NONE CORRESPONDENCE N68711-92-D-4670 15	**05-09-1996** 06-19-1996 5090.3.A. CTO 0076	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	LETTER TRANSMITTING REGULATORY COMPLIANCE AND PERMIT EXEMPTION FOR CONDUCTING A VACUUM ENHANCED GROUNDWATER EXTRACTION PILOT TEST	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_003	L181-06-0125 BX 0025 30090141
AR_M60050_004101 NONE CORRESPONDENCE NONE 6	**05-14-1996** 10-26-2007 5090.3.A. NONE	CHRISTOPHER, J. DTSC - SACRAMENTO, CA MAHMOUD, T. DTSC - CYPRESS, CA	REVIEW AND COMMENTS ON DRAFT REMEDIAL INVESTIGATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 OU 0000002B OU 0000003 SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	

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AR_M60050_004086 NONE CORRESPONDENCE NONE 8	**05-15-1996** 10-04-2007 5090.3.A. NONE	VITALE, L. CRWQCB - RIVERSIDE, CA MAHMOUD, T. DTSC - LONG BEACH, CA	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION REPORTS (INCLUDES OFFICE OF SCIENTIFIC AFFAIRS AND HUMAN AND ECOLOGICAL RISK SECTION COMMENTS DATED 14 MAY 1996)	ADMIN RECORD BASE INFO REPOSITORY	LANDFILL 002 LANDFILL 017 OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_001611 NONE CORRESPONDENCE NONE 33	**05-17-1996** 09-04-1996 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON THE DRAFT PHASE II RI REPORT FOR THE MAGAZINE ROAD LANDFILL, SITE 2 OU 2B W/ENCL	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0038 30090141
AR_M60050_004068 NONE CORRESPONDENCE NONE 20	**05-20-1996** 10-02-2007 5090.3.A. NONE	ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PHASE II REMEDIAL INVESTIGATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002 SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_000812 SW1905 REPORT N68711-93-D-1459 91	**05-24-1996** 06-19-1996 5090.3.A. DO 0071	SEDLAK, W. OHM REMEDIATION SERVICES CORP. KENNEDY, K. NAVFAC - SOUTHWEST DIVISION	FINAL SITE HEALTH AND SAFETY PLAN FOR REMOVAL ACTIONS AT SITE 2 AND 17	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_002	L181-06-0125 BX 0020 30090141

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AR_M60050_001515 CTO-0079/0140 REPORT N68711-92-D-4670 12	**06-01-1996** 07-03-1996 5090.3.A. CTO 0079	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM REVISED RISK ASSESSMENT PROCEDURES (DOCUMENT SIGNED 10 JUNE 1996) {SEE RECORDS # 1600 - DTSC COMMENTS AND # 2535 - NAVY ENVIRONMENTAL HEALTH CENTER COMMENTS}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0036 30090141

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AR_M60050_001507 NONE CORRESPONDENCE N68711-92-D-4670 16	**06-05-1996** 06-06-1996 5090.3.A. CTO 0065	COWSER, D. BECHTEL NATIONAL, INC. KENNEDY, P. NAVFAC - SOUTHWEST DIVISION	DOCUMENT REVIEW COMMENTS AND RESPONSES ON FINAL RCRA FACILITY ASSESSMENT ADDENDUM	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_004	L181-06-0125 BX 0036 30090141
AR_M60050_002265 NONE OTHER N68711-92-D-4670 674	**06-24-1996** 09-21-1998 5090.3.A. CTO 0076	TEDALDI, D. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	CHAIN OF CUSTODY RECORDS, PHASE II REMEDIAL INVESTIGATION/FEASIBILITY STUDY AT THE STATION LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0051 30090141

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AR_M60050_001624 NONE CORRESPONDENCE NONE 7	**07-31-1996** 09-16-1996 5090.3.A. NONE	STROUD, M. NAVFAC - SOUTHWEST DIVISION KOBETICH, G. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	IRP RESPONSE ACTIVITIES AT TWO LANDFILL SITES FOR EMERGENCY REMOVAL ACTIONS PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_005	L181-06-0125 BX 0038 30090141
AR_M60050_001980 NONE MINUTES NONE 100	**07-31-1996** 09-18-1997 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS FOR 31 JULY 1996 RAB MEETING: AGENDA, HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00015 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00024 SITE 00025 TANK 00398	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0045 30090141
AR_M60050_001656 NONE CORRESPONDENCE N68711-92-D-4670 4	**08-13-1996** 09-27-1996 5090.3.A. CTO 0079	COWSER, D. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON THE TECHNICAL MEMORANDUM REVISED RISK ASSESSMENT PROCEDURES (SEE RECORD # 1600 - DTSC COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00004 SITE 00007 SITE 00013 SITE 00014 SITE 00015 SITE 00019 SITE 00020 SITE 00023	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141

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AR_M60050_001663 NONE CORRESPONDENCE NONE 4	**08-16-1996** 09-30-1996 5090.3.A. NONE	ARELLANO, A. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON THE FINAL QUARTERLY GROUNDWATER MONITORINGREPORT APPROVAL W/ENCL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141
AR_M60050_001681 NONE CORRESPONDENCE NONE 36	**09-05-1996** 10-02-1996 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REQUEST FOR ARAR'S FOR LANDFILL SITES OU2B & OU2C TRANSMITTAL OF SCAQMD ARAR'S	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141
AR_M60050_001674 CTO-0063B/0419 CORRESPONDENCE N68711-92-D-4670 5	**09-20-1996** 01-31-2000 5090.3.A. CTO 0063B	SCHWARTZ, A. BECHTEL NATIONAL, INC. MARTIN, T. NAVFAC - SOUTHWEST DIVISION	QUARTERLY UPDATING & MAINTENANCE OF THE INFORMATION REPOSITORY AT THE HERITAGE PARK REGIONAL LIBRARY IN IRVINE WAS PERFORMED.	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00004 SITE 00007 SITE 00011 SITE 00013 SITE 00014 SITE 00017 SITE 00019 SITE 00020 SITE 00024	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141
AR_M60050_001683 NONE CORRESPONDENCE NONE 14	**09-25-1996** 10-02-1996 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION GATES, B. ORANGE COUNTY SHERIFF - SANTA ANA, CA	COMPLETION OF REMEDIAL INVESTIGATION UNDER CERCLA AND REQUEST FOR RIGHTS OF ENTRY TO EXTENDING PROPERTY BOUNDARIES OF THE LANDFILL SITE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141

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AR_M60050_001684 NONE CORRESPONDENCE NONE 14	**09-25-1996** 10-02-1996 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION BANKUTHY, C. IRVINE RANCH WATER DISTRICT - IRVINE, CA	COMPLETION OF RI UNDER CERCLA FOR IR SITE 2 AND REQUEST FOR RIGHTS OF ENTRY TO EXTENDING PROPERTY BOUNDARIES OF THE LANDFILL SITE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141
AR_M60050_001685 NONE CORRESPONDENCE NONE 14	**09-25-1996** 10-02-1996 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION DUNLAP, B. THE IRVINE COMPANY	COMPLETION OF RI UNDER CERCLA FOR IR SITE 2 AND REQUEST FOR RIGHTS OF ENTRY TO EXTENDING PROPERTY BOUNDARIES OF THE LANDFILL SITE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141
AR_M60050_001983 NONE MINUTES NONE 69	**09-25-1996** 09-18-1997 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS FOR 25 SEPTEMBER 1996 MEETING: AGENDA, HANDOUTS, & MINUTES OF 31 JULY 1996 RAB MEETING, SIGN-IN SHEETS, REV. "BLUE SHEET"	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00015 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00024 SITE 00025 TANK 00398	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0045 30090141

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AR_M60050_001690 NONE REPORT NONE 47	**10-02-1996** 10-08-1996 5090.3.A. NONE	JOYCE, J. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	FINAL ACTION MEMORANDUM TIME CRITICAL REMOVAL ACTIONS AT THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS (SIGNED BY J. JOYCE ON 02 OCTOBER 1996) {SEE RECORD # 2428 - RESPONSE TO COMMENTS}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0039 30090141
AR_M60050_001880 NONE CORRESPONDENCE NONE 51	**10-07-1996** 03-26-1997 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL ACTION MEMORANDUM, TIME-CRITICAL REMOVAL ACTIONS , IRP SITE 2 AND IRP SITE 17	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141
AR_M60050_004074 NONE CORRESPONDENCE NONE 2	**10-07-1996** 10-02-2007 5090.3.A. NONE	SCANDURA, J. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND APPROVAL OF DRAFT FINAL PHASE II REMEDIAL INVESTIGATION REPORT, MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_001878 NONE CORRESPONDENCE NONE 11	**10-09-1996** 03-26-1997 5090.3.A. NONE	ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	ACCEPTANCE OF "DRAFT FINAL PHASE II RI REPORT OU 2B (SITES 2 AND 17)"; COMMENTS FOR TECH MEMO AND FUTURE REPORTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141
AR_M60050_001876 NONE PUBLIC NOTICE NONE 1	**10-10-1996** 03-26-1997 5090.3.A. NONE	LOS ANGELES TIMES - LOS ANGELES, CA PUBLIC	PUBLIC NOTICE OF REMOVAL ACTIONS AT MAGAZINE ROAD LANDFILL, COMMUNICATION STATION LANDFILL AND AIRCRAFT EXPEDITIONARY REFUELING SITE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000003 SITE 00002 SITE 00017 SITE 00019 UNIT 2	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141
AR_M60050_001877 NONE PUBLIC NOTICE NONE 1	**10-10-1996** 03-26-1997 5090.3.A. NONE	ORANGE COUNTY REGISTER - SANTA ANA, CA PUBLIC	PUBLIC NOTICE OF REMOVAL ACTIONS AT MAGAZINE ROAD LANDFILL, COMMUNICATION STATION LANDFILL AND AIRCRAFT EXPEDITIONARY REFUELING SITE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000003 SITE 00002 SITE 00017 SITE 00019	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141

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AR_M60050_001866 NONE CORRESPONDENCE NONE 2	**10-24-1996** 03-26-1997 5090.3.A. NONE	STROUD, M. NAVFAC - SOUTHWEST DIVISION NELSON, M. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	IN REFERENCE TO THE RESPONSE ACTIVITIES FOR THE INSTALLATION RESTORATION PROGRAM	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141
AR_M60050_004077 NONE CORRESPONDENCE NONE 4	**10-29-1996** 10-02-2007 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. BRAC PMO WEST	REVIEW AND COMMENTS ON ACTION MEMORANDUM FOR REMOVAL ACTIONS (INCLUDES CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD COMMENTS DATED 22 OCTOBER 1996)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_001863 NONE CORRESPONDENCE NONE 14	**11-01-1996** 03-26-1997 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON DRAFT PHASE II FS REPORT FOR THE MAGAZINE ROAD LANDFILL, SITE 2, OU 2B	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141
AR_M60050_001865 NONE CORRESPONDENCE NONE 4	**11-01-1996** 03-26-1997 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE ACTION MEMORANDUM FOR REMOVAL ACTIONS AT LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141
AR_M60050_001862 NONE CORRESPONDENCE NONE 16	**11-04-1996** 03-26-1997 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON DRAFT PHASE II FS REPORT FOR THE COMMUNICATION STATION LANDFILL, SITE 17, OU2B	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141
AR_M60050_001886 NONE CORRESPONDENCE NONE 5	**11-08-1996** 03-27-1997 5090.3.A. NONE	ARTHUR, B. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	EPA REVIEW OF "DRAFT FINAL PHASE II FS REPORT - OU 2B (SITES 2 AND 17)"	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0044 30090141

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AR_M60050_004078 NONE CORRESPONDENCE NONE 4	**12-02-1996** 10-02-2007 5090.3.A. NONE	JANICKI, P. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA MAHMOUD, T. DTSC - LONG BEACH, CA	REVIEW AND COMMENTS ON DRAFT PHASE II FEASIBILITY STUDY REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_001773 NONE CORRESPONDENCE NONE 1	**12-04-1996** 03-20-1997 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	EXTENSION REQUEST FOR OPERABLE UNIT 1 AND OPERABLE UNIT 2A	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A SITE 00002 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141

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AR_M60050_001848 NONE MINUTES NONE 182	**12-04-1996** 03-24-1997 5090.3.A. NONE	RESTORATION ADVISORY BOARD RESTORATION ADVISORY BOARD	04 DECEMBER 1996 RAB MEETING PUBLIC INFORMATION MATERIALS (INCLUDES MEETING AGENDA, DRAFT MEETING MINUTES, MEMBER SIGN-UP SHEET, FACT SHEET #7, EXECUTIVE SUMMARY ON DRAFT RI OU 3A)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003A SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024	FRC - PERRIS IMAGED TORO_009	L181-06-0125 BX 0043 30090141

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AR_M60050_001981 NONE MINUTES NONE 182	**12-04-1996** 09-18-1997 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS FOR 04 DECEMBER 1996 RAB MEETING - AGENDA, HANDOUTS, & MINUTES OF 25 SEPTEMBER 1996, REVISED "BLUE SHEET" FOR 04 DECEMBER 1996 MEETING	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002B OU 0000002C OU 0000003A SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00021 SITE 00022	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0045 30090141
AR_M60050_001770 NONE CORRESPONDENCE NONE 3	**12-06-1996** 03-20-1997 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	CLARIFICATION OF LANDFILL CLOSURE ISSUES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_002428 MCAS EL TORO SER 6284/1AU CORRESPONDENCE NONE 5	**12-19-1996** 06-20-2001 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	TRANSMITTAL OF THE RESPONSE TO COMMENTS ON THE FINAL ACTION MEMORANDUM TIME CRITICAL REMOVAL ACTIONS AT THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS (SEE RECORD # 1690 - ACTION MEMO)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141

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AR_M60050_002064 NONE CORRESPONDENCE NONE 4	**01-05-1997** 01-30-1998 5090.3.A. NONE	SCANDURA, J. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	DTSC'S RESPONSE TO MCAS EL TORO'S REQUEST FOR EXTENSIONS TO THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141
AR_M60050_001817 NONE MINUTES NONE 17	**01-09-1997** 03-21-1997 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	DEFENSE ENVIRONMENTAL RESPONSE TASK FORCE (DERTF) PRESENTATION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_001752 CTO-0076/0513 MINUTES N68711-92-D-4670 4	**01-15-1997** 03-19-1997 5090.3.A. CTO 0076	COWSER, D. BECHTEL NATIONAL, INC. MCAS EL TORO - SANTA ANA, CA	15 JANUARY 1997 MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141

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AR_M60050_004175 NONE CORRESPONDENCE NONE 17	**01-21-1997** 01-23-2008 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PHASE II REMEDIAL INVESTIGATION REPORT (INCLUDES SUPERFUND TECHNICAL SUPPORT SECTION COMMENTS DATED 16 JANUARY 1997) [SEE RECORD # 1712 - DRAFT RI REPORT]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003A SITE 00001 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00014 SITE 00016	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	
AR_M60050_001754 NONE MINUTES N68711-92-D-4670 18	**01-24-1997** 03-20-1997 5090.3.A. CTO 0103	HALLERBACH, D. BECHTEL NATIONAL, INC. SELBY, R. NAVFAC - SOUTHWEST DIVISION	16 JANUARY 1997 MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00019 SITE 00024 SITE 00025 TANK 00398 TANK FARM 002	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_002072 CTO-0155/0062 CORRESPONDENCE N68711-92-D-4670 33	**01-27-1997** 02-23-1998 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESPONSE TO COMMENTS ON THE DRAFT PROPOSED PLAN STATION LANDFILLS OPERABLE UNITS 2B AND 2C (VARIOUS DATES)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0048 30090141
AR_M60050_001755 CTO-0076/0516 MINUTES N68711-92-D-4670 4	**01-28-1997** 03-20-1997 5090.3.A. CTO 0076	LATAS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	22 JANUARY 1997 MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141

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AR_M60050_001756 NONE MINUTES N68711-92-D-4670 31	**02-06-1997** 03-20-1997 5090.3.A. CTO 0073	BROOKS, P. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	30 JANUARY 1997 MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017 SITE 00019	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_002199 MCAS EL TORO SER 11000/1JD.131 CORRESPONDENCE NONE 3	**02-19-1997** 05-30-2001 5090.3.A. NONE	BURR, I. MCAS EL TORO - SANTA ANA, CA NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF THE COMMENTS BY BASE ON THE DRAFT CONSTRUCTION WORK PLAN FOR TIME-CRITICAL REMOVAL ACTIONS AT THE MAGAZINE ROAD LANDFILL AND THE COMMUNICATION STATION LANDFILL (SEE RECORD # 582 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0050 30090141
AR_M60050_001759 NONE MINUTES N68711-92-D-4670 4	**02-26-1997** 03-20-1997 5090.3.A. CTO 0073	BROOKS, P. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	20 FEBRUARY 1997 MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_001746 NONE REPORT N68711-95-D-7530 769	**02-27-1997** 03-17-1997 5090.3.A. DO 0009	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	GROUNDWATER MONITORING REPORT NOVEMBER-DECEMBER 1996 SAMPLING ROUND (VOLUME I AND II OF II)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00006 SITE 00013 SITE 00015 SITE 00019	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0041 30090141 BX 0042

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AR_M60050_001745 CTO-0103/0144 REPORT N68711-92-D-4670 2000	**03-01-1997** 03-17-1997 5090.3.A. CTO 0103	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL BASE REALIGNMENT AND CLOSURE (BRAC) CLEANUP PLAN (BCP)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000003A OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	CHOICE IMAGING SOLUTIONS SW-20100702-6/8	

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AR_M60050_002038 NONE CORRESPONDENCE N68711-92-D-4670 30	**03-03-1997** 11-24-1997 5090.3.A. CTO 0124	LATAS, T. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	TECHNICAL MEMORANDUM REFUSE SURVEY	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141
AR_M60050_001761 CTO-0076/0533 CORRESPONDENCE N68711-92-D-4670 25	**03-04-1997** 03-20-1997 5090.3.A. CTO 0076	CARLISLE, C. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESPONSE TO COMMENTS TO DRAFT PHASE II FEASIBILITY STUDY REPORTS (WITH VARIOUS DATES)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002C SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_004257 NONE CORRESPONDENCE NONE 20	**04-09-1997** 04-16-2008 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE GROUNDWATER MONITORING REPORT NOVEMBER-DECEMBER 1996 SAMPLING ROUND (INCLUDES FOUR SETS OF SPIKED VOC SAMPLES, DATED 04 APRIL 1997) [SEE RECORD # 1746 - GROUNDWATER MONITORING REPORT]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00019 WELL 01-MW101 WELL 01-MW102 WELL 02-NEW7 WELL 06-DGMW69 WELL 13-UGMW32 WELL 19-DGMW86	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_004161 NONE CORRESPONDENCE NONE 1	**04-10-1997** 01-22-2008 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND APPROVAL OF THE DRAFT FINAL PHASE II FEASIBILITY STUDY REPORT [SEE RECORD # 1823 - DRAFT FINAL FS REPORT]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	
AR_M60050_004162 NONE CORRESPONDENCE NONE 11	**04-16-1997** 01-22-2008 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE II FEASIBILITY STUDY REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	

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AR_M60050_000578 SW3573 REPORT N68711-93-D-1459 25	**05-02-1997** 11-22-2000 5090.3.A. DO 0075	LINCER, J. HELIX ENVIRONMENTAL HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	BIOLOGICAL ASSESSMENT OF THE COASTAL CALIFORNIA GNAT CATCHER AND ITS HABITAT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20100702-3/8	
AR_M60050_002009 NONE CORRESPONDENCE NONE 21	**05-07-1997** 09-24-1997 5090.3.A. NONE	STROUD, M. NAVFAC - SOUTHWEST DIVISION KOBETICH, G. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	LETTER REQUESTING INITIATION OF FORMAL CONSULTATION UNDER SECTION 7(A)(2) OF THE ENDANGERED SPECIES ACT REGARDING THE LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0046 30090141
AR_M60050_002518 SW3407 REPORT N68711-93-D-1459 58	**05-23-1997** 09-18-2001 5090.3.A. DO 0070	RAWAL, D. OHM REMEDIATION SERVICES CORP. NAVFAC - SOUTHWEST DIVISION	TANK REMOVAL AND SITE CLOSURE REPORT - UNDERGROUND STORAGE TANKS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 UST 009001 UST 009002	FRC - PERRIS IMAGED TORO_019	L181-06-0125 BX 0058 30090141

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AR_M60050_001974 NONE MINUTES NONE 99	**05-28-1997** 09-18-1997 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS FOR 28 MAY 1997 RAB MEETING-AGENDA, HANDOUTS & DRAFT MEETING MINUTES FROM 26 MARCH 1997 RAB MEETING	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002A OU 0000002B OU 0000003 OU 0000003A SITE 00002 SITE 00004 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0045 30090141
AR_M60050_000569 SW3893 REPORT N68711-93-D-1459 5	**05-30-1997** 11-22-2000 5090.3.A. DO 0075	CLAYCOMB, D. OHM REMEDIATION SERVICES CORP. NAVFAC - SOUTHWEST DIVISION	BIWEEKLY BIOLOGICAL MONITORING REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141

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AR_M60050_002021 NONE CORRESPONDENCE NONE 18	**06-12-1997** 11-10-1997 5090.3.A. NONE	KOBETICH, G. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA STROUD, M. NAVFAC - SOUTHWEST DIVISION	BIOLOGICAL OPINION ON THE REMEDIATION PROGRAM, ORANGE COUNTY, CALIFORNIA (1-6-97-F-14)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0046 30090141
AR_M60050_004259 NONE CORRESPONDENCE NONE 3	**06-18-1997** 04-16-2008 5090.3.A. NONE	SCANDURA, J DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION FOR OPERABLE UNITS, DATED 13 JUNE 1997	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00009 SITE 00010 SITE 00013 SITE 00015 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	

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AR_M60050_004260 NONE CORRESPONDENCE NONE 2	**06-23-1997** 04-16-2008 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF REQUEST FOR FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION FOR OPERABLE UNITS, DATED 13 JUNE 1997	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00009 SITE 00010 SITE 00013 SITE 00015 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	

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AR_M60050_002007 NONE REPORT N68711-95-D-7530 1000	**06-27-1997** 09-24-1997 5090.3.A. DO 0009	CDM FEDERAL PROGRAMS CORP. MULTIPLE AGENCIES	FINAL GROUNDWATER MONITORING REPORT MARCH 1997 SAMPLING ROUND, VOLUMES I AND II OF II	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002B OU 0000002C OU 0000003 OU 0000003A SITE 00002 SITE 00003 SITE 00004 SITE 00013 SITE 00015 SITE 00024 WELL 00001DGMW57 WELL 00004UGMW63 WELL 00005NEW1 WELL 00005UGMW27 WELL 00017DGMW82 WELL 00018BGMP08 WELL 00018BGMW02 WELL 00018BGMW18 WELL 00018BGMW24 WELL 00018DGMW57	CHOICE IMAGING SOLUTIONS SW-20100604-9/10	

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AR_M60050_002366 NONE CORRESPONDENCE NONE 4	**07-02-1997** 04-08-1999 5090.3.A. NONE	HORNECKER, L. NAVFAC - SOUTHWEST DIVISION NELSON, M. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	BIOLOGICAL MONITORING REPORTS INTERIM ACTIONS AT LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0053 30090141
AR_M60050_003590 NONE CORRESPONDENCE NONE 2	**07-02-1997** 07-12-2006 5090.3.A. NONE	DIEKMANN, W. COUNTY OF ORANGE HEALTH CARE AGENCY - SANTA ANA, CA KATCHARIAN, H. MCAS EL TORO - SANTA ANA, CA	CONFIRMATION OF THE TANK REMOVAL PROJECT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 UST 009001 UST 009002	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_004261 NONE CORRESPONDENCE NONE 2	**07-10-1997** 04-16-2008 5090.3.A. NONE	JANICKI, P. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE II FEASIBILITY STUDY REPORT [SEE RECORD # 1823 - DRAFT FINAL PHASE II FEASIBILITY STUDY REPORT]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_002365 NONE CORRESPONDENCE NONE 3	**07-18-1997** 04-08-1999 5090.3.A. NONE	HORNECKER, L. NAVFAC - SOUTHWEST DIVISION NELSON, M. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	BIOLOGICAL MONITORING REPORTS INTERIM ACTIONS AT LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0053 30090141

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AR_M60050_000573 SW4094 REPORT N68711-93-D-1459 6	**07-22-1997** 11-22-2000 5090.3.A. DO 0075	CLAYCOMB, D. OHM REMEDIATION SERVICES CORP. NAVFAC - SOUTHWEST DIVISION	WEEKLY BIOLOGICAL MONITORING REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141
AR_M60050_002367 NONE REPORT NONE 2	**07-25-1997** 04-12-1999 5090.3.A. NONE	HORNECKER, L. NAVFAC - SOUTHWEST DIVISION NELSON, M. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	BIOLOGICAL MONITORING REPORT (5-11 JUL 97), INTERIM ACTIONS AT LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0053 30090141
AR_M60050_004149 NONE CORRESPONDENCE NONE 8	**08-07-1997** 01-22-2008 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE GROUNDWATER MONITORING REPORT, SAMPLING ROUND (INCLUDES GEOLOGICAL SERVICES UNIT COMMENTS DATED 31 JULY 1997, AND GROUNDWATER MONITORING WELL PURGING AND SAMPLING LOG)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002 OU 0000002B OU 0000002C OU 0000003 OU 0000003A SITE 00002 SITE 00003 SITE 00004 SITE 00013 SITE 00015 SITE 00024 WELL 00001MW101 WELL 00001MW102 WELL 00002DGMW59	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	

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AR_M60050_000568 SW4240 REPORT N68711-93-D-1459 4	**08-19-1997** 11-22-2000 5090.3.A. DO 0075	CLAYCOMB, D OHM REMEDIATION SERVICES CORP. NAVFAC - SOUTHWEST DIVISION	WEEKLY BIOLOGICAL MONITORING REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141

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AR_M60050_001986 NONE CORRESPONDENCE NONE 15	**09-05-1997** 09-18-1997 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	ADVANCED SUBMITTAL OF FEDERAL FACILITIES AGREEMENT EXTENSION REQUEST FOR CHANGES TO THE DRAFT FINAL INTERIM RECORD OF DECISION (ROD) FOR OU 2A, OU 2B AND OU 2C	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0045 30090141
AR_M60050_001994 NONE CORRESPONDENCE N68711-92-D-4670 68	**09-05-1997** 09-23-1997 5090.3.A. CTO 0076	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESPONSE TO COMMENTS ON DRAFT FINAL PHASE II FEASIBILITY STUDY REPORTS (VARIOUS DATES)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0046 30090141

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AR_M60050_002005 NONE CORRESPONDENCE N68711-92-D-4670 21	**09-05-1997** 09-24-1997 5090.3.A. CTO 0076	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	TRANSMITTAL LETTER OF MODIFICATIONS TO DRAFT FINAL REMEDIAL INVESTIGATION REPORTS ON THE LANDFILLS AND RESPONSE TO COMMENTS ON THE DRAFT FINAL REMEDIAL INVESTIGATION REPORTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0046 30090141
AR_M60050_000579 SW4322 ANALYTICAL DATA N68711-93-D-1459 27	**09-18-1997** 11-22-2000 5090.3.A. DO 0075	SEDLAK, W. OHM REMEDIATION SERVICES CORP. HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	GEOTECHNICAL SOIL TESTING RESULTS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141

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AR_M60050_001987 NONE CORRESPONDENCE NONE 18	**09-18-1997** 09-18-1997 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	SUBMITTAL OF FEDERAL FACILITIES AGREEMENT EXTENSION REQUEST FOR CHANGES IN THE DRAFT FINAL INTERIM RECORD OF DECISION (ROD) FOR OPERABLE UNITS (SEE RECORD # 2662 - CRWQCB RESPONSE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0045 30090141

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AR_M60050_001978 NONE MINUTES N68711-92-D-4670 16	**09-24-1997** 09-18-1997 5090.3.A. CTO 0063B	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER, AGENDA, & PUBLIC NOTICE OF 24 SEPTEMBER 1997, RAB MEETING MINUTES OF 06 AUGUST 1997	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000002A OU 0000003 OU 0000003A OU 0000003B SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_011	L181-06-0125 BX 0045 30090141

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AR_M60050_002039 NONE MINUTES NONE 71	**09-24-1997** 11-24-1997 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	24 SEPTEMBER 1997 RAB MEETING PUBLIC INFORMATION MATERIALS (INCLUDES RAB MEETING AGENDA, PUBLIC NOTICE, 06 AUGUST 1997 RAB MEETING MINUTES, AND MISCELLANEOUS AGENCIES COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002A OU 0000003 OU 0000003A SITE 00001 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141
AR_M60050_002177 CTO-0076/0572 PHOTO N68711-92-D-4670 41	**10-28-1997** 04-16-1998 5090.3.A. CTO 0076	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	AERIAL PHOTOGRAPHS OF MAGAZINE ROAD LANDFILL AND THE MEMO TO THE PROJECT FILE CONCERNING THE PHOTOGRAPHS DATED 12 MAY 1997	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0049 30090141
AR_M60050_002028 NONE CORRESPONDENCE NONE 5	**11-03-1997** 11-21-1997 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON THE DRAFT PROPOSED PLAN FOR CLOSURE OF INACTIVE LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141

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AR_M60050_002029 NONE CORRESPONDENCE NONE 15	**11-17-1997** 11-21-1997 5090.3.A. NONE	MAHMOUD, T. DTSC - LONG BEACH, CA MULTIPLE AGENCIES	COMMENTS ON DRAFT PROPOSED PLAN FOR OPERABLE UNIT 2B, SITES 2 & 17 AND OPERABLE UNIT 2C, SITES 3 & 5	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141
AR_M60050_002030 NONE MINUTES N68711-92-D-4670 20	**11-19-1997** 11-21-1997 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	COMMUNITY RELATIONS SUPPORT (03 DECEMBER 1997 RAB MEETING AGENDA AND PUBLIC NOTICE, 24 SEPTEMBER 1997 MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000002A OU 0000003A SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141
AR_M60050_002058 NONE MINUTES NONE 91	**12-03-1997** 01-29-1998 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIAL / HANDOUTS (INCLUDES 03 DECEMBER 1997 RAB MEETING AGENDA, PUBLIC NOTICE, 24 SEPTEMBER 1997 MEETING MINUTES, RAB SIGN-IN SHEET & VARIOUS AGENCIES COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000002A OU 0000002B OU 0000002C OU 0000003A SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141

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AR_M60050_002068 NONE CORRESPONDENCE NONE 18	**12-30-1997** 01-30-1998 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION FOR PRIMARY DOCUMENTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141
AR_M60050_002056 NONE CORRESPONDENCE NONE 1	**01-07-1998** 01-29-1998 5090.3.A. NONE	MATHEWS, T. COUNTY OF ORANGE PLANNING & DEVELOPMENT SERVICES DEPARTMENT - SANTA ANA, CA SCANDURA, J. OFFICE OF MILITARY FACILITIES - LONG BEACH, CA	DRAFT PROPOSED PLAN FOR FOUR LANDFILL SITES (LETTER REGARDING DRAFT PROPOSED PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141

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AR_M60050_002672 NONE CORRESPONDENCE NONE 1	**01-07-1998** 05-29-2002 5090.3.A. NONE	VITALE, L. CRWQCB - RIVERSIDE, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	RESPONSE TO REQUEST FOR EXTENSIONS TO THE FEDERAL FACILITIES AGREEMENT APPENDIX A SCHEDULE FOR PRIMARY DOCUMENTS - RWQCB CONCURS WITH PROPOSED EXTENSION DATES (SEE RECORD # 2068 - REQUEST)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_002272 NONE CORRESPONDENCE NONE 4	**01-19-1998** 09-23-1998 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	LETTERS REGARDING TRANSMITTAL OF ON-SCENE COORDINATOR REPORT, TIME CRITICAL REMOVAL ACTION; (W/OUT ENCLOSURE) [SEE RECORD # 1993 - ON-SCENE COORDINATOR REPORT]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0052 30090141
AR_M60050_002055 NONE MINUTES N68711-92-D-4670 24	**01-21-1998** 01-29-1998 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	28 JANUARY 1998 RESTORATION ADVISORY BOARD (RAB) MEETING AGENDA, PUBLIC NOTICE, RAB AND NON RAB MEMBER SIGN-IN SHEET; 03 DECEMBER 1997 MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B OU 0000002C OU 0000003A OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0047 30090141

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AR_M60050_002205 CTO-0155/0062 CORRESPONDENCE N68711-92-D-4670 33	**01-27-1998** 05-07-1998 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESPONSE TO COMMENTS ON THE DRAFT PROPOSED PLAN STATION LANDFILLS OPERABLE UNITS 2B AND 2C (VARIOUS DATES)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0050 30090141
AR_M60050_002148 NONE MINUTES NONE 51	**01-28-1998** 03-30-1998 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA PUBLIC	PUBLIC INFORMATION MATERIALS (INCLUDES 28 JANUARY 1998 AGENDA, PUBLIC NOTICE, 03 DECEMBER 1997 FINAL MEETING MINUTES, SIGN-IN SHEETS, MISCELLANEOUS AGENCIES COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000003A SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017 SITE 00024 TANK 00398	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0049 30090141
AR_M60050_002147 CTO-0155/0086 MINUTES N68711-92-D-4670 24	**03-12-1998** 03-30-1998 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	BASEWIDE COMMUNITY RELATIONS SUPPORT - 25 MARCH 1998 RESTORATION ADVISORY BOARD (RAB) AGENDA, 28 JANUARY 1998 MEETING MINUTES, RAB SIGN-IN SHEETS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B OU 0000002C OU 0000003 OU 0000003A SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0049 30090141

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AR_M60050_002193 NONE MINUTES NONE 66	**03-25-1998** 05-07-1998 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS / HANDOUTS INCLUDES: RAB MEETING AGENDA, PUBLIC NOTICE, 28 JANUARY 1998 MEETING MINUTES, MISCELLANEOUS PRESENTATIONS, AGENCY COMMENTS (MAILER IN CONFID.)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000003A SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0050 30090141
AR_M60050_002192 NONE CORRESPONDENCE NONE 3	**04-08-1998** 05-07-1998 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA MULTIPLE AGENCIES	REQUEST FOR EXTENSION TO THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0050 30090141

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AR_M60050_004269 NONE CORRESPONDENCE NONE 1	**04-08-1998** 04-21-2008 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION, DATED 02 APRIL 1998	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000008 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_002206 NONE CORRESPONDENCE NONE 7	**04-14-1998** 05-08-1998 5090.3.A. NONE	WIERCIOCH, C. ORANGE COUNTY - MCAS EL TORO LOCAL REDEVELOPMENT AUTHORITY - SANTA ANA, CA RICHIE, E. MCAS EL TORO - SANTA ANA, CA	INITIAL QUESTIONS FROM EL TORO MASTER DEVELOPMENT PROGRAM REGARDING DON/USMC PROPOSED PLAN FOR LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0050 30090141
AR_M60050_002191 NONE CORRESPONDENCE NONE 5	**04-24-1998** 05-07-1998 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	LETTER REGARDING DTSC COMMENTS FOR INCLUSION IN THE FINAL PROPOSED PLAN FOR LANDFILL SITE 24 FILOT TEST UPDATE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0049 30090141

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AR_M60050_002207 NONE CORRESPONDENCE NONE 13	**04-28-1998** 05-08-1998 5090.3.A. NONE	RITCHIE, E. MCAS EL TORO - SANTA ANA, CA WIERCIOCH, C. MCAS EL TORO LOCAL REDEVELOPMENT AUTHORITY - SANTA ANA, CA	RESPONSE TO MCAS EL TORO INITIAL QUESTIONS REGARDING DON/USMC DRAFT FINAL PROPOSED PLAN FOR REMEDIATION LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0050 30090141
AR_M60050_000420 CTO-0155/0146 REPORT N68711-92-D-4670 74	**05-01-1998** 04-19-2000 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL PROPOSED PLAN FOR CLOSURE OF INACTIVE LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141
AR_M60050_002210 CTO-0155/0123 REPORT N68711-92-D-4670 73	**05-11-1998** 05-11-1998 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	FINAL PROPOSED PLAN, OPERABLE UNITS AND SITES, CLOSURE OF INACTIVE LANDFILLS DATED MAY 1998	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0050 30090141
AR_M60050_002292 NONE MINUTES N68711-92-D-4670 15	**05-13-1998** 11-17-1998 5090.3.A. CTO 0161	TEDALDI, D. BECHTEL NATIONAL, INC. BROUSSARD, T. NAVFAC - SOUTHWEST DIVISION	05 MARCH 1998 MEETING MINUTES FOR THE BASE REALIGNMENT AND CLOSURE (BRAC) OFFICE AND LOCAL REDEVELOPMENT AUTHORITY COORDINATION MEETING ON LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0052 30090141
AR_M60050_004271 NONE CORRESPONDENCE NONE 4	**05-14-1998** 04-21-2008 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT COMPLIANCE MONITORING WELLS WORK PLAN, MAGAZINE ROAD LANDFILL, DATED 22 APRIL 1998	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	

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AR_M60050_002220 NONE MINUTES NONE 42	**05-27-1998** 07-21-1998 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS INCLUDES: RAB SCHEDULE MEETING ANNOUNCEMENT DATED 27 MAY 1998 PROPOSED PLAN CLOSURE OF INACTIVE LANDFILLS, LETTERS (VARIOUS DATES) MISC.	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0050 30090141
AR_M60050_002277 SW5188 REPORT N68711-93-D-1459 229	**05-29-1998** 09-23-1998 5090.3.A. DO 0075	SEDLAK, W. OHM REMEDIATION SERVICES CORP. NAVFAC - SOUTHWEST DIVISION	ON-SCENE COORDINATOR REPORT FOR TIME-CRITICAL REMOVAL ACTION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0052 30090141
AR_M60050_002217 NONE PUBLIC NOTICE NONE 2	**06-11-1998** 07-21-1998 5090.3.A. NONE	LOS ANGELES TIMES - LOS ANGELES, CA PUBLIC	PUBLIC NOTICE ANNOUNCEMENTS 18 JUNE 1998: PUBLIC MEETING REGARDING CLOSURE OF LANDFILLS [LOS ANGELES TIMES (ORANGE COUNTY EDITION) AND ORANGE COUNTY REGISTER]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0050 30090141
AR_M60050_002216 CTO-0142/0410 CORRESPONDENCE N68711-92-D-4670 9	**06-16-1998** 07-21-1998 5090.3.A. CTO 0142	TEDALDI, D. BECHTEL NATIONAL, INC. JOYCE, J. MCAS EL TORO - SANTA ANA, CA	TRANSMITTAL OF THE LETTER DATED 16 JUNE 1998 TO SWDIV; T. BROUSSARD WITH AMENDMENTS TO CTO-142 QUALITY ASSURANCE PROJECT PLAN (QAPP) TO SUPPORT COMPLIANCE WELL WORK PLAN (SEE RECORD # 2019 - DRAFT FINAL QAPP)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0050 30090141
AR_M60050_002221 NONE MINUTES NONE 310	**06-18-1998** 07-28-1998 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA PUBLIC	18 JUNE 1998 PUBLIC MEETING - PROPOSED PLAN-CLOSURE OF INACTIVE LANDFILLS - PUBLIC INFORMATION MATERIALS (INCLUDES MEETING OVERVIEW AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0050 30090141

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AR_M60050_003069 NONE CORRESPONDENCE NONE 2	**07-12-1998** 05-03-2004 5090.3.A. NONE	BENNETT, C. BL ASSOCIATES JOYCE, J. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON PROPOSED PLAN - SOIL VAPOR EXTRACTION (SVE) FOR VADOSE ZONE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0070 30090141
AR_M60050_004125 NONE CORRESPONDENCE NONE 3	**07-12-1998** 01-16-2008 5090.3.A. NONE	KOGERMAN, B. TAXPAYERS FOR RESPONSIBLE PLANNING JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PROPOSED PLAN FOR CLOSURE OF INACTIVE LANDFILLS [SEE RECORD # 2076 - DRAFT FINAL PROPOSED PLAN]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	
AR_M60050_002252 NONE CORRESPONDENCE NONE 8	**08-03-1998** 08-31-1998 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION FOR PRIMARY DOCUMENTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0051 30090141
AR_M60050_002256 NONE CORRESPONDENCE NONE 2	**08-06-1998** 08-31-1998 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND APPROVAL OF REQUEST FOR EXTENSION OF DEADLINE FOR SUBMITTAL OF DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0051 30090141
AR_M60050_004137 NONE CORRESPONDENCE NONE 1	**08-07-1998** 01-17-2008 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO FURTHER COMMENTS ON THE ON-SCENE COORDINATOR REPORT FOR TIME-CRITICAL REMOVAL ACTION [SEE RECORD # 2277 - COORDINATOR REPORT]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	

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AR_M60050_002257 NONE CORRESPONDENCE NONE 1	**08-10-1998** 08-31-1998 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	U.S. EPA APPROVAL OF REQUEST FOR EXTENSION OF DEADLINE FOR SUBMITTAL OF DRAFT ROD FOR CLOSURE OF INACTIVE STATION LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0051 30090141
AR_M60050_002254 NONE MINUTES N68711-92-D-4670 20	**08-11-1998** 08-31-1998 5090.3.A. CTO 0161	TEDALDI, D. BECHTEL NATIONAL, INC. JOYCE, J. MCAS EL TORO - SANTA ANA, CA	MEETING MINUTES RE: MCAS EL TORO BRAC OFFICE AND LOCAL REDEVELOPMENT AUTHORITY COORDINATION MEETING ON LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00017	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0051 30090141
AR_M60050_000198 NONE CORRESPONDENCE NONE 5	**08-17-1998** 11-19-1999 5090.3.A. NONE	WALLACE, C. MCAS EL TORO - SANTA ANA, CA BARTEL, J. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	RESPONSE TO COMMENTS ON THE PROPOSED PLAN FOR CLOSURE OF INACTIVE LANDFILLS (PROPOSED PLAN CAN BE REFERENCED AT AR #420)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0006 30090141
AR_M60050_002259 NONE CORRESPONDENCE NONE 8	**08-20-1998** 08-31-1998 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	REQUEST FOR CHANGES IN THE FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE FOR PRIMARY DOCUMENTS (SEE RECORDS # 2690 - EPA APPROVAL; # 2691 - DTSC APPROVAL; AND # 2692 - CRWQCB APPROVAL)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0051 30090141

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AR_M60050_004274 NONE CORRESPONDENCE NONE 1	**08-25-1998** 04-21-2008 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION FOR PRIMARY DOCUMENTS [SEE RECORD # 2252 - REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION FOR PRIMARY DOCUMENTS]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_002289 NONE MINUTES NONE 183	**09-30-1998** 10-06-1998 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS FOR THE 30 SEPTEMBER 1998 RESTORATION ADVISORY BOARD (RAB) MEETING [INCLUDES AGENDA, PUBLIC NOTICE, 29 JULY 1998 MEETING MINUTES AND MISCELLANEOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000002A OU 0000002B OU 0000003 SITE 00002 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0052 30090141
AR_M60050_000093 NONE CORRESPONDENCE NONE 1	**11-03-1998** 09-08-1999 5090.3.A. NONE	WOCHNICK, M. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REQUEST FOR A COPY OF THE DRAFT RECORD OF DECISION (SEE RECORD # 2294)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0004 30090141

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AR_M60050_002295 NONE CORRESPONDENCE NONE 8	**11-03-1998** 11-17-1998 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE EXTENSION REQUEST FOR DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024	FRC - PERRIS IMAGED TORO_016	L181-06-0125 BX 0052 30090141
AR_M60050_002368 NONE CORRESPONDENCE NONE 9	**11-23-1998** 04-13-1999 5090.3.A. NONE	FAIR, S. DTSC - CYPRESS, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON DRAFT TECHNICAL MEMORANDUM, UNSAT-H INFILTRATION MODELING FOR LANDFILL COVERS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0053 30090141

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AR_M60050_002298 NONE MINUTES N68711-92-D-4670 24	**11-25-1998** 11-25-1998 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RAB MEETING MAILER - 02 DECEMBER 1998 AGENDA AND PUBLIC NOTICE FOR RAB MEETING, RAB MEETING MINUTES, 30 SEPTEMBER 1998 RAB MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0052 30090141
AR_M60050_002302 NONE MINUTES N68711-92-D-4670 35	**12-01-1998** 12-22-1998 5090.3.A. CTO 0161	TEDALDI, D. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	MINUTES FROM 22 OCTOBER 1998 COORDINATION MEETING FOR LANDFILL PROPOSED PLAN, WITH AGENDA, SIGN-IN SHEETS AND VARIOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0052 30090141

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AR_M60050_002303 NONE MINUTES NONE 87	**12-02-1998** 12-22-1998 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS FOR 02 DECEMBER 1998 RESTORATION ADVISORY BOARD MEETING; AGENDA, PUBLIC NOTICE, 30 SEPTEMBER 1998 RESTORATION ADVISORY BOARD MEETING MINUTES AND MISCELLANEOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003A OU 0000003B SITE 00001 SITE 00002 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0052 30090141
AR_M60050_002377 NONE CORRESPONDENCE NONE 7	**01-29-1999** 04-12-1999 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	U.S. EPA COMMENTS ON DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00007	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_002379 NONE CORRESPONDENCE NONE 12	**01-29-1999** 04-13-1999 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT RECORD OF DECISION FOR LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141

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AR_M60050_002380 NONE CORRESPONDENCE NONE 7	**01-29-1999** 04-13-1999 5090.3.A. NONE	MITTERMEIER, J. OPPORTUNITIES AHEAD JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_002381 NONE CORRESPONDENCE NONE 2	**02-01-1999** 04-13-1999 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENT ON DRAFT RECORD OF DECISION, OU 2B, LANDFILL SITES 2 AND 17	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_002382 NONE CORRESPONDENCE NONE 2	**02-04-1999** 04-13-1999 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	SUPPLEMENTAL COMMENTS ON DRAFT RECORD OF DECISION, OU 2B, MAGAZIINE ROAD AND COMMUNICATION STATION LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_002385 NONE CORRESPONDENCE NONE 2	**02-08-1999** 04-13-1999 5090.3.A. NONE	WOCHNICK, M. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_000200 NONE CORRESPONDENCE NONE 2	**02-15-1999** 11-19-1999 5090.3.A. NONE	RUDOLPH, M. RESTORATION ADVISORY BOARD MEMBER FEINSTEIN, D. U.S. SENATE - LOS ANGELES, CA	QUESTIONS AND CONCERNS REGARDING FOUR LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0006 30090141

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AR_M60050_000197 NONE CORRESPONDENCE NONE 2	**02-24-1999** 11-19-1999 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA REAVIS, G. PUBLIC	RESPONSE TO LETTER OF 10 JANUARY 1999 EXPRESSING CONCERN THAT THE FBI HAS EXPRESSED A DESIRE TO ACQUIRE THE EXISTING ACREAGE KNOWN AS SITE 1	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0006 30090141
AR_M60050_002717 CERT MAIL NO. P 115 386 417 CORRESPONDENCE NONE 5	**03-08-1999** 06-04-2002 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA KISTNER, G. U.S. EPA - SAN FRANCISCO, CA	REQUEST FOR CHANGES TO FEDERAL FACILITIES AGREEMENT SCHEDULE FOR PRIMARY DOCUMENTS, SCHEDULE FOR OPERABLE UNIT 2C AGREED UPON DURING 4 MARCH 1999 PHONE CONFERENCE, WITH ADDDITIONAL EXTENSION REQUEST FOR OPERABLE UNITS 2B AND 3 W/ENCLOSURE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_002718 CERT MAIL NO. P 115 386 418 CORRESPONDENCE NONE 5	**03-08-1999** 06-04-2002 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA SCANDURA, J. DTSC - CYPRESS, CA	REQUEST FOR CHANGES TO FEDERAL FACILITIES AGREEMENT SCHEDULE FOR PRIMARY DOCUMENTS, SCHEDULE FOR OPERABLE UNIT 2C AGREED UPON DURING 4 MARCH 1999 PHONE CONFERENCE, WITH ADDDITIONAL EXTENSION REQUEST FOR OPERABLE UNITS 2B AND 3 W/ENCLOSURE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141

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AR_M60050_002719 CERT MAIL NO. P 115 386 419 CORRESPONDENCE NONE 5	**03-08-1999** 06-04-2002 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA HANNON, P. CRWQCB - RIVERSIDE, CA	REQUEST FOR CHANGES TO FEDERAL FACILITIES AGREEMENT SCHEDULE FOR PRIMARY DOCUMENTS, SCHEDULE FOR OPERABLE UNIT 2C AGREED UPON DURING 4 MARCH 1999 PHONE CONFERENCE, WITH ADDDITIONAL EXTENSION REQUEST FOR OPERABLE UNITS 2B AND 3 W/ENCLOSURE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_002397 CTO-0155/0458 MINUTES N68711-92-D-4670 25	**03-25-1999** 04-13-1999 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. TINKER, G. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD MEETING MAILER - 31 MARCH 1999 RAB MEETING AGENDA AND PUBLIC NOTICE, 27 JANUARY 1999 RAB MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_002398 CTO-0155/0468 MINUTES N68711-92-D-4670 7	**04-08-1999** 04-13-1999 5090.3.A. CTO 0155	TEDALDI, D. BECHTEL NATIONAL, INC. TINKER, G. NAVFAC - SOUTHWEST DIVISION	21 APRIL 1999 RESTORATION ADVISORY BOARD MEETING MAILER (INCLUDES AGENDA AND PUBLIC NOTICE) [MEETING RESCHEDULED FROM 31 MARCH 1999]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141

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AR_M60050_002410 NONE MINUTES NONE 65	**04-21-1999** 05-19-1999 5090.3.A. NONE	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS: PUBLIC NOTICE AND AGENDA FOR 21 APRIL 1999 RESTORATION ADVISORY BOARD MEETING, 27 JANUARY 1999 RAB MEETING MINUTES, AND VARIOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002B OU 0000002C OU 0000003A SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141

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AR_M60050_002406 NONE CORRESPONDENCE NONE 8	**04-29-1999** 05-03-1999 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA MULTIPLE AGENCIES	REQUEST FOR CHANGES IN FEDERAL FACILITY AGREEMENT SCHEDULE - THIRTY DAY EXTENSION FOR SUBMITTAL OF THE DRAFT FINAL PROPOSED PLAN FOR OPERABLE UNITS GROUNDWATER REMEDIATION (SEE RECORD # 2705 - DTSC RESPONSE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141

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AR_M60050_000461 FWSD-RAC-99-0228 REPORT N68711-98-D-5713 82	**05-07-1999** 06-29-2000 5090.3.A. CTO 0005	DIRKIN, D. FOSTER WHEELER ENVIRONMENTAL NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN - GEOTECHNICAL EVALUATION OF BORROW SOURCE FOR LANDFILL COVERS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0011 30090141
AR_M60050_000463 FWSD-RAC-99-0247 REPORT N68711-98-D-5713 52	**05-07-1999** 06-29-2000 5090.3.A. CTO 0005	MARGOTTO, R. FOSTER WHEELER ENVIRONMENTAL NAVFAC - SOUTHWEST DIVISION	FINAL SITE-SPECIFIC HEALTH AND SAFETY PLAN - GEOTECHNICAL EVALUATION OF BORROW SOURCES FOR LANDFILL COVERS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0011 30090141
AR_M60050_000012 NONE CORRESPONDENCE NONE 2	**05-17-1999** 08-03-1999 5090.3.A. NONE	RUNDLE, D. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA JOYCE, J. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO DRAFT RESPONSE TO COMMENTS ON THE DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0001 30090141
AR_M60050_002707 NONE CORRESPONDENCE NONE 3	**05-18-1999** 06-03-2002 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT REPORT EVALUATION OF PERCHLORATE IN GROUNDWATER (SEE RECORDS # 2403 - EVALUATION AND # 57 - RESPONSE TO COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141

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AR_M60050_000038 NONE PUBLIC NOTICE NONE 1	**05-19-1999** 08-04-1999 5090.3.A. NONE	LOS ANGELES TIMES - LOS ANGELES, CA PUBLIC	PUBLIC NOTICE OF PUBLIC MEETING AND RESTORATION ADVISORY BOARD MEETING TO BE HELD 16 MAY 1999	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00008 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0002 30090141
AR_M60050_000039 NONE PUBLIC NOTICE NONE 1	**05-19-1999** 08-04-1999 5090.3.A. NONE	ORANGE COUNTY REGISTER - SANTA ANA, CA PUBLIC	PUBLIC NOTICE OF PUBLIC MEETING AND RESTORATION ADVISORY BOARD MEETING TO BE HELD 26 MAY 1999	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00008 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0002 30090141
AR_M60050_002708 NONE CORRESPONDENCE NONE 1	**05-20-1999** 06-03-2002 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	CONCURRENCE WITH THE DRAFT EVALUATION OF PERCHLORATE IN GROUNDWATER BUT REQUESTS FURTHER INVESTIGATION AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORDS # 2403 - EVALUATION AND # 57 - RESPONSE TO COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_000036 NONE CORRESPONDENCE NONE 2	**05-28-1999** 08-04-1999 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	AGREEMENT ON REQUEST FOR CHANGES TO THE FEDERAL FACILITIES AGREEMENT SCHEDULE FOR DRAFT FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0002 30090141

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AR_M60050_000060 NONE CORRESPONDENCE NONE 5	**06-07-1999** 08-04-1999 5090.3.A. NONE	WIERCIOCH, C. ORANGE COUNTY - MCAS EL TORO LOCAL REDEVELOPMENT AUTHORITY - SANTA ANA, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE PROPOSED PLAN FOR CLEANUP AT THREE SHALLOW SOIL SITES (SEE RECORD # 2383 - PROPOSED PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00002 SITE 00008 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0002 30090141
AR_M60050_000061 NONE CORRESPONDENCE NONE 6	**06-15-1999** 08-04-1999 5090.3.A. NONE	BARTEL, J. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE PROPOSED PLAN FOR CLEANUP AT THREE SHALLOW SOIL SITES (SEE RECORD # 2383 - PROPOSED PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00002 SITE 00008 SITE 00011 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0002 30090141
AR_M60050_000018 CTO-0135/0260 & 0260-1 & 0260-2 CORRESPONDENCE N68711-92-D-4670 60	**06-16-1999** 08-03-1999 5090.3.A. CTO 0135	TEDALDI, D. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	COMPILED RESPONSE TO COMMENTS ON DRAFT RECORD OF DECISION (REV. 1 REPLACEMENT PAGES) {SEE RECORD # 75}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0001 30090141
AR_M60050_000356 NONE CORRESPONDENCE NONE 8	**06-18-1999** 04-13-2000 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA JOYCE, J. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT HISTORICAL RADIOLOGICAL ASSESSMENT DATED MAY 1999 (WITH ENCLOSURE) (DRAFT HRA CAN BE REFERENCED AT REF. #55)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00008 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000570 SW6922 CORRESPONDENCE N68711-93-D-1459 5	**06-23-1999** 11-22-2000 5090.3.A. DO 0075	SEDLAK, W. OHM REMEDIATION SERVICES CORP. HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	PLANS FOR PRELIMINARY SITE VERIFICATION	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001 SITE 00002 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141

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AR_M60050_000389 NONE CORRESPONDENCE NONE 4	**07-01-1999** 04-18-2000 5090.3.A. NONE	BAKER, K. DTSC - CYPRESS, CA JOYCE, J. NAVFAC - SOUTHWEST DIVISION	REVIEW OF THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (EPA ID NO. CA6170023208)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141
AR_M60050_000007 NONE CORRESPONDENCE NONE 4	**07-07-1999** 08-03-1999 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0001 30090141
AR_M60050_000006 NONE CORRESPONDENCE NONE 8	**07-15-1999** 08-03-1999 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON THE DRAFT FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0001 30090141
AR_M60050_000614 NONE CORRESPONDENCE NONE 7	**07-15-1999** 01-05-2001 5090.3.A. NONE	DRACH, S. MCCUTCHEN, DOYLE, BROWN & ENERSEN, LLP MODANLOU, P. MCAS EL TORO LOCAL REDEVELOPMENT AUTHORITY - SANTA ANA, CA	PRELIMINARY COMMENTS ON BEHALF OF THE ORANGE COUNTY LOCAL REDEVELOPMENT AUTHORITY (LRA) CONCERNING THE DRAFT FINAL RECORD OF DECISION (ROD) DATED JUNE 1999 (SEE RECORD # 75 - DOCUMENT)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0014 30090141
AR_M60050_002728 NONE CORRESPONDENCE NONE 5	**07-15-1999** 06-04-2002 5090.3.A. NONE	BAILEY, D. CALIFORNIA DEPARTMENT OF HEALTH SERVICES - SACRAMENTO, CA MAHMOUD, T. DTSC - CYPRESS, CA	TRANSMITTAL OF THE COMMENTS ON THE TECHNICAL MEMORANDUM, RADIONUCLIDES IN GROUNDWATER (COMMENTS ON THE TECHNICAL MEMORANDUM WAS NOT SUBMITTED TO ADMINISTRATIVE RECORDS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0062 30090141

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AR_M60050_000005 NONE CORRESPONDENCE NONE 1	**07-16-1999** 08-03-1999 5090.3.A. NONE	WIERCIOCH, C. ORANGE COUNTY - MCAS EL TORO LOCAL REDEVELOPMENT AUTHORITY - SANTA ANA, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	LOCAL REDEVELOPMENT AUTHORITY REVIEW AND COMMENTS ON THE DRAFT FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0001 30090141
AR_M60050_000615 NONE CORRESPONDENCE NONE 12	**07-16-1999** 01-05-2001 5090.3.A. NONE	PALMER, B. GEOSYNTEC MODANLOU, P. MCAS EL TORO LOCAL REDEVELOPMENT AUTHORITY - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL RECORD OF DECISION (ROD) DATED JUNE 1999 (SEE RECORD # 75 - DOCUMENT)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0014 30090141
AR_M60050_000057 CTO-0171/0129 CORRESPONDENCE N68711-92-D-4670 5	**07-23-1999** 08-04-1999 5090.3.A. CTO 0171	HEIRONIMUS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	COMPILED RESPONSE TO REGULATOR COMMENTS ON THE DRAFT EVALUATION OF PERCHLORATE IN GROUNDWATER (SEE RECORDS # 32 - EPA COMMENTS; # 2707 - DTSC COMMENTS; AND # 2708 - CRWQCB COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_010	L181-06-0125 BX 0002 30090141

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AR_M60050_000134 NONE MINUTES NONE 118	**07-28-1999** 09-09-1999 5090.3.A. NONE	RESTORATION ADVISORY BOARD RESTORATION ADVISORY BOARD	28 JULY 1999 RESTORATION ADVISORY BOARD MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA, PUBLIC NOTICE, 26 MAY 1999 RAB MEETING MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000001 OU 0000002A OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0005 30090141
AR_M60050_000576 SW7051 ANALYTICAL DATA N68711-93-D-1459 20	**07-28-1999** 11-22-2000 5090.3.A. DO 0075	SEDLAK, W. OHM REMEDIATION SERVICES CORP. HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	CONE PENETRATION TESTING LOGS AND SAMPLE RESULTS FOR THE PERCHLORATE & EPA 8270 SAMPLES	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001 SITE 00002 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141
AR_M60050_000137 CTO-0155/0563 MINUTES N68711-92-D-4670 20	**08-04-1999** 09-09-1999 5090.3.A. CTO 0155	HEIRONIMUS, T. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESTORATION ADVISORY BOARD SUBCOMMITTEE MEETING MINUTES AND RAB MEMBER DOCUMENT COMMENTS PRESENTED AT THE 28 JULY 1999 RAB MEETING	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0005 30090141

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AR_M60050_002875 NONE CORRESPONDENCE NONE 2	**08-06-1999** 12-09-2002 5090.3.A. NONE	BARTEL, J. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA JOYCE, J. MCAS EL TORO - SANTA ANA, CA	RESPONSE TO REQUEST FOR RELIEF FOR MITIGATION OF IMPACTS TO THE FEDERALLY THREATENED COASTAL GNATCATCHER ASSOCIATED WITH THE FINAL CLOSURE AND REMEDIATION OF THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0065 30090141
AR_M60050_000122 NONE CORRESPONDENCE NONE 4	**08-13-1999** 09-09-1999 5090.3.A. NONE	JOYCE, J. MCAS EL TORO - SANTA ANA, CA BAKER, K. DTSC - CYPRESS, CA	RESPONSE TO REQUEST FOR A SUBMITTAL OF A CLOSURE PLAN OR PERMIT APPLICATION WITH A RCRA FACILITY INVESTIGATION WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0005 30090141
AR_M60050_002507 SW7535 REPORT N68711-93-D-1459 10	**08-18-1999** 09-17-2001 5090.3.A. DO 0112	HORNECKER, L. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	SUPPLEMENTAL INFORMATION ANOMALY AREA 3 (ALSO KNOWN AS MSC R1) [POSSIBLE REFUSE AREA] FOR THE PLANNED SITE VISIT OF 25 AUGUST 1999	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH AA 0000003 BLDG 0000368 OU 0000002A OU 0000003 SITE 00001 SITE 00024	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0057 30090141
AR_M60050_000404 NONE CORRESPONDENCE NONE 2	**08-23-1999** 04-18-2000 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT FINAL EVALUATION OF PERCHLORATE IN GROUNDWATER DATED JULY 1999 (SEE RECORD # 70 - EVALUATION)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141

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AR_M60050_000202 PROJECT NO. BLA 990703 REPORT NONE 8	**09-25-1999** 11-19-1999 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM: EVALUATION OF POTENTIAL RADIUM 226 PAINTED INSTRUMENT GAUGE RECOVERED FROM THE FORMER MCAS EL TORO	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0006 30090141
AR_M60050_000218 CTO-0164/0115 CORRESPONDENCE N68711-92-D-4670 46	**10-29-1999** 11-22-1999 5090.3.A. CTO 0164	HEIRONIMUS, T. BECHTEL NATIONAL, INC. MULTIPLE AGENCIES	RESPONSE TO COMMENTS ON THE DRAFT FINAL RECORD OF DECISION, DATED OCTOBER 1999 (SEE RECORD # 7 - COMMENTS FROM EPA)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0006 30090141
AR_M60050_000358 NONE CORRESPONDENCE NONE 9	**11-04-1999** 04-13-2000 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON DRAFT PHASE II REMEDIAL INVESTIGATION REPORT, ATTACHMENTS O AND P DATED 07 SEPTEMBER 1999 (WITH ATTACHMENT) {SEE RECORD # 143 - REPORT}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003A OU 0000003B SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00014 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000201 NONE CORRESPONDENCE NONE 4	**11-11-1999** 11-19-1999 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER KISTNER, G. U.S. EPA - SAN FRANCISCO, CA	REVIEW, COMMENTS AND QUESTIONS ON THE DRAFT RECORD OF DECISION (SEE RECORD # 75 - DRAFT FINAL ROD)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0006 30090141

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AR_M60050_000211 SW7386 REPORT N68711-93-D-1459 28	**11-16-1999** 11-22-1999 5090.3.A. DO 0065	OHM REMEDIATION SERVICES CORP. GOULD, D. MCAS EL TORO - SANTA ANA, CA	DEMONSTRATION PROJECT UPDATE, ENVIRONMENTAL LOCATIONS OF CONCERN AND OTHER FEATURES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0006 30090141
AR_M60050_000348 NONE MINUTES NONE 4	**11-19-1999** 04-13-2000 5090.3.A. NONE	OUELLETTE, R. KENNEDY/JENKS CONSULTANTS COLEMAN, B. BECHTEL NATIONAL, INC.	RESTORATION ADVISORY BOARD (RAB) TECHNICAL REVIEW SUBCOMMITTEE DRAFT MEETING MINUTES FROM 25 AUGUST 1999	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001 SITE 00002	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141

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AR_M60050_000352 NONE MINUTES NONE 4	**11-19-1999** 04-13-2000 5090.3.A. NONE	OUELLETTE, R. KENNEDY/JENKS CONSULTANTS COLEMAN, B. BECHTEL NATIONAL, INC.	RESTORATION ADVISORY BOARD (RAB) TECHNICAL REVIEW SUBCOMMITTEE MEETING MINUTES FROM 11 AUGUST 1999	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000651 SITE 00001 SITE 00007 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000353 NONE MINUTES NONE 4	**11-19-1999** 04-13-2000 5090.3.A. NONE	OUELLETTE, R. KENNEDY/JENKS CONSULTANTS COLEMAN, B. BECHTEL NATIONAL, INC.	RESTORATION ADVISORY BOARD (RAB) TECHNICAL REVIEW SUBCOMMITTEE MEETING MINUTES FROM 30 JUNE 1999	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017 SITE 00025	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000410 NONE MINUTES NONE 4	**11-19-1999** 04-19-2000 5090.3.A. NONE	OUELLETTE, R. KENNEDY/JENKS CONSULTANTS COLEMAN, B. BECHTEL NATIONAL, INC.	RESTORATION ADVISORY BOARD (RAB) TECHNICAL REVIEW SUBCOMMITTEE MEETING MINUTES FROM 08 SEPTEMBER 1999	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000296 SITE 00001 SITE 00003 SITE 00005 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141
AR_M60050_000469 NONE CORRESPONDENCE NONE 1	**11-24-1999** 06-30-2000 5090.3.A. NONE	FARBER, J. CITY OF IRVINE - IRVINE, CA LEE, W. MCAS MIRAMAR - SAN DIEGO, CA	LETTER INQUIRING ABOUT THE VARIOUS USES MADE OF AND MATERIALS USED AT EXPLOSIVE ORDNANCE DISPOSAL (EOD) FACILITIES	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0011 30090141
AR_M60050_000344 NONE CORRESPONDENCE NONE 2	**11-29-1999** 04-12-2000 5090.3.A. NONE	WOCHNICK, M. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA FAIR, S. DTSC - CYPRESS, CA	COMMENTS ON THE FINAL RECORD OF DECISION (ROD) DATED OCTOBER 1999 - "WORKING DRAFT" (REF. #75, 201, 215, 218, 330, 345, 354, 359, 424, 425)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141

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AR_M60050_000354 NONE CORRESPONDENCE NONE 2	**11-29-1999** 04-13-2000 5090.3.A. NONE	LAPIN, M. MCAS EL TORO MASTER DEVELOPMENT PROGRAM - SANTA ANA, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE WORKING DRAFT FINAL RECORD OF DECISION (ROD) [REF. #75, 201, 215, 218, 330, 344, 345, 359, 424, 425]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000330 CTO-0164/0114 CORRESPONDENCE N68711-92-D-4670 1	**11-30-1999** 04-11-2000 5090.3.A. CTO 0164	HANNON, P. CRWQCB - RIVERSIDE, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	LETTER STATING THAT CRWQCB HAS RECEIVED THE "WORKING DRAFT" FINAL RECORD OF DECISION (ROD) FOR OU 2B AND THERE ARE NO ADDITIONAL COMMENTS (REF: AR #75, 201, 215, 218, 344, 345, 354, 359, 424, 425)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0009 30090141

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AR_M60050_000350 NONE MINUTES NONE 152	**12-01-1999** 04-13-2000 5090.3.A. NONE	RESTORATION ADVISORY BOARD NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FROM THE 01 DECEMBER 1999 RESTORATION ADVISORY BOARD (RAB) MEETING (RAB AGENDA & MEETING MINUTES FROM 29 SEPTEMBER 1999 CAN BE REFERENCED AT RECORD # 243)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH APHO 00008 APHO 00009 APHO 00010 APHO 00028 APHO 00030 APHO 00035 APHO 00037 APHO 00041 BLDG 0000047 BLDG 0000296 BLDG 0000297 BLDG 0000368 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024 SWMU 00046 UST 000047A	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141

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					UST 000047B UST 000278 UST 000298A UST 000298B UST 000380 UST 000388B UST 000390 UST 000391 UST 000392E UST 000392F UST 000462 UST 000473 UST 000637 UST 000651 UST 000673 UST 000800 UST 000891A UST 000891B UST 000891C UST 000902A UST 000902B UST 000902C		
AR_M60050_000359 NONE CORRESPONDENCE NONE 3	**12-01-1999** 04-13-2000 5090.3.A. NONE	HERSH, P. CITY OF IRVINE - IRVINE, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE WORKING DRAFT FINAL RECORD OF DECISION (ROD) (SEE RECORD # 215)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH BLDG 0000296 OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000437 NONE MINUTES NONE 1	**12-01-1999** 04-26-2000 5090.3.A. NONE	BENNETT, C. BL ASSOCIATES NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) SUBCOMMITTEE MAIN AGENDA ISSUES SINCE 29 SEPTEMBER 1999	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001 SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0010 30090141

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AR_M60050_000273 NONE CORRESPONDENCE NONE 8	**12-15-1999** 03-15-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION HURLEY, G. RESTORATION ADVISORY BOARD MEMBER	RESPONSE TO RESTORATION ADVISORY BOARD (RAB) COMMITTEE CHAIRMAN COMMENTS DATED 02 NOVEMBER 1999, ON THE BASE REALIGNMENT AND CLOSURE (BRAC) PLAN (REFERENCE AR #377 - COMMENTS BY TECHNICAL REVIEW COMMITTEE & AR #2392 BRAC CLEANUP PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0008 30090141
AR_M60050_000265 SWDIV SER 06CC.KF/0780 CORRESPONDENCE NONE 20	**12-21-1999** 03-09-2000 5090.3.A. NONE	SAKAMOTO, D. NAVFAC - SOUTHWEST DIVISION SCANDURA, J. DTSC - CYPRESS, CA	LAND USE COVENANT AGREEMENTS AND RECORDS OF DECISION (RODS). (WITH ENCLOSURES) - (RESPONSE TO 21 DECEMBER 1999 LETTER TO DTSC CAN BE REFERENCED AT REF. #349)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0008 30090141

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AR_M60050_001809 NONE CORRESPONDENCE NONE 1	**01-01-2000** 03-21-1997 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION COUNTY OF ORANGE HEALTH CARE AGENCY - SANTA ANA, CA	RESPONSE TO COUNTY OF ORANGE HEALTH CARE AGENCY COMMENTS OF 14 MARCH 1988 ON THE VERIFICATION STEP PLAN OF ACTION FOR CONFIRMATION STUDY (SEE RECORD # 1808)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00005 SITE 00007	FRC - PERRIS IMAGED TORO_012	L181-06-0125 BX 0042 30090141
AR_M60050_000276 NONE CORRESPONDENCE NONE 13	**01-04-2000** 03-20-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE - REQUEST A CHANGE TO THE APPENDIX A SCHEDULE FOR PRIMARY DOCUMENTS. (WITH ENCLOSURES) (RESPONSE FROM EPA & DTSC CAN BE REFERENCED AT REF. #269 & #415)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0008 30090141
AR_M60050_000343 NONE CORRESPONDENCE NONE 1	**01-04-2000** 04-12-2000 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA BENNETT, C. BL ASSOCIATES	RESPONSE TO LETTER DATED 11 NOVEMBER 1999 REGARDING THE PROPOSED REMEDY FOR THE LANDFILLS AND SPECIFICALLY, THE PRESENCE OF RADIONUCLIDES IN AND AROUND THE LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000355 NONE CORRESPONDENCE NONE 1	**01-06-2000** 04-13-2000 5090.3.A. NONE	WOODINGS, R. CITY OF LAKE FOREST - LAKE FOREST, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT FINAL HISTORICAL RADIOLOGICAL ASSESSMENT (DRAFT FINAL HRA CAN BE REFERENCED AT AR #238 AND COMMENTS BY REDEVELOPMENT AUTHORITY AT AR #468)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000269 NONE CORRESPONDENCE NONE 3	**01-11-2000** 03-10-2000 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO 04 JANUARY 2000 FEDERAL FACILITY AGREEMENT (FFA) EXTENSION REQUEST. (NAVY EXTENSION REQUEST & RESPONSE CAN BE REFERENCED AT REF. #276 & #415)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0008 30090141

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AR_M60050_000415 NONE CORRESPONDENCE NONE 2	**01-11-2000** 04-19-2000 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO 04 JANUARY 2000 FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST (REFERENCE #269 & #276)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141
AR_M60050_000432 NONE MINUTES NONE 2	**01-12-2000** 04-26-2000 5090.3.A. NONE	OUELLETTE, R. KENNEDY/JENKS CONSULTANTS NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) TECHNICAL REVIEW SUBCOMMITTEE MEETING MINUTES FROM 12 JANUARY 2000	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00005	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0010 30090141
AR_M60050_000349 NONE CORRESPONDENCE NONE 2	**01-18-2000** 04-13-2000 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA SAKAMOTO, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO LETTER DATED 21 DECEMBER 1999 REGARDING DTSC'S REQUIREMENTS FOR LAND USE COVENANTS AND PROPOSED LANGUAGE FOR RECORDS OF DECISION (ROD) AT NAVY BASES - (LETTER DATED 21 DECEMBER 1999 CAN BE REFERENCED AT REF. #265)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141

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AR_M60050_000296 NONE CORRESPONDENCE NONE 8	**01-19-2000** 04-04-2000 5090.3.A. NONE	LAPIN, M. COUNTY OF ORANGE - SANTA ANA, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DECEMBER 1999 DRAFT BASE REALIGNMENT AND CLOSURE (BRAC) BUSINESS PLAN (WITH ENCLOSURE) (REFERENCE AR #233 - DRAFT BRAC BUSINESS PLAN; AR #311 FINAL BRAC BUSINESS PLAN; AR #313 RESPONSE TO COMMENTS ON DRAFT BRAC BUSINESS PLAN)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0008 30090141
AR_M60050_000403 NONE PUBLIC NOTICE NONE 1	**01-20-2000** 04-18-2000 5090.3.A. NONE	ORANGE COUNTY REGISTER - SANTA ANA, CA NAVFAC - SOUTHWEST DIVISION	PUBLIC NOTICE FOR THE RESTORATION ADVISORY BOARD (RAB) MEETING TO BE HELD 26 JANUARY 2000	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141

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AR_M60050_000312 CTO-0200/0032 MINUTES N68711-92-D-4670 24	**01-21-2000** 04-07-2000 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. SELBY, R. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER - INCLUDES AGENDA & PUBLIC NOTICE FOR 26 JANUARY 2000 MEETING AND MINUTES & ATTACHMENTS FROM THE 01 DECEMBER 1999 MEETING (REF. #357)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH BLDG 0000296 OU 0000001 OU 0000002A SITE 00002 SITE 00011 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0008 30090141
AR_M60050_000392 NONE PUBLIC NOTICE NONE 1	**01-21-2000** 04-18-2000 5090.3.A. NONE	LOS ANGELES TIMES - LOS ANGELES, CA NAVFAC - SOUTHWEST DIVISION	PUBLIC NOTICE FOR THE RESTORATION ADVISORY BOARD (RAB) MEETING TO BE HELD 26 JANUARY 2000	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141

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AR_M60050_000321 NONE CORRESPONDENCE NONE 5	**01-24-2000** 04-10-2000 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW OF THE DRAFT BASE REALIGNMENT AND CLOSURE (BRAC) BUSINESS PLAN, DATED DECEMBER 1999	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141

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AR_M60050_000357 NONE MINUTES NONE 108	**01-26-2000** 04-13-2000 5090.3.A. NONE	RESTORATION ADVISORY BOARD NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FROM THE 26 JANUARY 2000 RESTORATION ADVISORY BOARD (RAB) MEETING (RAB MEETING MINUTES AND AGENDA FROM 01 DECEMBER 1999 CAN BE REFERENCED AT REF. #312)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH BLDG 0000296 OU 0000003 SITE 00001 SITE 00002 SITE 00012 SITE 00017 UST 000047A UST 000047B	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000429 NONE MINUTES NONE 1	**01-26-2000** 04-26-2000 5090.3.A. NONE	BENNETT, C. BL ASSOCIATES NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) SUBCOMMITTEE MAIN AGENDA ISSUES SINCE 26 JANUARY 2000 AND AGENDA ISSUES SINCE 1 DECEMBER 1999	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141
AR_M60050_000438 NONE MINUTES NONE 4	**01-26-2000** 04-26-2000 5090.3.A. NONE	BENNETT, C. BL ASSOCIATES RESTORATION ADVISORY BOARD	26 JANUARY 2000 RESTORATION ADVISORY BOARD MEETING HANDOUT: STUDY OF GROSS ALPHA RESPONSES IN THE AREA OF SITE 2 AND SITE 5 AND THE AREA BETWEEN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0010 30090141
AR_M60050_000313 NONE CORRESPONDENCE NONE 16	**02-18-2000** 04-07-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION HANNON, P. CRWQCB - RIVERSIDE, CA	RESPONSES TO COMMENTS ON THE DRAFT BASE REALIGNMENT AND CLOSURE (BRAC) PLAN OF DECEMBER 1999 (REFERENCE AR #233 - DRAFT BRAC BUSINESS PLAN; AR #296 - COMMENTS ON DRAFT BRAC BUSINESS PLAN; & AR #311 - FINAL BRAC BUSINESS PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00025	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0008 30090141
AR_M60050_000361 NONE CORRESPONDENCE NONE 4	**02-22-2000** 04-13-2000 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE REVISED SECTION 7 (DESCRIPTION OF ALTERNATIVES) AND SECTION 10 (STATUTORY DETERMINATIONS) FOR THE RECORD OF DECISION (ROD) [REVISIONS TO RESPONSE TO DTSC LETTER DATED 22 FEBRUARY 2000] {SEE RECORDS # 327 AND # 351 - ADDITIONAL RESPONSE}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0009 30090141

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AR_M60050_000476 NONE CORRESPONDENCE NONE 3	**02-22-2000** 07-06-2000 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA KRAMER, S. FEDERAL BUREAU OF INVESTIGATION - LOS ANGELES, CA	LETTER REGARDING INFORMATION ON THE PROPOSED ACTIVITIES FOR THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE WHICH THE FBI WAS SUPPOSED TO COMPILE AND SUBMIT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0011 30090141
AR_M60050_000345 NONE CORRESPONDENCE NONE 1	**03-06-2000** 04-12-2000 5090.3.A. NONE	GUNTER, M. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA CHESNEY, T. DTSC - CYPRESS, CA	COMMENTS ON THE RESPONSE TO COMMENTS DATED 11 FEBRUARY 2000, AND FINAL INTERIM RECORD OF DECISION (ROD) - "WORKING DRAFT" (SEE RECORD # 215)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000481 SWDIV SER 06CC.DG/190 CORRESPONDENCE NONE 2	**03-16-2000** 07-14-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION CHESNEY, T. DTSC - CYPRESS, CA	RESPONSE TO DTSC LETTER DATED 22 FEBRUARY 2000, CONCERNING RECORD OF DECISION LANGUAGE (SEE RECORDS # 327 - REVISIONS BASED ON THESE RESPONSES; # 482 - ADDITIONAL DTSC COMMENTS; AND # 351 & # 361 - ADDITIONAL COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0011 30090141
AR_M60050_000351 NONE CORRESPONDENCE NONE 2	**03-27-2000** 04-13-2000 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS INCLUDED IN DTSC LETTER DATED 22 FEBRUARY 2000, CONCERNING LANGUAGE IN RECORD OF DECISION (ROD) (SEE RECORDS # 361 - 22 FEBRUARY 2000 LETTER, AND # 481 - LETTER TO WHICH THIS IS RESPONSE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0009 30090141
AR_M60050_000327 SWDIV SER 06CC.DG/219 CORRESPONDENCE NONE 8	**03-29-2000** 04-10-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION CHESNEY, T. DTSC - CYPRESS, CA	REVISIONS TO RESPONSE TO COMMENTS ON THE "WORKING DRAFT" FINAL INTERIM RECORD OF DECISION (INCLUDES REVISION PAGES)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20100702-3/8	

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AR_M60050_000360 CTO-0200/0054 MINUTES N68711-92-D-4670 46	**03-29-2000** 04-13-2000 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. SELBY, R. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING AGENDA OF 29 MAR 2000 INCLUDES MEETING MINUTES OF 26 JAN 2002, MEETING MINUTES OF 27 OCT 1999, MEETING MINUTES OF 12 JAN 2000, VARIOUS HANDOUTS AND MAILING LIST	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH BLDG 0000242 BLDG 0000243 OU 0000001 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000430 NONE MINUTES NONE 4	**03-29-2000** 04-26-2000 5090.3.A. NONE	BENNETT, C. BL ASSOCIATES NAVFAC - SOUTHWEST DIVISION	MINUTES FROM THE RESTORATION ADVISORY BOARD (RAB) SUBCOMMITTEE MAIN AGENDA ISSUES SINCE 26 JANUARY 2000	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00002	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141
AR_M60050_000435 NONE MINUTES NONE 1	**03-29-2000** 04-26-2000 5090.3.A. NONE	BENNETT, C. BL ASSOCIATES NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) REPORT / AGENDA ISSUES SINCE 29 JANUARY 2000	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00002 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0010 30090141
AR_M60050_000425 CTO-0164/0164 & CTO-0164/0164-1 & CTO-0164/0164-2 REPORT N68711-92-D-4670 500	**04-01-2000** 04-19-2000 5090.3.A. CTO 0164	HEIRONIMUS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL INTERIM RECORD OF DECISION (ROD) DATED APRIL 2000 {INCLUDES REPLACEMENT PAGES DATED 12 MAY 2000 AND 19 JULY 2000; ALSO INCLUDES TRANSMITTAL LETTERS TO VARIOUS REGULATORS}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141
AR_M60050_000482 NONE CORRESPONDENCE NONE 2	**04-07-2000** 07-14-2000 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON ADDITIONAL MODIFICATIONS MADE AFTER WORKING DRAFT - FINAL OF RECORD OF DECISION WAS ISSUED {IN ADDITION TO MODIFICATIONS MADE IN RESPONSE TO DTSC LETTER CONCERNING LANGUAGE OF ROD} (SEE RECORDS # 327 AND # 481)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0011 30090141

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AR_M60050_000346 NONE CORRESPONDENCE NONE 42	**04-10-2000** 04-13-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION NAVFAC - SOUTHWEST DIVISION	INCLUSION INTO THE ADMINISTRATIVE RECORD, THE MEMORANDUM OF AGREEMENT BETWEEN THE UNITED STATES DEPARTMENT OF THE NAVY AND THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0009 30090141
AR_M60050_000424 CTO-0164/0163 CORRESPONDENCE N68711-92-D-4670 50	**04-14-2000** 04-19-2000 5090.3.A. CTO 0164	MULTIPLE AGENCIES NAVFAC - SOUTHWEST DIVISION	BECHTEL'S CONSOLIDATED RESPONSE TO COMMENTS ON "WORKING DRAFT" FINAL RECORD OF DECISION (ROD) (COMMENTS BY: CITY OF IRVINE, USEPA, DTSC, CRWQCB, CA INTEGRATED WASTE MGMT BOARD (CIWMB), EL TORO MASTER DEVELOP PROG. & RAB MEMBER) - SEE COMMENTS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0010 30090141

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AR_M60050_002732 NONE CORRESPONDENCE NONE 5	**04-20-2000** 06-04-2002 5090.3.A. NONE	BAILEY, D. CALIFORNIA DEPARTMENT OF HEALTH SERVICES - SACRAMENTO, CA CHESNEY, T. DTSC - CYPRESS, CA	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_000449 NONE REPORT NONE 114	**05-01-2000** 06-26-2000 5090.3.A. NONE	CHRISTENSEN, B. ROY F. WESTON, INC. NAVFAC - SOUTHWEST DIVISION	FINAL HISTORICAL RADIOLOGICAL ASSESSMENT (HRA)	ADMIN RECORD BASE INFO REPOSITORY	AOC 000264 BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000295 BLDG 0000296 BLDG 0000297 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 0001789 BLDG 0001803 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0011 30090141
AR_M60050_001145 NONE CORRESPONDENCE NONE 2	**05-08-2000** 03-29-2001 5090.3.A. NONE	BROWN, M. MICHAEL S. BROWN AND ASSOCIATES MULTIPLE AGENCIES	COMMENTS ON THE FINAL RECORD OF DECISION FOR THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS (SEE RECORD # 425 - FINAL INTERIM RECORD OF DECISION)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0027 30090141

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AR_M60050_000454 CTO-0200/0075 MINUTES N68711-92-D-4670 46	**05-31-2000** 06-29-2000 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER - INCLUDES AGENDA AND PUBLIC NOTICE FOR 31 MAY 2000 MEETING & MINUTES AND ATTACHMENTS FROM THE 29 MARCH 2000 RAB MEETING (INCLUDES MAILING LIST)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000295 BLDG 0000296 BLDG 0000297 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0011 30090141
AR_M60050_000530 NONE MINUTES NONE 1	**05-31-2000** 10-04-2000 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) REVIEW COMMITTEE (RAB SUBCOMMITTEE) REPORT, MAIN AGENDA ISSUES SINCE 29 MARCH 2000	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000531 NONE CORRESPONDENCE NONE 1	**05-31-2000** 10-04-2000 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) SUBCOMMITTEE REQUEST FOR HERB LEVINE, US EPA, TO ATTEND 31 MAY 2000 RAB MEETING TO ANSWER QUESTIONS DURING THE REGULATORY AGENCY PORTION OF MEETING	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001 SITE 00002 SITE 00005 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000532 NONE CORRESPONDENCE NONE 4	**05-31-2000** 10-04-2000 5090.3.A. NONE	RESTORATION ADVISORY BOARD NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) SUBCOMMITTEE COMMENTS ON THE EARTH TECH RADIONUCLIDES IN GROUNDWATER REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141

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AR_M60050_000533 NONE MINUTES NONE 2	**05-31-2000** 10-04-2000 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER NAVFAC - SOUTHWEST DIVISION	31 MAY 2000 RESTORATION ADVISORY BOARD MEETING HANDOUT: EXCERPT PAGES FROM DRAFT REMEDIAL INVESTIGATION REPORT - MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000534 NONE CORRESPONDENCE NONE 1	**05-31-2000** 10-04-2000 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER ARNOLD, C. NAVFAC - SOUTHWEST DIVISION	REQUEST FROM RESTORATION ADVISORY BOARD (RAB) SUBCOMMITTEE FOR A COPY OF ANALYTICAL DATA COLLECTED FROM LOCATIONS 237 TO 250 FOR REVIEW	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000448 NONE CORRESPONDENCE NONE 2	**06-14-2000** 05-17-2000 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	EPA COMMENTS ON THE FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER, ENVIRONMENTAL SUMMARY DOCUMENT, FOR CERTAIN PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	APHO 00044 SITE 00001	FRC - PERRIS IMAGED TORO_013	L181-06-0125 BX 0011 30090141
AR_M60050_003381 NONE CORRESPONDENCE NONE 5	**06-26-2000** 10-27-2005 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER, ENVIRONMENTAL SUMMARY DOCUMENT FOR CERTAIN PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00017 UST 000568	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_000572 SW8790 CORRESPONDENCE N68711-93-D-1459 29	**06-27-2000** 11-22-2000 5090.3.A. DO 0075	SEDLAK, W. OHM REMEDIATION SERVICES CORP. HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	TRANSMITTAL OF EXCERPTS FROM THE ON-SCENE COORDINATOR REPORT FOR TIME-CRITICAL REMOVAL ACTION: FIGURES AND FINAL CONSTRUCTION MONITORING REPORT (SEE RECORD # 2277 - WHOLE REPORT)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141

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AR_M60050_002818 NONE CORRESPONDENCE NONE 3	**06-28-2000** 09-30-2002 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE FINAL INTERIM RECORD OF DECISION (ROD) FOR THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS, DATED APRIL 2000 (SEE RECORD # 425 - FINAL INTERIM ROD)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0064 30090141
AR_M60050_000711 GS-10F-0227J REPORT N68711-00-F-0102 1407	**06-30-2000** 03-05-2001 5090.3.A. NONE	BJOSTAD, D. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	GROUNDWATER MONITORING DATA SUMMARY REPORT - 1999 MONITORING ROUNDS 9, 10, & 11 (SEE RECORDS # 655 - EPA COMMENTS; # 656 - CRWQCB COMMENTS; AND # 758 - DTSC COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00002 SITE 00003 SITE 00005 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0018 30090141
AR_M60050_002863 NONE CORRESPONDENCE NONE 3	**07-06-2000** 11-20-2002 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA BENNETT, C. RESTORATION ADVISORY BOARD MEMBER	RESPONSE TO REQUEST FOR DTSC'S OPINION REGARDING THE EXCLUSION OF AREA D1 FROM THE REMEDIAL PROCESS FOR THE MAGAZINE ROAD LANDFILL - DTSC CONTINUES TO CONCUR WITH THE EXCLUSION OF THE AREA	ADMIN RECORD BASE INFO REPOSITORY	AREA D-1 OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0065 30090141
AR_M60050_000542 NONE CORRESPONDENCE NONE 5	**07-12-2000** 10-04-2000 5090.3.A. NONE	YUEN, A. U.S. DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE - CARLSBAD, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER ENVIRONMENTAL SUMMARY DOCUMENT, FOR CERTAIN PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000806 BLDG 0000807 BLDG 0000809 BLDG 0000810 SITE 00001 SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141

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AR_M60050_000498 CTO-0200/0095 MINUTES N68711-92-D-4670 41	**07-19-2000** 08-03-2000 5090.3.A. CTO 0200	HEIRONIMUS, T. BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER - INCLUDES AGENDA & PUBLIC NOTICE FOR THE 26 JULY 2000 MEETING. ALSO, INCLUDES RAB MEETING MINUTES & ATTACHMENTS FROM THE 31 MAY 2000 MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000307 BLDG 0000787 BLDG 0001789 BLDG 0001803 OU 0000001 OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000503 SWDIV SER 06CC.DG/636 CORRESPONDENCE NONE 3	**08-02-2000** 08-07-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION BRODERICK, J. CRWQCB - RIVERSIDE, CA	PROPOSED DOCUMENT SCHEDULE, THE INTERIM RECORD OF DECISION (ROD) FOR MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS ARE SUBMITTED FOR CRWQCB REVIEW AND APPROVAL (W/ENCLOSURE) [SEE RECORD # 650 - CRWQCB RESPONSE]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000507 SW8516 ANALYTICAL DATA N68711-93-D-1459 7	**08-04-2000** 08-09-2000 5090.3.A. DO 0065	BERGER, G. OHM REMEDIATION SERVICES CORP. DEMAREE, B. NAVFAC - SOUTHWEST DIVISION	FINAL COPIES OF COLOG NATURAL GAMMA WELL LOGS INCLUDES COPY OF 02_UGMW25 LOG HEADING INCORRECTLY IDENTIFIED AS 02_DGMW25 ON PRELIMINARY COPY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141

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AR_M60050_003384 NONE CORRESPONDENCE NONE 10	**08-10-2000** 10-27-2005 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE FINDING OF SUITABILITY TO LEASE (FOSL) FOR MASTER LEASE WITH THE COUNTY OF ORANGE	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000484 BLDG 0000799 BLDG 0001687 OU 0000001 OU 0000002 PARCEL 0007 PARCEL 0016 SITE 00002 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00013 SITE 00015 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00025	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_000643 NONE CORRESPONDENCE NONE 3	**08-17-2000** 02-14-2001 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REQUEST FOR FURTHER CLARIFICATION REGARDING A PLAN TO ADDRESS SHORT TERM POTENTIAL RISKS PRIOR TO APPROVING THE PROPOSED FEDERAL FACILITY AGREEMENT SCHEDULE (SEE RECORD # 501 - ORIGINAL LETTER)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0015 30090141
AR_M60050_003353 NONE CORRESPONDENCE NONE 3	**08-18-2000** 10-26-2005 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	RESPONSE TO REQUEST TO EXPEDITE THE REVIEW OF THE DRAFT PROJECT WORK PLAN, REVISION 1 FOR PRE-DESIGN ACTIVITIES AND DEBRIS DISPOSAL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	

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AR_M60050_000644 NONE CORRESPONDENCE NONE 1	**08-21-2000** 02-15-2001 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF PROPOSED SCHEDULE AND CONSOLIDATION OF THE QA/QC PLANS (SEE RECORD # 502 - ORIGINAL LETTER)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0015 30090141
AR_M60050_000649 NONE CORRESPONDENCE NONE 1	**08-22-2000** 02-15-2001 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO SIGNIFICANT COMMENTS ON THE DRAFT PROJECT WORK PLAN, PRE-DESIGN ACTIVITIES AND DEBRIS DISPOSAL (SEE RECORD # 517 - DRAFT PROJECT PLAN)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00005	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0015 30090141
AR_M60050_000522 NONE CORRESPONDENCE NONE 7	**08-23-2000** 09-05-2000 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM - VERIFICATION OF PERCHLORATE AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 625 - DRAFT TECH MEMO)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000520 SW8999 CORRESPONDENCE N68711-93-D-1459 17	**08-28-2000** 09-05-2000 5090.3.A. DO 0065	SEDLAK, W. OHM REMEDIATION SERVICES CORP. HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	HEALTH AND SAFETY PLAN AMENDMENT 6 FOR GEOPHYSICAL SURVEY WORK AT THE EXPLOSIVE ORDNANACE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_002737 NONE CORRESPONDENCE NONE 14	**08-31-2000** 06-04-2002 5090.3.A. NONE	RICHARDSON, R. ORANGE COUNTY - MCAS EL TORO LOCAL REDEVELOPMENT AUTHORITY - SANTA ANA, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT RADIOLOGICAL SURVEY PLAN (SEE RECORD # 551 - PLAN)	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000296 BLDG 0000297 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141

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AR_M60050_000538 NONE CORRESPONDENCE NONE 1	**09-03-2000** 10-04-2000 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER GOULD, D. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) SUBCOMMITTEE COMMENTS ON PERCHLORATE STUDY OF JUNE 2000, PREPARED BY EARTH TECH	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_001013 NONE CORRESPONDENCE NONE 2	**09-07-2000** 03-29-2001 5090.3.A. NONE	WOCHNICK, M. CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD - SACRAMENTO, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PROJECT WORK PLAN - PRE-DESIGN ACTIVITIES AND DEBRIS DISPOSAL, REVISION 1 (SEE RECORD # 517 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00005	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0025 30090141
AR_M60050_003352 NONE CORRESPONDENCE NONE 20	**09-11-2000** 10-26-2005 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PROJECT WORK PLAN, REVISION 1 FOR PRE-DESIGN ACTIVITIES AND DEBRIS DISPOSAL (INCLUDES COMMENTS FROM HUMAN AND ECOLOGICAL RISK DIVISION [HERD] DATED 05 SEPTEMBER 2000)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00022 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_002418 SWDIV SER 06CC.DG/596 CORRESPONDENCE NONE 5	**09-12-2000** 06-01-2001 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT WORK PLAN PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 529 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141

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AR_M60050_000656 NONE CORRESPONDENCE NONE 2	**09-18-2000** 02-15-2001 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE GROUNDWATER MONITORING DATA SUMMARY REPORT, 1999 MONITORING ROUNDS 9, 10, & 11 (SEE RECORD # 711 - GROUNDWATER REPORT)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0016 30090141
AR_M60050_000537 NONE MINUTES NONE 4	**09-25-2000** 10-04-2000 5090.3.A. NONE	BENNETT, C. RESTORATION ADVISORY BOARD MEMBER NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) REVIEW COMMITTEE (RAB SUBCOMMITTEE) MAIN AGENDA ISSUES SINCE 26 JULY 2000	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00002 SITE 00005 SITE 00012 SITE 00016	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000603 NONE MINUTES NONE 157	**09-27-2000** 12-21-2000 5090.3.A. NONE	RESTORATION ADVISORY BOARD NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS - 27 SEPTEMBER 2000 RESTORATION ADVISORY BOARD (RAB) MEETING AGENDA AND PUBLIC NOTICE, 26 JULY 2000 RAB MEETING MINUTE, 28 JUNE 2000 AND 10 MAY 2000 (CORRECTED) RAB SUBCOMMITTEE MEETING MINUTES, HANDOUTS, AND LETTERS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000001 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0014 30090141
AR_M60050_000552 FWSD-RAC-01-0019 & SWDIV SER 06CC.DG/865 CORRESPONDENCE N68711-98-D-5713 40	**10-06-2000** 10-18-2000 5090.3.A. CTO 0022	HAMPARSUMIAN, H. FOSTER WHEELER MULTIPLE AGENCIES	RESPONSE TO VARIOUS AGENCY COMMENTS ON DRAFT PROJECT WORK PLAN, PRE-DESIGN ACTIVITIES AND DEBRIS DISPOSAL [INCLUDES TRANSMITTAL LETTER] (SEE RECORD # 517 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00005	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141

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AR_M60050_003349 NONE CORRESPONDENCE NONE 1	**10-16-2000** 10-26-2005 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM, VERIFICATION OF PERCHLORATE AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_000554 SWDIV SER 06CC.DG/843 CORRESPONDENCE NONE 4	**10-17-2000** 10-23-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION BRODERICK, J. CRWQCB - RIVERSIDE, CA	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR DRAFT RECORD OF DECISION (ROD), DROP TANK DRAINAGE AREA # 2 AND BATTERY ACID DISPOSAL AREA (W/ENCLOSURE) [SEE RECORD # 2432 - RESPONSE FROM CRWQCB]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141

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AR_M60050_000557 SWDIV SER 06CC.DG/850 CORRESPONDENCE NONE 9	**10-19-2000** 10-24-2000 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	LETTER TO REGULATORS REQUESTING AN EXTENSION TO THE FEDERAL FACILITIES AGREEMENT (FFA) FOR PRIMARY DOCUMENTS FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 2433 - RESPONSE FROM DTSC)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0012 30090141
AR_M60050_000658 NONE CORRESPONDENCE NONE 2	**10-19-2000** 02-15-2001 5090.3.A. NONE	BAILEY, D. CALIFORNIA DEPARTMENT OF HEALTH SERVICES - SACRAMENTO, CA CHESNEY, T. DTSC - CYPRESS, CA	REVIEW AND COMMENTS ON THE DRAFT PROJECT WORK PLAN - PRE-DESIGN ACTIVITIES AND DEBRIS DISPOSAL, REVISION 1 (SEE RECORD # 517 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00005	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0016 30090141
AR_M60050_003351 NONE CORRESPONDENCE NONE 5	**10-23-2000** 10-26-2005 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PROJECT WORK PLAN, AND DEBRIS DISPOSAL	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_003348 NONE CORRESPONDENCE NONE 1	**10-24-2000** 10-26-2005 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF REQUEST FOR REVISION AND EXTENSION TO THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE FOR THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_002433 NONE CORRESPONDENCE NONE 3	**11-03-2000** 06-20-2001 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO REQUEST FOR EXTENSION TO THE FEDERAL FACILITY AGREEMENT FOR PRIMARY DOCUMENTS ASSOCIATED WITH THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 557 - ORIGINAL LETTER)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0055 30090141

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AR_M60050_000668 NONE CORRESPONDENCE NONE 1	**11-09-2000** 02-20-2001 5090.3.A. NONE	KISTNER, G. U.S. EPA - SAN FRANCISCO, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT AMENDMENT TO DRAFT PROJECT WORK PLAN, PHASE II REMEDIAL INVESTIGATION AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORDS # 529 - PHASE II RI, AND # 774 FOR AMENDMENT)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0016 30090141
AR_M60050_000670 NONE CORRESPONDENCE NONE 2	**11-13-2000** 02-20-2001 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	NOTIFICATION OF COMMENT PERIOD EXTENSION FOR THE DRAFT WORK PLAN, PHASE II REMEDIAL INVESTIGATION AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 529 - PHASE II RI)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0016 30090141
AR_M60050_002907 SWDIV SER 06CC.DG/967 CORRESPONDENCE NONE 2	**11-22-2000** 01-27-2003 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION SCANDURA, J. DTSC - CYPRESS, CA	NOTIFICATION TO DTSC THAT SINCE NO RESPONSE WAS RECEIVED REGARDING THE EXTENSION FOR PRIMARY DOCUMENTS FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE THE NAVY DEEMS THAT THE REQUEST IS APPROVED	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0066 30090141
AR_M60050_000583 CTO-0200/0164 MINUTES N68711-92-D-4670 31	**11-29-2000** 11-27-2000 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER [INCLUDES AGENDA AND PUBLIC NOTICE FOR 29 NOVEMBER 2000 MEETING, AND MINUTES AND ATTACHMENTS FROM THE 27 SEPTEMBER 2000 RAB MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH BLDG 0000296 BLDG 0000297 BLDG 0000360 OU 0000001 OU 0000002A SITE 00001 SITE 00003 SITE 00005 SITE 00007 SITE 00014 SITE 00016 SITE 00018 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_014	L181-06-0125 BX 0013 30090141

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AR_M60050_000605 NONE MINUTES NONE 179	**11-29-2000** 12-26-2000 5090.3.A. NONE	RESTORATION ADVISORY BOARD NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS: 29 NOVEMBER 2000 RESTORATION ADVISORY BOARD (RAB) MEETING AGENDA AND PUBLIC NOTICE, 27 SEPTEMBER 2000 RAB MEETING MINUTES, 20 JULY 2000 AND 30 AUGUST 2000 RAB SUBCOMMITTEE MEETING MINUTES, HANDOUTS, AND LETTERS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0014 30090141
AR_M60050_001110 NONE CORRESPONDENCE NONE 8	**12-01-2000** 03-29-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW OF THE RESPONSE TO COMMENTS ON THE DRAFT PROJECT WORK PLAN - PRE-DESIGN ACTIVITIES AND DEBRIS DISPOSAL, REVISION 1 (SEE RECORDS # 517 - DOCUMENT AND # 552 - RESPONSE TO COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000002A OU 0000002C OU 0000003 SITE 00001 SITE 00003 SITE 00005 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0026 30090141
AR_M60050_000618 FWSD-RAC-01-0065 REPORT N68711-98-D-5713 194	**12-18-2000** 01-10-2001 5090.3.A. CTO 0022	HAMPARSUMIAN, H. FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN, REV. 0 - PAVEMENT DEMOLITION ACTIVITIES AT THE ORIGINAL LANDFILL AND METALLIC DEBRIS DISPOSAL AT THE FORMER EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 1109 - COMMENTS FROM DTSC)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001 SITE 00003	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0014 30090141
AR_M60050_000700 NONE CORRESPONDENCE NONE 4	**12-21-2000** 02-22-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE (SEE RECORD # 836 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0017 30090141

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AR_M60050_000702 NONE CORRESPONDENCE NONE 4	**12-22-2000** 02-22-2001 5090.3.A. NONE	BAILEY, D. CALIFORNIA DEPARTMENT OF HEALTH SERVICES - SACRAMENTO, CA CHESNEY, T. DTSC - CYPRESS, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE (SEE RECORD # 836 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0018 30090141
AR_M60050_000679 NONE CORRESPONDENCE NONE 5	**12-27-2000** 02-21-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON THE DRAFT WORK PLAN PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 529 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000001 SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0016 30090141
AR_M60050_000627 CTO-0200/0188 MINUTES N68711-92-D-4670 32	**01-18-2001** 01-18-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER [INCLUDES AGENDA & PUBLIC NOTICE FOR 31 JANUARY 2001 MEETING, MINUTES FROM 29 NOVEMBER 2000 MEETING, SUBCOMMITTEE MINUTES OF 29 NOVEMBER 2000 & 25 OCTOBER 2000, AND MAILING LIST]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000001 OU 0000002 OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_015	L181-06-0125 BX 0014 30090141

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AR_M60050_000961 NONE CORRESPONDENCE NONE 5	**01-22-2001** 03-29-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT BASE REALIGNMENT AND CLOSURE (BRAC) BUSINESS PLAN, DATED DECEMBER 2000 (SEE RECORD # 233 - BUSINESS PLAN)	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000787 BLDG 0001789 BLDG 0001803 OU 0000002A OU 0000002B OU 0000003 SITE 00002 SITE 00005 SITE 00008 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0024 30090141
AR_M60050_000689 NONE CORRESPONDENCE NONE 1	**01-26-2001** 02-21-2001 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO SIGNIFICANT COMMENTS ON THE AMENDMENT TO DRAFT PROJECT WORK PLAN, PHASE II REMEDIAL INVESTIGATION AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORDS # 529 - PHASE II RI, AND # 774 FOR AMENDMENT)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0017 30090141
AR_M60050_000852 SWDIV SER 06CC.DG/0140 CORRESPONDENCE N62742-94-D-0048 62	**01-29-2001** 03-26-2001 5090.3.A. CTO 0072	WANYOIKE, C. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	WORK PLAN, PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE (INCLUDES TRANSMITTAL LETTER FROM D. GOULD)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0021 30090141

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AR_M60050_000859 SWDIV SER 06CC.DG/0142 REPORT NONE 331	**01-29-2001** 03-27-2001 5090.3.A. NONE	CHRISTENSEN, B. ROY F. WESTON, INC. NAVFAC - SOUTHWEST DIVISION	FINAL RADIOLOGICAL SURVEY PLAN, REV. 3 - INCLUDES RESPONSE TO AGENCY COMMENTS ON THE DRAFT FINAL RADIOLOGICAL SURVEY PLAN (DHS, US EPA & EL TORO LRA COMMENTS ON THE DRAFT FINAL) [INCLUDES SWDIV TRANSMITTAL LETTER]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 APHO 00038 BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000295 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 0001789 BLDG 0001803 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00012 SITE 00017 SITE 00025	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0022 30090141

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AR_M60050_000963 NONE MINUTES NONE 160	**01-31-2001** 03-29-2001 5090.3.A. NONE	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FROM THE 31 JANUARY 2001 RESTORATION ADVISORY BOARD MEETING INCLUDING: RAB MEETING AGENDA / PUBLIC NOTICE, 29 NOVEMBER 2000 RAB MEETING MINUTES, RAB MEETING SCHEDULE, VARIOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00008 SITE 00012 SITE 00014 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0024 30090141
AR_M60050_000838 NONE CORRESPONDENCE N62742-94-D-0048 3	**02-01-2001** 03-26-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	COMPILED RESPONSE TO US EPA & DTSC COMMENTS ON THE DRAFT AMENDMENT TO THE DRAFT WORK PLAN, PHASE II REMEDIAL INVESTIGATION FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 774 - AMENDMENT)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0021 30090141
AR_M60050_000851 NONE CORRESPONDENCE N62742-94-D-0048 36	**02-01-2001** 03-26-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	COMPILED RESPONSE TO AGENCY COMMENTS ON THE DRAFT WORK PLAN, PHASE II REMEDIAL INVESTIGATION FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (COMMENTS BY DTSC, DTSC - GSU, DTSC - HERD, & US EPA)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000001 SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0021 30090141

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AR_M60050_002829 SWDIV SER 06CC.DG/0155 CORRESPONDENCE NONE 13	**02-07-2001** 11-19-2002 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA	TRANSMITTAL OF THE GROUNDWATER MONITORING PROGRAM ROUND 13 POINT PAPER (SEE RECORD # 2744 - CRWQCB COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_000774 NONE CORRESPONDENCE N62742-94-D-0048 27	**02-08-2001** 03-26-2001 5090.3.A. CTO 0072	WANYOIKE, C. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	AMENDMENT TO THE PHASE II REMEDIAL INVESTIGATION WORK PLAN FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORDS # 529 - RI WORK PLAN; # 668 - EPA COMMENTS; # 689 - CRWQCB COMMENTS; AND # 838 - COMPILED RESPONSES)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0020 30090141
AR_M60050_001109 NONE CORRESPONDENCE NONE 3	**02-08-2001** 03-29-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	DTSC IS SATISFIED PREVIOUS COMMENTS HAVE BEEN ADEQUATELY ADDRESSED IN THE FINAL WORK PLAN, PAVEMENT DEMOLITION ACTIVITIES AT THE ORIGINAL LANDFILL AND METALLIC DEBRIS DISPOSAL AT THE FORMER EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002C OU 0000003 SITE 00001 SITE 00003	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0026 30090141
AR_M60050_002419 SWDIV SER 06CC.DG/0182 CORRESPONDENCE NONE 3	**02-14-2001** 06-01-2001 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION SCANDURA, J. DTSC - CYPRESS, CA	RESPONSE TO REQUEST FOR A RESOURCE CONSERVATION AND RECOVERY ACT CLOSURE PLAN, AND TRANSMITTAL OF RESPONSE TO COMMENTS ON THE DRAFT WORK PLAN PHASE II REMEDIAL INVESTIGATION, DRAFT AMENDMENT TO THE DRAFT WORK PLAN, AND DRAFT HEALTH AND SAFETY PLAN	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20100702-7/8	

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AR_M60050_001266 NONE CORRESPONDENCE NONE 1	**02-16-2001** 03-29-2001 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO SIGNIFICANT COMMENTS ON THE DRAFT WORK PLAN, PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE (SEE RECORD # 836 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0031 30090141
AR_M60050_004243 NONE CORRESPONDENCE NONE 4	**02-23-2001** 04-14-2008 5090.3.A. NONE	JUNG, D. CITY OF IRVINE - IRVINE, CA MULTIPLE AGENCIES	REVIEW AND COMMENTS ON THE DRAFT GROUNDWATER MONITORING REPORT - JUNE 2000 MONITORING ROUND 12 [SEE RECORD # 637 - DRAFT GROUNDWATER MONITORING REPORT]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_000981 NONE CORRESPONDENCE NONE 2	**02-26-2001** 03-29-2001 5090.3.A. NONE	SIMON, G. COUNTY OF ORANGE - SANTA ANA, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	LOCAL REDEVELOPMENT AUTHORITY DOES NOT BELIEVE THAT SUBMITTING FURTHER COMMENTS ON THE FINAL RADIOLOGICAL SURVEY PLAN WOULD BE PRODUCTIVE OR APPROPRIATE AT THIS TIME	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000295 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 0001789 BLDG 0001803 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00012 SITE 00017 SITE 00025	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0024 30090141

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AR_M60050_002742 NONE CORRESPONDENCE NONE 6	**02-26-2001** 06-05-2002 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON THE DRAFT GROUNDWATER MONITORING REPORT - JUNE 2000 MONITORING ROUND 12 (SEE RECORD # 637 - MONITORING REPORT)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141

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AR_M60050_002864 NONE REPORT NONE 165	**03-01-2001** 11-20-2002 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION NAVFAC - SOUTHWEST DIVISION	FINAL BASE REALIGNMENT AND CLOSURE (BRAC) BUSINESS PLAN	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH AA 0000003 APHO 00038 BLDG 0000083 BLDG 0000243 BLDG 0000296 BLDG 0000297 BLDG 0000319 BLDG 0000360 BLDG 0000656 BLDG 0000791 BLDG 0000839 BLDG 0000873 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0065 30090141

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					SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 TANK FARM 555 UST 000364A UST GROUP 651		
AR_M60050_002743 NONE CORRESPONDENCE NONE 2	**03-15-2001** 06-05-2002 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT GROUNDWATER MONITORING REPORT - JUNE 2000 MONITORING ROUND 12 (SEE RECORD # 637 - MONITORING REPORT)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_000558 NONE CORRESPONDENCE NONE 19	**03-19-2001** 05-31-2001 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO RESPONSE TO COMMENTS ON THE DRAFT FINAL WORK PLAN & HEALTH AND SAFETY PLANS FOR THE PHASE II REMEDIAL INVESTIGATION AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORDS # 838 - RESPONSE FROM DON; # 831 - WORK PLAN; AND # 826 - H&SP)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0012 30090141

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AR_M60050_000766 CTO-0200/0204 MINUTES N68711-92-D-4670 34	**03-21-2001** 03-26-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER [INCLUDES AGENDA & PUBLIC NOTICE FOR 21 MARCH 2001 MEETING, AND MINUTES & ATTACHMENTS FROM THE 31 JANUARY 2001 RAB MEETING]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH AA 0000003 APHO 00038 APHO 00044 APHO 00046 BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000295 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 0001789 BLDG 0001803 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0020 30090141
AR_M60050_001732 NONE MINUTES NONE 170	**03-21-2001** 05-10-2001 5090.3.A. NONE	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	21 MARCH 2001 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA , PUBLIC NOTICE, 31 JANUARY 2001 RAB MEETING MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0040 30090141

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AR_M60050_002744 NONE CORRESPONDENCE NONE 1	**03-22-2001** 06-05-2002 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO SIGNIFICANT COMMENTS ON THE GROUNDWATER MONITORING PROGRAM ROUND 13 POINT PAPER (SEE RECORD # 2829 - POINT PAPER)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_003591 NONE CORRESPONDENCE NONE 2	**03-28-2001** 07-12-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	ADDITIONAL COMMENTS ON THE DRAFT WORK PLAN FOR PHASE II REMEDIAL INVESTIGATION AND COMMENTS ON THE DRAFT FINAL WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_002423 NONE CORRESPONDENCE NONE 2	**04-02-2001** 06-04-2001 5090.3.A. NONE	WOODINGS, R. CITY OF LAKE FOREST - LAKE FOREST, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE 30% SUBMITTAL REMEDIAL DESIGN AT THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS (SEE RECORD # 1003 - 30% SUBMITTAL)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_001338 NONE REPORT DAAD05-97-D-7004 126	**04-04-2001** 04-17-2001 5090.3.A. DO 0124	ROY F. WESTON, INC. NAVFAC - SOUTHWEST DIVISION	UNEXPLODED ORDNANCE (UXO) SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE, INCLUDES: PART 1 - WORK PLAN, PART 2 - HEALTH & SAFETY PLAN (SEE RECORDS # 2214 - EPA COMMENTS & # 2425 - DTSC COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0032 30090141

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AR_M60050_002420 NONE CORRESPONDENCE NONE 1	**04-11-2001** 06-01-2001 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	NOTIFICATION OF COMMENT PERIOD EXTENSION REQUEST FOR THE UNEXPLODED ORDNANCE (UXO) SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE WHICH INCLUDES: PART 1 - WORK PLAN, PART 2 - HEALTH & SAFETY PLAN	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141
AR_M60050_003592 NONE CORRESPONDENCE NONE 3	**04-13-2001** 07-12-2006 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	EXPLANATION FOR THE DELAY OF THE REVIEW AND COMMENTS ON THE DRAFT WORK PLAN FOR ORDNANCE AND EXPLOSIVES RANGE EVALUATION AND UNEXPLODED ORDNANCE SURFACE SWEEP WORK PACKAGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_001731 SWDIV SER 5GPN.JL/242 CORRESPONDENCE NONE 20	**05-02-2001** 05-10-2001 5090.3.A. NONE	STROUD, M. NAVFAC - SOUTHWEST DIVISION BARTEL, J. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	LETTER CONCERNING POTENTIAL ADVERSE EFFECTS TO FEDERALLY LISTED SPECIES FROM ACTIVITIES INCIDENTAL TO REMEDIATION AT THE MAGAZINE ROAD AND COMMUNCATION STATION LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0040 30090141
AR_M60050_002425 NONE CORRESPONDENCE NONE 9	**05-02-2001** 06-04-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN FOR ORDNANCE AND EXPLOSIVES RANGE EVALUATION AND UNEXPLODED ORDNANCE SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORDS # 1324 - DRAFT WORK PLAN AND # 1338 - SURFACE SWEEP PACKAGE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0054 30090141

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AR_M60050_001740 NONE CORRESPONDENCE NONE 11	**05-03-2001** 05-17-2001 5090.3.A. NONE	SMITH, K. COUNTY OF ORANGE PUBLIC FACILITIES & RESOURCES DEPARTMENT - SANTA ANA, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE 30% SUBMITTAL REMEDIAL DESIGN AT THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS (SEE RECORD # 1003 - 30% SUBMITTAL)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0041 30090141
AR_M60050_002214 NONE CORRESPONDENCE NONE 6	**05-03-2001** 06-01-2001 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE EXPLOSIVE ORDNANCE DISPOSAL RANGE EVALUATION WORK PLAN AND THE SURFACE SWEEP WORK PACKAGE FOR THE UNEXPLODED ORDNANCE DISPOSAL RANGE (SEE RECORDS # 1338 - SURFACE SWEEP PACKAGE, AND # 1324 - EOD RANGE WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0050 30090141
AR_M60050_001855 NONE CORRESPONDENCE NONE 2	**05-08-2001** 05-17-2001 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT CONSTRUCTION QUALITY CONTROL PLAN (SEE RECORD # 1002 - QUALITY CONTROL PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0043 30090141
AR_M60050_003489 NONE CORRESPONDENCE NONE 4	**05-08-2001** 05-05-2006 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA JUNG, D. CITY OF IRVINE - IRVINE, CA	EXPLANATION OF POTENTIAL USE RESTRICTIONS ASSOCIATED WITH LANDFILL SITES (INCLUDES CALIFORNIA INTEGRATED WASTE MANAGEMENT RESPONSE BOARD LETTER, DATED 16 APRIL 2001)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	

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AR_M60050_001739 CTO-0200/0232 MINUTES N68711-92-D-4670 34	**05-30-2001** 05-17-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER - INCLUDES AGENDA & PUBLIC NOTICE AND MINUTES AND ATTACHMENTS FROM 21 MARCH 2001 RAB MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH BLDG 0000307 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024 TANK FARM 555	FRC - PERRIS IMAGED TORO_018	L181-06-0125 BX 0041 30090141
AR_M60050_002439 NONE MINUTES N68711-92-D-4670 236	**05-30-2001** 06-25-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FROM THE 30 MAY 2001 RESTORATION ADVISORY BOARD (RAB) MEETING, INCLUDING MINUTES AND VARIOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH BLDG 0000307 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0055 30090141
AR_M60050_002444 NONE REPORT DAAD05-97-D-7004 100	**06-14-2001** 07-12-2001 5090.3.A. DO 0124	ROY F. WESTON, INC. NAVFAC - SOUTHWEST DIVISION	FINAL UNEXPLODED ORDNANCE (UXO) SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (INCLUDES: PART 1 - WORK PLAN, AND PART 2 - HEALTH AND SAFETY PLAN)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20100730-4/4	

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AR_M60050_004821 SWDIV SER 06CC.DG/0669 CORRESPONDENCE NONE 1	**06-22-2001** 07-26-2010 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION CHESNEY, T. DTSC - CYPRESS, CA	TRANSMITTAL OF THE FINAL UNEXPLODED ORDNANCE SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20100730-4/4	
AR_M60050_004822 SWDIV SER 06CC.DG/0669 CORRESPONDENCE NONE 1	**06-22-2001** 07-26-2010 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION HANNON, P. CRWQCB - RIVERSIDE, CA	TRANSMITTAL OF THE FINAL UNEXPLODED ORDNANCE SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20100730-4/4	
AR_M60050_004823 SWDIV SER 06CC.DG/0669 CORRESPONDENCE NONE 1	**06-22-2001** 07-26-2010 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA	TRANSMITTAL OF THE FINAL UNEXPLODED ORDNANCE SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20100730-4/4	
AR_M60050_002565 GS-10F-0227J REPORT N68711-00-F-0102 756	**06-26-2001** 10-30-2001 5090.3.A. NONE	CLIFFORD, R. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	FINAL GROUNDWATER MONITORING REPORT JUNE 2000 MONITORING ROUND 12 (INCLUDES SWDIV TRANSMITTAL LETTER)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_019	L181-06-0125 BX 0059 30090141

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AR_M60050_002451 NONE REPORT N62742-94-D-0048 254	**07-01-2001** 08-06-2001 5090.3.A. CTO 0072	WANYOIKE, C. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM - VERIFICATION OF PERCHLORATE AT THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_019	L181-06-0125 BX 0055 30090141
AR_M60050_002541 NONE CORRESPONDENCE NONE 1	**07-05-2001** 10-15-2001 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	EPA FINDS THAT ALL COMMENTS HAVE BEEN ADEQUATELY ADDRESSED ON THE FINAL UNEXPLODED ORDNANCE (UXO) SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 2444 - WORK PACKAGE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141
AR_M60050_002544 NONE CORRESPONDENCE NONE 3	**07-10-2001** 10-17-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE FINAL UNEXPLODED ORDNANCE (UXO) SURFACE SWEEP WORK PACKAGE FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE HAVE BEEN ADEQUATELY ADDRESSED (SEE RECORD # 2444 - WORK PACKAGE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141
AR_M60050_003495 NONE CORRESPONDENCE NONE 1	**07-19-2001** 05-05-2006 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE UNEXPLODED ORDNANCE (UXO) SURFACE SWEEP WORK PACKAGE, EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_002545 NONE CORRESPONDENCE NONE 2	**07-24-2001** 10-17-2001 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT SITE-SPECIFIC ENVIRONMENTAL BASELINE SURVEY REPORT AND THE DRAFT FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141

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AR_M60050_002446 CTO-0200/0252 MINUTES N68711-92-D-4670 37	**07-25-2001** 07-12-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER INCLUDING: AGENDA AND PUBLIC NOTICE FOR MEETING, MINUTES AND ATTACHMENTS FROM 30 MAY 2001 MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000307 OU 0000001 OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00012 SITE 00017 SITE 00018 SITE 00024 TANK FARM 555	FRC - PERRIS IMAGED TORO_017	L181-06-0125 BX 0055 30090141
AR_M60050_002491 NONE MINUTES NONE 180	**07-25-2001** 09-04-2001 5090.3.A. NONE	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	25 JULY 2001 RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS [INCLUDES AGENDA, PUBLIC NOTICE, 30 MAY 2001 RAB MEETING MINUTES AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH BLDG 0000307 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_019	L181-06-0125 BX 0057 30090141
AR_M60050_002556 NONE REPORT N62742-94-D-0048 39	**08-01-2001** 10-17-2001 5090.3.A. CTO 0072	WANYOIKE, C. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	FINAL FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER - ENVIRONMENTAL SUMMARY DOCUMENT FOR CERTAIN PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000003 PARCEL 0005A-2 SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0059 30090141

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AR_M60050_002557 NONE CORRESPONDENCE N62742-94-D-0048 3	**08-01-2001** 10-17-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON THE DRAFT SITE-SPECIFIC ENVIRONMENTAL BASELINE SURVEY REPORT FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE AND DRAFT FEDERAL AGENCY TO AGENCY PROPERTY TRANSFER	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 PARCEL 0005A-2 SITE 00001	FRC - PERRIS IMAGED TORO_023	L181-06-0125 BX 0059 30090141
AR_M60050_002546 NONE CORRESPONDENCE NONE 19	**08-06-2001** 10-17-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT SITE-SPECIFIC ENVIRONMENTAL BASELINE SURVEY REPORT FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 2450 - EBS)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141
AR_M60050_003496 NONE CORRESPONDENCE NONE 4	**08-06-2001** 05-05-2006 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER ENVIRONMENTAL SUMMARY DOCUMENT FOR CERTAIN PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	PARCEL 0005A-2 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_002479 FWSD-RAC-01-0987 REPORT N68711-98-D-5713 53	**08-07-2001** 08-15-2001 5090.3.A. CTO 0022	HAMPARSUMIAN, H. FOSTER WHEELER NAVFAC - SOUTHWEST DIVISION	FINAL IMPLEMENTATION PLAN - VEGETATION CLEARING AT THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_019	L181-06-0125 BX 0057 30090141
AR_M60050_002550 NONE CORRESPONDENCE NONE 5	**08-13-2001** 10-17-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE [SEE RECORDS # 2445 - TECH MEMO AND # 2587 - RESPONSE TO COMMENTS]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141

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AR_M60050_002883 NONE CORRESPONDENCE NONE 1	**08-13-2001** 12-10-2002 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	RWQCB HAS NO COMMENTS ON THE DRAFT SITE-SPECIFIC ENVIRONMENTAL BASELINE SURVEY REPORT FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE AND THE DRAFT FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER - ENVIRONMENTAL SUMMARY DOCUMENT FOR CERTAIN PROPERTY (PARCEL 5A2)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 PARCEL 0005A-2 SITE 00001	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0065 30090141
AR_M60050_002748 NONE CORRESPONDENCE NONE 2	**08-14-2001** 06-05-2002 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE [SEE RECORD # 2445 - TECH MEMO]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0062 30090141
AR_M60050_002568 NONE CORRESPONDENCE NONE 37	**09-07-2001** 11-26-2001 5090.3.A. NONE	HORNECKER, L. NAVFAC - SOUTHWEST DIVISION NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM - FORMER BOMB ASSEMBLY AREA NEAR THE MAGAZINE ROAD LANDFILL, AMMUNITION SUPPLY POINT (SEE RECORD # 2569 - DTSC COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141
AR_M60050_003530 NONE CORRESPONDENCE NONE 3	**09-13-2001** 05-16-2006 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. BRAC PMO WEST	REVIEW OF RESPONSES TO COMMENTS ON THE FINAL FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER, ENVIRONMENTAL SUMMARY DOCUMENT FOR CERTAIN PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	PARCEL 0005A-2 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	

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AR_M60050_002886 NONE CORRESPONDENCE NONE 1	**09-18-2001** 12-10-2002 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	EPA HAS NO FURTHER COMMENTS ON THE DRAFT SITE-SPECIFIC ENVIRONMENTAL BASELINE SURVEY REPORT FOR THE EOD RANGE AND THE DRAFT FEDERAL AGENCY-TO-AGENCY PROPERTY TRANSFER -ENVIRONMENTAL SUMMARY DOCUMENT FOR CERTAIN PROPERTY (PARCEL 5A2)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 PARCEL 0005A-2 SITE 00001	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0065 30090141
AR_M60050_002534 CTO-0200/0278 MINUTES N68711-92-D-4670 26	**09-19-2001** 09-19-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER; INCLUDES: AGENDA & PUBLIC NOTICE FOR 19 SEPTEMBER 2001 MEETING, AND MINUTES AND ATTACHMENTS FROM 25 JULY 2001 MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH AA 0000003 BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 0001789 BLDG 0001803 HANGAR 0295 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00008 SITE 00012 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141

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AR_M60050_002566 CTO-0200/0319 MINUTES N68711-92-D-4670 186	**09-19-2001** 10-31-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) PUBLIC INFORMATION MATERIALS; INCLUDES: AGENDA & PUBLIC NOTICE FOR 19 SEP 2001 MEETING, MEETNG MINUTES AND ATTACHMENTS FROM 25 JUL 2001 MEETING & REGULATORY AGENCY COMMENTS AND LETTERS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH BLDG 0000296 BLDG 0000307 OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00016	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141
AR_M60050_002571 NONE CORRESPONDENCE N62742-94-D-0048 20	**10-01-2001** 11-26-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON THE DRAFT WORK PLAN - ORDNANCE AND EXPLOSIVES RANGE EVALUATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE DATED MARCH 2001 {COMMENTS BY DTSC & US EPA} (SEE RECORDS # 2425 - DTSC COMMENTS AND # 1324 - DRAFT WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141
AR_M60050_002578 NONE CORRESPONDENCE N62742-94-D-0048 12	**10-01-2001** 12-11-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON THE DRAFT FINAL WORK PLAN, PHASE II REMEDIAL INVESTIGATION FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (COMMENTS BY DTSC AND DTSC - GEOLOGICAL SERVICES UNIT) {SEE RECORD # 831 - DRAFT FINAL WORK PLAN}	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141
AR_M60050_002559 NONE CORRESPONDENCE NONE 2	**10-02-2001** 10-17-2001 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN AQUIFER TEST AT THE MAGAZINE ROAD LANDFILL (SEE RECORD # 2538 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141

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AR_M60050_002560 NONE CORRESPONDENCE NONE 8	**10-03-2001** 10-17-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN AQUIFER TEST AT THE MAGAZINE ROAD LANDFILL (SEE RECORD # 2538 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0059 30090141
AR_M60050_003498 NONE CORRESPONDENCE NONE 9	**10-03-2001** 05-05-2006 5090.3.A. NONE	SIMON, G. COUNTY OF ORANGE - SANTA ANA, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE TECHNICAL MEMORANDUM, VERIFICATION OF PERCHLORATE AT EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE [INCLUDES COMMENTS BY GEOSYNTEC CONSULTANTS DATED 01 OCTOBER 2001]	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_002765 NONE CORRESPONDENCE NONE 2	**10-17-2001** 07-01-2002 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN AQUIFER TEST AT THE MAGAZINE ROAD LANDFILL (SEE RECORD # 2538 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000002B OU 0000003 SITE 00002 SITE 00016	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0063 30090141

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AR_M60050_002957 GS-10F-0227J & SWDIV SER 06CC.DG/1117 REPORT N68711-00-F-0102 648	**10-22-2001** 04-08-2003 5090.3.A. NONE	THIBEAULT, S. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	FINAL GROUNDWATER MONITORING REPORT FEBRUARY 2001 MONITORING ROUND 13 (INCLUDES SWDIV TRANSMITTAL LETTER)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0067 30090141
AR_M60050_002579 NONE REPORT N62742-94-D-0048 101	**11-01-2001** 12-11-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	FINAL HEALTH AND SAFETY PLAN - PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_023	L181-06-0125 BX 0060 30090141

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AR_M60050_002580 NONE CORRESPONDENCE N62742-94-D-0048 3	**11-01-2001** 12-11-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO COMMENTS ON THE DRAFT FINAL HEALTH AND SAFETY PLAN FOR THE PHASE II REMEDIAL INVESTIGATION AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 826 - DRAFT FINAL H&SP) {COMMENTS BY DTSC - HUMAN AND ECOLOGICAL RISK DIVISION}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141
AR_M60050_002569 NONE CORRESPONDENCE NONE 4	**11-02-2001** 11-26-2001 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE TECHNICAL MEMORANDUM - FORMER BOMB ASSEMBLY AREA, AMMUNITION SUPPLY POINT; DTSC REQUIRES NO FURTHER ACTION FOR THE AREA (SEE RECORD # 2568 - TECH MEMO)	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000806 BLDG 0000807 BLDG 0000808 BLDG 0000809 BLDG 0000810 OU 0000002B OU 0000003 SITE 00001 SITE 00002	FRC - PERRIS IMAGED TORO_019	L181-06-0125 BX 0059 30090141
AR_M60050_002577 SWDIV SER 06CC.DG/1186 REPORT N62742-94-D-0048 146	**11-27-2001** 12-11-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORDS # 2868 - AMENDMENT NO. 1; # 2910 - AMENDMENT NO. 2; # 3051 - DRAFT FINAL AMENDMENT NO. 1; # 3214 - FINAL AMENDMENT NO. 1; AND # 3220 - AMENDMENT NO. 3)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0060 30090141

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AR_M60050_002574 CTO-0200/0327 MINUTES N68711-92-D-4670 29	**11-28-2001** 11-26-2001 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER INCLUDES: AGENDA & PUBLIC NOTICE, 19 SEPTEMBER 2001 MEETING MINUTES, & 30 MAY 2001 SUBCOMMITTEE MEETING MINUTES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH BLDG 0000307 OU 0000001 OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00004 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 TANK FARM 555	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141

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AR_M60050_002598 CTO-0200/0340 MINUTES N68711-92-D-4670 234	**11-28-2001** 01-16-2002 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS WHICH INCLUDES: RAB MEETING AGENDA/PUBLIC NOTICE, 19 SEPTEMBER MINUTES & 30 MAY SUBCOMMITTEE MEETING MINUTES, RAB MEETING SCHEDULE, NOVEMBER PROPOSED PLAN FOR GROUNDWATER, VARIOUS HANDOUTS, AGENCY COMMENTS AND LETTERS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00004 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00016 SITE 00017 SITE 00018 SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141

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AR_M60050_002588 NONE REPORT N62742-94-D-0048 347	**12-01-2001** 12-13-2001 5090.3.A. CTO 0072	SWENSSON, D. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	FINAL TECHNICAL MEMORANDUM PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE [INCLUDES SWDIV TRANSMITTAL LETTER]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002B OU 0000002C OU 0000003 OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_027	L181-06-0125 BX 0073 30090141
AR_M60050_002587 SWDIV SER 06CC.DG/1292 CORRESPONDENCE N62742-94-D-0048 12	**12-07-2001** 12-13-2001 5090.3.A. CTO 0072	GOULD, D. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	TRANSMITTAL OF THE COMPILED RESPONSE TO COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL RANGE {COMMENTS BY DHS, LRA, EPA}	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B OU 0000002C OU 0000003 OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141
AR_M60050_002589 3088.0 REPORT N62474-98-D-2076 151	**12-10-2001** 12-13-2001 5090.3.A. CTO 0073	RAWAL, D. IT CORPORATION HORNECKER, L. NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM - GROUNDWATER ELEVATION INFORMATION FROM SELECTED WELLS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000001 OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00005 SITE 00009 SITE 00017 SITE 00018	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141

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AR_M60050_002590 NONE REPORT N62742-94-D-0048 194	**12-17-2001** 12-20-2001 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN - ORDNANCE AND EXPLOSIVES RANGE EVALUATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE [INCLUDES SWDIV TRANSMITTAL LETTER BY D. GOULD]	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0060 30090141
AR_M60050_002830 NONE CORRESPONDENCE NONE 3	**01-03-2002** 11-19-2002 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE FINAL WORK PLAN ORDNANCE AND EXPLOSIVES RANGE EVALUATION AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE - DTSC APPROVES WORK PLAN (SEE RECORD # 2590 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_002758 NONE MINUTES NONE 8	**01-10-2002** 06-06-2002 5090.3.A. NONE	BROWN, G. NAVFAC - SOUTHWEST HANNON, P. CRWQCB - RIVERSIDE, CA	08 JANUARY 2002 KICKOFF MEETING HANDOUTS FOR THE ORDNANCE AND EXPLOSIVES RANGE EVALUATION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0063 30090141
AR_M60050_002833 NONE CORRESPONDENCE NONE 2	**01-18-2002** 11-19-2002 5090.3.A. NONE	BAILEY, D. CALIFORNIA DEPARTMENT OF HEALTH SERVICES - SACRAMENTO, CA CHESNEY, T. DTSC - CYPRESS, CA	REVIEW OF THE RESPONSE TO COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM PHASE II EVALUATION OF RADIONUCLIDES IN GROUNDWATER AT FORMER LANDFILL SITES AND THE EXPLOSIVE ORDNANCE DISPOSAL RANGE - DHS STATES THAT THEIR COMMENTS HAVE BEEN ADEQUATELY ADDRESSED	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00017 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141

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AR_M60050_002601 CTO-0200/0343 MINUTES N68711-92-D-4670 34	**01-30-2002** 01-17-2002 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER - INCLUDES AGENDA AND PUBLIC NOTICE AND MINUTES AND ATTACHMENTS FROM THE 28 NOVEMBER 2001 RAB MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH AA 0000003 BLDG 0000307 OU 0000002A OU 0000002B OU 0000002C OU 0000003 OU 0000003B SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00007 SITE 00008 SITE 00011 SITE 00012 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141

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AR_M60050_002607 CTO-0200/0360 MINUTES N68711-92-D-4670 188	**01-30-2002** 03-07-2002 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) PUBLIC INFORMATION MATERIALS - INCLUDES AGENDA, PUBLIC NOTICE AND MINUTES FROM 19 SEP 2001 MEETING, AGENCY COMMENTS & LETTERS, VARIOUS PRESENTATION AND INFORMATION MATERIALS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH AA 0000003 BLDG 0000307 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 0001789 BLDG 0001803 OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00016 SITE 00017	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0060 30090141

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AR_M60050_002608 GS-10F-0227J & SWDIV SER 06CC/0152 REPORT N68711-00-F-0102 865	**02-14-2002** 03-07-2002 5090.3.A. NONE	THIBEAULT, S. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	FINAL GROUNDWATER MONITORING REPORT SEPTEMBER 2001 MONITORING ROUND 14 [INCLUDES SWDIV TRANSMITTAL LETTER BY D. GOULD]	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0061 30090141
AR_M60050_004279 SWDIV SER 06CC.DG/0163 CORRESPONDENCE NONE 5	**02-19-2002** 04-21-2008 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION SCANDURA, J. DTSC - CYPRESS, CA	REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION FOR PRIMARY DOCUMENTS (INCLUDES APPENDIX A SCHEDULE)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_002772 NONE CORRESPONDENCE NONE 1	**02-21-2002** 07-01-2002 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	APPROVAL OF REQUEST FOR FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION FOR PRIMARY DOCUMENTS [SEE RECORD # 4279 - REQUEST FOR FFA SCHEDULE EXTENSION FOR PRIMARY DOCUMENTS]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0063 30090141

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AR_M60050_003549 NONE CORRESPONDENCE NONE 6	**02-22-2002** 05-30-2006 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT BASE REALIGNMENT AND CLOSURE (BRAC) BUSINESS PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B PARCEL 0005A PARCEL 0012B PARCEL 0013E SITE 00001 SITE 00002 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_002835 NONE CORRESPONDENCE NONE 6	**02-27-2002** 11-19-2002 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO REQUEST FOR EXTENSION TO THE FEDERAL FACILITY AGREEMENT FOR SUBMITTAL OF THE DRAFT REMEDIAL INVESTIGATION REPORT FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE - DTSC GRANTS REQUEST	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_002615 NONE REPORT N62742-94-D-0048 102	**03-07-2002** 04-10-2002 5090.3.A. CTO 0078	WANYOIKE, C. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	WORK PLAN - AQUIFER TEST FOR THE MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00002	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0061 30090141
AR_M60050_002838 NONE CORRESPONDENCE NONE 9	**03-08-2002** 11-19-2002 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT RECORD OF DECISION FOR OPERABLE UNITS AND THE DRAFT RESPONSIVENESS SUMMARY FOR THE REGIONAL VOLATILE ORGANIC COMPOUND GROUNDWATER PLUME AND THE VOC SOURCE AREA (SEE RECORDS # 2596 - ROD AND # 2603 - SUMMARY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141

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AR_M60050_002614 CTO-0200/0371 MINUTES N68711-92-D-4670 35	**03-27-2002** 04-04-2002 5090.3.A. CTO 0200	BECHTEL NATIONAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER - INCLUDES AGENDA AND PUBLIC NOTICE FOR THE 27 MARCH 2002 MEETING WITH MINUTES AND ATTACHMENTS FROM THE 30 JANUARY 2002 RAB MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH AA 0000003 BLDG 0000307 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0061 30090141
AR_M60050_002631 CTO-0038/0014 MINUTES N68711-95-D-7526 190	**03-27-2002** 05-21-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS INCLUDING: RESTORATION ADVISORY BOARD MEETING AGENDA & PUBLIC NOTICE FROM 27 MARCH 2002 MEETING; MINUTES FROM THE 30 JANUARY 2002 RAB MEETING; INFORMATION SHEETS; VARIOUS REGULATORY AGENCY LETTERS, & PRESENTATION MATERIALS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_023	L181-06-0125 BX 0061 30090141

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AR_M60050_003234 NONE REPORT NONE 50	**04-01-2002** 02-24-2005 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION MCAS EL TORO - SANTA ANA, CA	BASE REALIGNMENT AND CLOSURE (BRAC) BUSINESS PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AST 000314 AST 000315 AST 000658 BLDG 0000046 BLDG 0000083 BLDG 0000133 BLDG 0000312 BLDG 0000656 BLDG 0000791 BLDG 0000839 BLDG 0000873 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019	CHOICE IMAGING SOLUTIONS SW-20101008-2/7	

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					SITE 00020 SITE 00021 SITE 00022 SITE 00024 SITE 00025 TAA 000007B TAA 000651B UST 000800G		
AR_M60050_002617 SWDIV SER 06CC.GB/0327 CORRESPONDENCE NONE 15	**04-04-2002** 04-10-2002 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL AQUIFER TEST WORK PLAN (SEE RECORD # 2615 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_020	L181-06-0125 BX 0061 30090141
AR_M60050_002890 SWDIV SER 96CC.GB/0489 CORRESPONDENCE NONE 2	**05-07-2002** 12-12-2002 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION CHESNEY, T. DTSC - CYPRESS, CA	REQUEST FOR TIMELY CONCURRENCE AND RESPONSE ON THE NAVY'S APPROACH TO ADDRESSING LATERAL DEFORMATION TO THE LANDFILL CAP PROPOSED AT THE MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0065 30090141
AR_M60050_004309 NONE CORRESPONDENCE NONE 3	**05-10-2002** 05-30-2008 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. MCAS EL TORO - SANTA ANA, CA	RESPONSE TO REQUEST FOR TIMELY CONCURRENCE AND RESPONSE ON THE NAVY'S APPROACH TO ADDRESSING LATERAL DEFORMATION TO THE LANDFILL CAP PROPOSED AT THE MAGAZINE ROAD LANDFILL [SEE RECORD # 2890 - REQUEST FOR TIMELY CONCURRENCE AND RESPONSE]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	

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AR_M60050_002759 CTO-0038/0018 MINUTES N68711-95-D-7526 34	**05-29-2002** 06-06-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD MEETING MAILER - RAB MEETING AGENDA AND PUBLIC NOTICE WITH MINUTES AND SIGN-IN SHEETS FROM THE 27 MARCH 2002 MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH AA 0000003 BLDG 0000307 OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00011 SITE 00016 SITE 00017 SITE 00018 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0063 30090141
AR_M60050_002792 CTO-0038/0045 MINUTES N68711-95-D-7526 159	**05-29-2002** 08-27-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FOR THE 29 MAY 2002 RESTORATION ADVISORY BOARD MEETING AGENDA & PUBLIC NOTICE; MINUTES FROM THE 27 MARCH 2002 RAB MEETING; INFORMATION SHEETS; VARIOUS REGULATORY AGENCY LETTERS, & PRESENTATION MATERIALS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0064 30090141

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AR_M60050_002846 NONE CORRESPONDENCE NONE 4	**06-26-2002** 11-20-2002 5090.3.A. NONE	HANNON, P. CRWQCB - RIVERSIDE, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON APPENDIX C OF THE WORK PLAN - AQUIFER TEST FOR THE MAGAZINE ROAD LANDFILL (SEE RECORD # 2615 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH OU 0000002B SITE 00002	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_002786 CTO-0038/0033 MINUTES N68711-95-D-7526 27	**07-31-2002** 08-27-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD MEETING AGENDA & PUBLIC NOTICE FOR 31 JULY MEETING AND MINUTES & ATTACHMENTS FROM 29 MAY 2002 MEETING (INCLUDES MAILING LIST)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0064 30090141
AR_M60050_002820 CTO-0038/0070 MINUTES N68711-95-D-7526 177	**07-31-2002** 10-17-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FOR THE 31 JULY 2002 RESTORATION ADVISORY BOARD MEETING [INCLUDES AGENDA, MINUTES, VARIOUS HANDOUTS, 29 MAY 2002 AND 27 MARCH 2002 RAB SUBCOMMITTEE MEETING MINUTES, GUIDANCE DOCUMENTS AND PRESENTATION MATERIALS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH BLDG 0000435 OU 0000001 OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0064 30090141

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AR_M60050_002853 NONE CORRESPONDENCE NONE 6	**08-15-2002** 11-20-2002 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT FINAL CONSTRUCTION QUALITY CONTROL PLAN AND DRAFT FINAL CONTINGENCY PLAN AT THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS (SEE RECORDS # 2782 - CONTINGENCY PLAN AND # 2783 - CONSTRUCTION QC PLAN)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_002854 NONE CORRESPONDENCE NONE 2	**08-15-2002** 11-20-2002 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT FINAL CONSTRUCTION QUALITY CONTROL PLAN AND DRAFT FINAL CONTINGENCY PLAN AT THE MAGAZINE ROAD AND COMMUNICATION STATION LANDFILLS (SEE RECORDS # 2782 - CONTINGENCY PLAN AND # 2783 - CONSTRUCTION QC PLAN)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_002858 SWDIV SER 06CC.GB/0993 CORRESPONDENCE NONE 3	**09-20-2002** 11-20-2002 5090.3.A. NONE	GOULD, D. NAVFAC - SOUTHWEST DIVISION BRODERICK, J. CRWQCB - RIVERSIDE, CA	REQUEST FOR COMPATIBLE DATES FOR A CONFERENCE CALL TO RESOLVE ISSUES RELATED TO THE MAGAZINE ROAD LANDFILL AQUIFER TEST	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000002B OU 0000003 SITE 00001 SITE 00002	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_000373 CTO-0038/0086 MINUTES N68711-95-D-7526 211	**09-25-2002** 11-20-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS: RESTORATION ADVISORY BOARD MEETING AGENDA & PUBLIC NOTICE FOR 25 SEPTEMBER 2002, MINUTES AND MATERIALS FROM 31 JULY 2002 MEETING, PRESENTATION OF PROPOSED PLAN, VARIOUS PRESENTATION MATERIALS, AND HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0010 30090141

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AR_M60050_002824 CTO-0038/0064 MINUTES N68711-95-D-7526 29	**09-25-2002** 10-17-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	25 SEPTEMBER 2002 RESTORATION ADVISORY BOARD MEETING MAILER [INCLUDES AGENDA, PUBLIC NOTICE, MINUTES, AND 31 JULY 2002 MEETING MINUTES, AND SIGN-IN SHEETS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000002A OU 0000002B OU 0000003 SITE 00001 SITE 00002 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_021	L181-06-0125 BX 0065 30090141
AR_M60050_002897 NONE CORRESPONDENCE NONE 4	**10-21-2002** 12-12-2002 5090.3.A. NONE	YUEN, A. U.S. DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE - CARLSBAD, CA GOULD, D. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE BASE REALIGNMENT AND CLOSURE (BRAC) TEAM MEETING OF 25 SEPTEMBER 2002 AND THE DRAFT WORK PLAN PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE (SEE RECORD # 529 - WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0066 30090141
AR_M60050_002917 NONE CORRESPONDENCE NONE 8	**11-14-2002** 01-27-2003 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA PISZKIN, F. NAVFAC - SOUTHWEST DIVISION	REVIEW AND COMMENTS ON THE DRAFT HEALTH AND SAFETY PLAN, PRELIMINARY ASSESSMENT OF POTENTIAL RELEASE LOCATIONS, ENVIRONMENTAL BASELINE SURVEY (WITH ENCLOSURE)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0066 30090141
AR_M60050_002868 NONE REPORT N62742-94-D-0048 18	**11-21-2002** 12-09-2002 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	AMENDMENT NO. 1 TO THE FINAL WORK PLAN PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0065 30090141

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AR_M60050_002903 CTO-0038/0092 MINUTES N68711-95-D-7526 27	**12-04-2002** 12-12-2002 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD MEETING MAILER - RAB MEETING AGENDA & PUBLIC NOTICE FOR 4 DECEMBER 2002 MEETING AND MINUTES & ATTACHMENTS FROM THE 25 SEPTEMBER 2002 MEETING (INCLUDES MAILING LIST AND SIGN-IN SHEETS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0066 30090141
AR_M60050_002910 NONE REPORT N62742-94-D-0048 18	**12-04-2002** 01-27-2003 5090.3.A. CTO 0072	EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	AMENDMENT NO. 2 TO WORK PLAN PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0066 30090141
AR_M60050_002921 CTO-0038/0116 MINUTES N68711-95-D-7526 143	**12-04-2002** 01-30-2003 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FROM THE RESTORATION ADVISORY BOARD MEETING HELD ON 04 DECEMBER 2002 - INCLUDES AGENDA, MEETING MINUTES FROM THE 25 SEPTEMBER 2002 MEETING AND VARIOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH SITE 00002 SITE 00003 SITE 00005 SITE 00017	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0066 30090141

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AR_M60050_002908 CTO-0038/0112 MINUTES N68711-95-D-7526 26	**01-29-2003** 01-27-2003 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. RESTORATION ADVISORY BOARD	RESTORATION ADVISORY BOARD MEETING MAILER - INCLUDES RAB MEETING AGENDA, PUBLIC NOTICE FOR 29 JANUARY 2003 MEETING, AND MINUTES FROM THE 04 DECEMBER 2002 MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00024 SITE 00025	FRC - PERRIS IMAGED TORO_022	L181-06-0125 BX 0066 30090141
AR_M60050_003562 NONE CORRESPONDENCE NONE 1	**02-03-2003** 05-31-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE ECOLOGICAL RISK ASSESSMENT (ERA) MEMORANDUM, PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003563 NONE CORRESPONDENCE NONE 1	**02-03-2003** 05-31-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE AMENDMENT NO. 2 TO WORK PLAN, PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_003564 NONE CORRESPONDENCE NONE 8	**02-03-2003** 05-31-2006 5090.3.A. NONE	CHESNEY, T. DTSC - CYPRESS, CA PISZKIN, F. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT RECORD OF DECISION, CRASH CREW TRAINING PIT NO. 2	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00011 SITE 00016 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_002948 SWDIV SER 06CC.MS/0439 REPORT N68711-00-D-0004 1026	**02-07-2003** 04-08-2003 5090.3.A. DO 0006	CLIFFORD, R. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	FINAL GROUNDWATER MONITORING REPORT SEPTEMBER 2002 MONITORING ROUND 16	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00015 SITE 00016 SITE 00017 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00024	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0067 30090141
AR_M60050_003597 NONE CORRESPONDENCE NONE 1	**03-25-2003** 07-12-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA DOUCHAND, L. MCAS EL TORO - SANTA ANA, CA	CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST FOR THE SUBMITTAL OF THE REMEDIAL DESIGN AND REMEDIAL ACTION DOCUMENTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_002966 CTO-0038/0162 MINUTES N68711-95-D-7526 145	**03-26-2003** 05-08-2003 5090.3.A. CTO 0038	COLEMAN, B. BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FOR THE 26 MARCH 2003 RESTORATION ADVISORY BOARD MEETING - INCLUDES AGENDA, PUBLIC NOTICE, MEETING MINUTES FROM 29 JANUARY 2003 MEETING AND VARIOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0067 30090141
AR_M60050_003598 NONE CORRESPONDENCE NONE 3	**03-26-2003** 07-12-2006 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA DOUCHAND, L. BRAC PMO WEST	APPROVAL OF FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR THE SUBMITTAL OF THE FINAL REMEDIAL DESIGN, CONSTRUCTION QUALITY CONTROL AND ASSURANCE PLAN, AND CONTINGENCY PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_002965 SWDIV SER 06CC.DD/0746 REPORT N62742-94-D-0048 13	**05-01-2003** 05-08-2003 5090.3.A. CTO 0072	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	INVESTIGATION DERIVED WASTE (IDW) DISPOSAL PLAN - SOIL AND WATER	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	FRC - PERRIS IMAGED TORO_027	L181-06-0125 BX 0073 30090141
AR_M60050_002962 CTO-0038/0161 PUBLIC NOTICE N68711-95-D-7526 3	**05-03-2003** 05-08-2003 5090.3.A. CTO 0038	COLEMAN, B. BECHTEL ENVIRONMENTAL, INC. PUBLIC	PUBLIC NOTICE FOR THE RESTORATION ADVISORY BOARD SITE TOUR ON 03 MAY 2003	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00024	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0067 30090141
AR_M60050_003610 NONE CORRESPONDENCE NONE 1	**05-15-2003** 07-14-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. BRAC PMO WEST	CONCERNS REGARDING THE DATA COLLECTED DURING THE AQUIFER TEST	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_002971 CTO-0038/0170 MINUTES N68711-95-D-7526 24	**05-28-2003** 05-22-2003 5090.3.A. CTO 0038	BECHTEL ENVIRONMENTAL, INC. RESTORATION ADVISORY BOARD	28 MAY 2003 RESTORATION ADVISORY BOARD (RAB) MEETING AGENDA [INCLUDES PUBLIC NOTICE, 26 MARCH 2003 MEETING MINUTES, SIGN IN SHEET]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00001 SITE 00011	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0068 30090141
AR_M60050_003617 NONE CORRESPONDENCE NONE 15	**06-16-2003** 07-14-2006 5090.3.A. NONE	ABBASI, R. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT SCREENING ECOLOGICAL RISK ASSESSMENT (ERA), PHASE II REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003180 NONE CORRESPONDENCE NONE 3	**06-17-2003** 10-15-2004 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT SCREENING ECOLOGICAL RISK ASSESSMENT, REMOVAL SITE EVALUATION (DOCUMENT WAS NOT SUBMITTED TO ADMINISTRATIVE RECORDS)	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0072 30090141
AR_M60050_003626 NONE CORRESPONDENCE NONE 1	**07-17-2003** 07-14-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE EXTENSION REQUEST TO FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE FOR THE FINAL REMEDIAL DESIGN, THE DRAFT OPERATION AND MAINTENANCE PLAN, AND THE DRAFT REMEDIAL ACTION CLOSEOUT REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003628 NONE CORRESPONDENCE NONE 3	**07-24-2003** 07-14-2006 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE 7-WEEK EXTENSION REQUEST TO THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE FOR THE POST-RECORD OF DECISION (ROD)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	APHO 00044 SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003629 NONE CORRESPONDENCE NONE 4	**07-24-2003** 07-14-2006 5090.3.A. NONE	ABBASI, R. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT RADIOLOGICAL RELEASE REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	APHO 00044 SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	

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AR_M60050_002996 SWDIV SER 06CC.AP/1091 REPORT N68711-00-D-0004 419	**07-25-2003** 08-06-2003 5090.3.A. DO 0006	CLIFFORD, R. CDM FEDERAL PROGRAMS CORP. CLIFFORD, R. NAVFAC - SOUTHWEST DIVISION	FINAL GROUNDWATER MONITORING REPORT MARCH 2003 MONITORING ROUND 17 [INCLUDES SWDIV TRANSMITTAL LETTER BY A. PISZKIN]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0068 30090141
AR_M60050_003013 CTO-0060/0015 MINUTES N68711-95-D-7526 211	**07-30-2003** 10-30-2003 5090.3.A. CTO 0060	BECHTEL ENVIRONMENTAL, INC. RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MATERIALS FROM THE 30 JULY 2003 RESTORATION ADVISORY BOARD (RAB) MEETING - INCLUDES AGENDA AND RAB MEETING MINUTES FROM 28 MAY 2003 MEETING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00001 SITE 00011	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0069 30090141
AR_M60050_003032 SWDIV SER 06CC.AP/1126 CORRESPONDENCE NONE 6	**08-01-2003** 01-13-2004 5090.3.A. NONE	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	LETTER REQUESTING AN EXTENSION TO THE FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE FOR PRIMARY DOCUMENTS	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_027	L181-06-0125 BX 0069 30090141
AR_M60050_003631 NONE CORRESPONDENCE NONE 1	**08-06-2003** 07-14-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE REQUEST FOR AN EXTENSION TO THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE FOR THE DRAFT REMEDIAL INVESTIGATION, EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003635 NONE CORRESPONDENCE NONE 3	**08-19-2003** 07-17-2006 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) 15-MONTH EXTENSION REQUEST FOR THE DRAFT REMEDIAL INVESTIGATION, DRAFT FEASIBILITY STUDY, DRAFT PROPOSED PLAN, AND DRAFT RECORD OF DECISION (ROD) AT THE EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	

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AR_M60050_003000 NONE REPORT NONE 20	**08-26-2003** 09-08-2003 5090.3.A. NONE	WEIDEMEIER, T. WEIDEMEIER & ASSOCIATES SMITS, M. NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM - RECOMMENDATIONS FOR WELLS INSTALLATION LOCATIONS AND AQUIFER AND GROUNDWATER ANALYTICAL DATA REQUIRED FOR EVALUATING MONITORED NATURAL ATTENUATION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00002 SITE 00016 SITE 00017 WELL 00001 WELL 00002 WELL 00003 WELL 00004 WELL 00005 WELL 00007 WELL 00009 WELL 00010 WELL 00011 WELL 00012 WELL 00013 WELL 00014D WELL 00014S	CHOICE IMAGING SOLUTIONS SW-20100702-7/8	
AR_M60050_003009 SWDIV SER 0CC.GB/1244 CORRESPONDENCE NONE 6	**09-02-2003** 10-23-2003 5090.3.A. NONE	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	LETTER REQUESTING 4 WEEK EXTENSIONS FOR THE REMAINING OPERABLE UNIT LANDFILL SITES POST-RECORD OF DECISION (ROD) FEDERAL FACILITY AGREEMENT (FFA) PRIMARY DELIVERABLES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0068 30090141
AR_M60050_003637 NONE CORRESPONDENCE NONE 1	**09-05-2003** 07-17-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. BRAC PMO WEST	REVIEW AND NO COMMENTS ON THE MEMORANDUM, AMENDED SITE INVESTIGATION DERIVED DISPOSAL PLAN - SOIL, WATER, AND RADIOLOGICAL ITEMS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003639 NONE CORRESPONDENCE NONE 1	**09-10-2003** 07-17-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FINAL GROUNDWATER MONITORING REPORT, MARCH 2003, MONITORING ROUND 17	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	

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AR_M60050_003178 NONE CORRESPONDENCE NONE 6	**09-18-2003** 10-15-2004 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. NAVFAC - SOUTHWEST DIVISION	COMMENTS ON THE DRAFT SCREENING ECOLOGICAL RISK ASSESSMENT (ERA) (DRAFT ERA WAS NOT SUBMITTED TO ADMINISTRATIVE RECORDS)	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0072 30090141
AR_M60050_003642 NONE CORRESPONDENCE NONE 3	**09-19-2003** 07-17-2006 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) 4-WEEK EXTENSION REQUEST FOR THE FINAL REMEDIAL DESIGN, DRAFT OPERATIONS AND MAINTENANCE PLAN, AND DRAFT REMEDIAL ACTION CLOSEOUT REPORTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003004 CTO-0060/0006 MINUTES N68711-95-D-7526 32	**09-24-2003** 10-09-2003 5090.3.A. CTO 0060	BECHTEL ENVIRONMENTAL, INC. RESTORATION ADVISORY BOARD	RESTORATION ADVISORY BOARD 24 SEPTEMBER 2003 MEETING AGENDA INCLUDES 30 JULY 2003 MEETING MINUTES, AND SIGN-IN SHEETS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00002 SITE 00008 SITE 00012 SITE 00017	FRC - PERRIS IMAGED TORO_024	L181-06-0125 BX 0068 30090141
AR_M60050_003189 SWDIV SER 06CC.AP/1333 CORRESPONDENCE NONE 4	**09-30-2003** 10-20-2004 5090.3.A. NONE	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENTION REQUEST	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0072 30090141
AR_M60050_003662 NONE CORRESPONDENCE NONE 1	**10-09-2003** 07-25-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST FOR THE FINAL REMEDIAL DESIGN (RD) AND REMEDIAL ACTION (RA)	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	

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AR_M60050_003666 NONE CORRESPONDENCE NONE 7	**11-06-2003** 07-25-2006 5090.3.A. NONE	ABBASI, R. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FINAL GROUNDWATER MONITORING REPORT, MARCH 2003 MONITORING ROUND 17 (INCLUDES GEOLOGICAL SERVICES UNIT COMMENTS DATED 03 NOVEMBER 2003)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	
AR_M60050_003667 NONE CORRESPONDENCE NONE 2	**11-06-2003** 07-25-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FINAL FINDING OF SUITABILITY TO LEASE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00016	CHOICE IMAGING SOLUTIONS SW-20100702-8/8	
AR_M60050_003010 6576.1 & 6576.0 REPORT N62474-98-D-2076 200	**11-07-2003** 10-23-2003 5090.3.A. CTO 0087	RAWAL, D. SHAW ENVIRONMENTAL, INC. CROOK, M. NAVFAC - SOUTHWEST DIVISION	SUMMARY REPORT FOR THE AQUIFER TEST AND TREATMENT FIELD ACTIVITIES FOR THE MAGAZINE ROAD LANDFILL, REVISION 1 (INCLUDES REVISION PAGES CONVERTING THE ORIGINAL REPORT, DATED 10 OCTOBER 2003, TO REVISION 1)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20100702-7/8	
AR_M60050_003021 NONE MINUTES NONE 20	**12-03-2003** 12-03-2003 5090.3.A. NONE	NAVFAC - SOUTHWEST DIVISION RESTORATION ADVISORY BOARD	PUBLIC INFORMATION MEETING MAILER FOR THE 03 DECEMBER 2003 RESTORATION ADVISORY BOARD MEETING - INCLUDES AGENDA, PUBLIC NOTICE, MEETING MINUTES FROM 24 SEPTEMBER 2003 MEETING AND VARIOUS HANDOUTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018	FRC - PERRIS IMAGED TORO_027	L181-06-0125 BX 0069 30090141

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AR_M60050_003043 CTO-0060/0050 MINUTES N68711-95-D-7526 100	**12-03-2003** 01-22-2004 5090.3.A. CTO 0060	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FOR THE 03 DECEMBER 2003 RESTORATION ADVISORY BOARD MEETING (INCLUDES AGENDA, PUBLIC NOTICE, MEETING MINUTES FROM 24 SEPTEMBER 2003 MEETING AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 WELL TIC-55	CHOICE IMAGING SOLUTIONS SW-20100604-10/10	
AR_M60050_003668 NONE CORRESPONDENCE NONE 6	**12-08-2003** 07-25-2006 5090.3.A. NONE	ABBASI, R. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT RADIOLOGICAL SAMPLING AMENDMENT TO RADIOLOGICAL SURVEY PLAN (INCLUDES DEPARTMENT OF HEALTH SERVICES COMMENTS DATED 24 NOVEMBER 2003)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	
AR_M60050_003074 SWDIV SER 06CC.GB/1574 CORRESPONDENCE NONE 3	**12-16-2003** 05-03-2004 5090.3.A. NONE	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT FINAL UNSAT-H MODELING REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20100730-4/4	

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AR_M60050_003063 SWDIV SER 06CC.AP/0001 CORRESPONDENCE NONE 6	**01-02-2004** 04-19-2004 5090.3.A. NONE	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0070 30090141
AR_M60050_003809 NONE CORRESPONDENCE NONE 3	**01-13-2004** 11-21-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL TECHNICAL MEMORANDUM UNSAT-H MODELING REPORT, LANDFILL COVERS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003811 NONE CORRESPONDENCE NONE 3	**01-30-2004** 11-21-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FINAL TECHNICAL MEMORANDUM, UNSAT-H MODELING FOR LANDFILL COVERS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003812 NONE CORRESPONDENCE NONE 1	**02-05-2004** 11-21-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003813 NONE CORRESPONDENCE NONE 3	**02-06-2004** 11-21-2006 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST, LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003064 CTO-0060/0069 MINUTES N68711-95-D-7526 165	**03-31-2004** 04-19-2004 5090.3.A. CTO 0060	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	31 MARCH 2004 68TH RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS [INCLUDES AGENDA, PUBLIC NOTICE, AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH SITE 00001 SITE 00003 SITE 00005	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0070 30090141

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AR_M60050_003082 CTO-0060/0080 MINUTES N68711-95-D-7526 27	**03-31-2004** 05-24-2004 5090.3.A. CTO 0060	BECHTEL ENVIRONMENTAL, INC. SON, C. NAVFAC - SOUTHWEST DIVISION	RESTORATION ADVISORY BOARD (RAB) MEETING MAILER, MEETING AGENDA AND PUBLIC NOTICE FOR 26 MAY 2004, RAB MEETING MINUTES, ATTACHMENTS FROM THE 31 MARCH 2004 MEETING, DATED MAY 2004	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00001 SITE 00003 SITE 00005 SITE 00011	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0070 30090141
AR_M60050_003121 NONE REPORT N68711-00-D-0004 350	**04-16-2004** 08-03-2004 5090.3.A. DO 0006	CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	FINAL GROUNDWATER MONITORING REPORT, SEPTEMBER 2003 MONITORING ROUND 18 (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101008-1/7	
AR_M60050_003078 SWDIV SER 06CC.AP/0465 CORRESPONDENCE NONE 5	**04-26-2004** 05-04-2004 5090.3.A. NONE	PISZKIN, F. NAVFAC - SOUTHWEST DIVISION MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST, REMEDIAL ACTION SCHEDULE INSTALLATION RESTORATION (IR) PROGRAM	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	FRC - PERRIS IMAGED TORO_025	L181-06-0125 BX 0070 30090141
AR_M60050_003823 NONE CORRESPONDENCE NONE 2	**05-04-2004** 11-22-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR LANDFILL SITES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003825 NONE CORRESPONDENCE NONE 2	**05-19-2004** 11-22-2006 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL SAMPLING AND ANALYSIS PLAN (SAP), AMENDMENT NO. 1, PHASE II REMEDIAL INVESTIGATION (RI)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	

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AR_M60050_003826 NONE CORRESPONDENCE NONE 7	**05-24-2004** 11-22-2006 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL SAMPLING AND ANALYSIS PLAN (SAP), AMENDMENT NO. 1, PHASE II REMEDIAL INVESTIGATION [INCLUDES CALIFORNIA DEPARTMENT OF FISH AND GAME COMMENTS DATED 13 MAY 2004]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003115 CTO-0060/0102 MINUTES N68711-95-D-7526 26	**05-26-2004** 07-15-2004 5090.3.A. CTO 0060	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS PACKAGE FOR THE 28 JULY 2004 RESTORATION ADVISORY BOARD (RAB) MEETING [INCLUDES 28 JULY 2004 AGENDA AND PUBLIC NOTICE, 26 MAY 2004 MEETING MINUTES AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	FRC - PERRIS IMAGED TORO_027	L181-06-0125 BX 0070 30090141
AR_M60050_004095 NONE CORRESPONDENCE NONE 2	**06-03-2004** 10-16-2007 5090.3.A. NONE	MOUTOUX, N. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NON-CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR THE REMEDIAL INVESTIGATION REPORT AND THE SUBSEQUENT DOCUMENTS EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_004097 NONE CORRESPONDENCE NONE 3	**06-04-2004** 10-16-2007 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NON-CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR THE REMEDIAL INVESTIGATION REPORT AND SUBSEQUENT DOCUMENT, EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	

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AR_M60050_003174 6858 REPORT N68711-00-D-0004 350	**06-30-2004** 10-08-2004 5090.3.A. DO 0072	KUKRETI, A. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	WORK PLAN FOR SITE ASSESSMENTS AT TEMPORARY ACCUMULATION AREAS AND SOLID WASTE MANAGEMENT UNITS (INCLUDES REPLACEMENT PAGES THAT INCORPORATE THE COMMENTS FOR THE WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000002 BLDG 0000051 BLDG 0000139 BLDG 0000151 BLDG 0000155 BLDG 0000297 BLDG 0000306 BLDG 0000388 BLDG 0000634 BLDG 0000671 BLDG 0000672 HANGAR 0002 SITE 00002 SITE 00051 SWMU 00033 SWMU 00039 SWMU 00043 SWMU 00078 SWMU 00079 SWMU 00080 SWMU 00081 SWMU 00082 SWMU 00089 SWMU 00116 SWMU 00172 SWMU 00177 SWMU 00251 TAA 000002 TAA 000051 TAA 000115 TAA 000297 TAA 000388A TAA 000388B TAA 000634 TAA 000671	CHOICE IMAGING SOLUTIONS SW-20101008-1/7	

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					TAA 000672		
AR_M60050_003118 6775 REPORT N62474-98-D-2076 135	**07-13-2004** 07-26-2004 5090.3.A. CTO 0109	BACON, W. SHAW ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN FOR REMOVAL OF MUNITIONS AND EXPLOSIVES OF CONCERN SCRAP AND NON-MUNITIONS AND EXPLOSIVES OF CONCERN SCRAP FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE" SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_028	L181-06-0125 BX 0070 30090141
AR_M60050_003255 NONE REPORT N68711-00-D-0004 300	**08-31-2004** 04-13-2005 5090.3.A. DO 0006	CLIFFORD, R. CDM FEDERAL PROGRAMS CORP. NAVFAC - SOUTHWEST DIVISION	MARCH 2004 FINAL GROUNDWATER MONITORING REPORT ROUND 19 (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024 WELL 00002_DGMW60 WELL 00002_DGMW61	CHOICE IMAGING SOLUTIONS SW-20101008-4/7	
AR_M60050_003166 CTO-0060/0132 MINUTES N68711-95-D-7526 24	**09-29-2004** 09-22-2004 5090.3.A. CTO 0060	BECHTEL ENVIRONMENTAL, INC. NAVFAC - SOUTHWEST DIVISION	29 SEPTEMBER 2004 71ST RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS [INCLUDES AGENDA, PUBLIC NOTICE, 29 SEPTEMBER 2004 MEETING MINUTES, SIGN IN SHEET AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE" SEARCH SITE 00001 SITE 00002 SITE 00008 SITE 00012 SITE 00017 SITE 00025	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0071 30090141

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AR_M60050_003211 NONE MINUTES N68711-00-D-0004 23	**12-01-2004** 12-08-2004 5090.3.A. DO 0069	CDM BROWN AND CALDWELL NAVFAC - SOUTHWEST	01 DECEMBER 2004 72ND RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS [INCLUDES AGENDA, PUBLIC NOTICE, 29 SEPTEMBER 2004 MEETING MINUTES, AND SIGN IN SHEET]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	"PERCHLORATE " SEARCH SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00017 SITE 00025	FRC - PERRIS IMAGED TORO_028	L181-06-0125 BX 0072 30090141
AR_M60050_003214 NONE REPORT N62742-94-D-0048 84	**12-01-2004** 12-27-2004 5090.3.A. CTO 0072	CHEN, H. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	FINAL SAMPLING AND ANALYSIS PLAN AMENDMENT NO. 1, PHASE II REMEDIAL INVESTIGATION (SEE RECORDS # 2577 - FINAL WORK PLAN; # 2868 - AMENDMENT NO. 1; # 2910 - AMENDMENT NO. 2; # 3051 - DRAFT FINAL AMENDMENT NO. 1; AND # 3220 - AMENDMENT NO. 3)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0072 30090141
AR_M60050_003218 126463/003-3 MINUTES N68711-00-D-0004 100	**12-01-2004** 01-13-2005 5090.3.A. DO 0069	BROWN AND CALDWELL NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS FOR THE 01 DECEMBER 2004 72ND RESTORATION ADVISORY BOARD MEETING (INCLUDES AGENDA, PUBLIC NOTICE, 29 SEPTEMBER 2004 MEETING MINUTES, SIGN-IN SHEET AND VARIOUS HANDOUTS) [ALSO INCLUDES PRIVACY ACT INFORMATION]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101008-2/7	
AR_M60050_003220 NONE REPORT N62742-94-D-0048 24	**01-11-2005** 01-25-2005 5090.3.A. CTO 0072	CHEN, H. EARTH TECH, INC. NAVFAC - SOUTHWEST DIVISION	SAMPLING AND ANALYSIS PLAN AMENDMENT NO. 3 FOR THE PHASE II REMEDIAL INVESTIGATION (SEE RECORDS # 2577 - FINAL WORK PLAN; # 2868 - AMENDMENT NO. 1; # 2910 - AMENDMENT NO. 2; # 3051 - DRAFT FINAL AMENDMENT NO. 1; AND # 3214 - FINAL AMENDMENT NO. 1)	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001	FRC - PERRIS IMAGED TORO_026	L181-06-0125 BX 0072 30090141
AR_M60050_003703 NONE CORRESPONDENCE NONE 4	**01-12-2005** 08-29-2006 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM (TM), AQUIFER TEST, MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	

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AR_M60050_003221 NONE CORRESPONDENCE N62742-94-D-0048 13	**01-17-2005** 01-26-2005 5090.3.A. CTO 0072	CHEN, H. EARTH TECH, INC. BROWN, G. NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM ON THE REMEDIAL INVESTIGATION TIER III-C ASSESSMENT RESULTS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 WELL MW 01 WELL MW 101 WELL MW 201 WELL MW 205 WELL MW 209	CHOICE IMAGING SOLUTIONS SW-20101008-2/7	
AR_M60050_003222 NONE CORRESPONDENCE N62742-94-D-0048 4	**01-17-2005** 01-26-2005 5090.3.A. CTO 0072	CHEN, H. EARTH TECH, INC. BROWN, G. NAVFAC - SOUTHWEST DIVISION	TECHNICAL MEMORANDUM FOR THE REMEDIAL INVESTIGATION TIER III-D, PERCHLORATE INVESTIGATION TASKS	ADMIN RECORD BASE INFO REPOSITORY	"PERCHLORATE " SEARCH SITE 00001 SITE 00002 WELL MW 211 WELL MW 213 WELL MW 215	CHOICE IMAGING SOLUTIONS SW-20101008-2/7	
AR_M60050_004403 NONE CORRESPONDENCE NONE 3	**01-21-2005** 09-08-2008 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST, DATED 14 JANUARY 2005	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	
AR_M60050_003867 BRAC SER BPMOW.FAP/0336 CORRESPONDENCE NONE 3	**01-25-2005** 01-08-2007 5090.3.A. NONE	PISZKIN, F. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT WORK PLAN AQUIFER CHARACTERIZATION AND TREATABILITY TESTING AT FORMER EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	
AR_M60050_004404 NONE CORRESPONDENCE NONE 2	**01-25-2005** 09-08-2008 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST, DATED 14 JANUARY 2005	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	

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AR_M60050_003232 126463/003-3 MINUTES N68711-00-D-0004 100	**01-26-2005** 02-15-2005 5090.3.A. DO 0069	BROWN AND CALDWELL NAVFAC - SOUTHWEST DIVISION	PUBLIC INFORMATION MATERIALS PACKAGE FOR THE 26 JANUARY 2005 RESTORATION ADVISORY BOARD MEETING (INCLUDES AGENDA, 01 DECEMBER 2004 MEETING MINUTES, JULY 2004 - JULY 2005 MEETING SCHEDULE, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101008-2/7	
AR_M60050_003244 126463/003-2.3 MINUTES N68711-00-D-0004 49	**01-26-2005** 04-04-2005 5090.3.A. DO 0069	BROWN AND CALDWELL NAVFAC - SOUTHWEST	26 JANUARY 2005 RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES [INCLUDES PUBLIC NOTICE, AGENDA, SIGN-IN SHEET, 01 DECEMBER 2004 MEETING MINUTES, AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00008 SITE 00012 SITE 00017 SITE 00018 SITE 00024 SITE 00025	CHOICE IMAGING SOLUTIONS SW-20101008-3/7	
AR_M60050_004436 NONE CORRESPONDENCE NONE 3	**01-31-2005** 11-28-2008 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE INVESTIGATION DERIVED WASTE DISPOSAL PLAN, SOIL AND WATER	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	
AR_M60050_003732 NONE CORRESPONDENCE NONE 2	**02-28-2005** 09-07-2006 5090.3.A. NONE	MAHMOUD, T. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, AQUIFER CHARACTERIZATION AND TREATABILITY TESTING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	

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AR_M60050_003733 NONE CORRESPONDENCE NONE 1	**02-28-2005** 09-07-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, AQUIFER CHARACTERIZATION AND TREATABILITY TESTING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003262 9130 REPORT N62474-98-D-2076 30	**03-07-2005** 05-03-2005 5090.3.A. CTO 0109	BACON, W. SHAW ENVIRONMENTAL, INC. BRAC PMO WEST	FINAL EXPLOSIVE SAFETY SUBMISSION FOR THE ENVIRONMENTAL AND CONSTRUCTION SUPPORT FOR MUNITIONS AND EXPLOSIVES OF CONCERN AT THE EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000795 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101008-4/7	
AR_M60050_003271 BRAC SER BPMOW.SKB/0508 CORRESPONDENCE NONE 25	**03-10-2005** 05-19-2005 5090.3.A. NONE	PISZKIN, F. BRAC PMO WEST BARTEL, J. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA	BACKGROUND INFORMATION AND UPDATED DESCRIPTION OF PROPOSED ADDITIONAL SITE INVESTIGATION ACTIVITIES (INCLUDES PROJECT LOCATION MAP, PROPOSED MONITORING WELL AND HYDROPUNCH SAMPLING LOCATION MAP, SWDIV LETTER DATED 22 MARCH 2001, AND US FISH AND…	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101008-4/7	
AR_M60050_003288 NONE REPORT N68711-00-D-0004 350	**03-14-2005** 06-29-2005 5090.3.A. DO 0006	CLIFFORD, R. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL GROUNDWATER MONITORING REPORT, SEPTEMBER 2004 MONITORING ROUND 20 (CD COPIES ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101008-5/7	
AR_M60050_003476 NONE CORRESPONDENCE NONE 1	**03-16-2005** 04-03-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL FEASIBILITY STUDY ADDENDUM	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	

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AR_M60050_003729 NONE CORRESPONDENCE NONE 1	**03-21-2005** 09-07-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT WORK PLAN, LANDFILL COVER TEST FILL CONSTRUCTION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003731 NONE CORRESPONDENCE NONE 2	**03-21-2005** 09-07-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, LANDFILL COVER TEST FILL CONSTRUCTION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003734 NONE CORRESPONDENCE NONE 1	**03-21-2005** 09-07-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO FURTHER COMMENTS ON THE DRAFT WORK PLAN, AQUIFER CHARACTERIZATION AND TREATABILITY TESTING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003730 NONE CORRESPONDENCE NONE 2	**03-28-2005** 09-07-2006 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT WORK PLAN, LANDFILL COVER TEST FILL CONSTRUCTION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_004860 BRAC SER BPMOW.FAP/0561 CORRESPONDENCE NONE 3	**03-28-2005** 08-18-2010 5090.3.A. NONE	PISZKIN, F. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT GROUNDWATER FEASIBILITY STUDY ADDENDUM	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	
AR_M60050_003735 NONE CORRESPONDENCE NONE 3	**03-29-2005** 09-07-2006 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REQUEST FOR PROJECT DESCRIPTION, CONTAMINANTS AT THE SITE, ENVIRONMENTAL SETTING, BIOLOGICAL RESOURCES AND IDENTIFICATION OF THE ALTERNATIVES BEING SOUGHT FROM THE DON, IN ORDER TO IDENTIFY (SEE COMMENTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	

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AR_M60050_003253 126463/003-3.4 MINUTES N68711-00-D-0004 100	**03-30-2005** 04-13-2005 5090.3.A. DO 0069	BROWN AND CALDWELL NAVFAC - SOUTHWEST	PUBLIC INFORMATION MATERIALS FOR THE 30 MARCH 2005 74TH RESTORATION ADVISORY BOARD (RAB) MEETING [INCLUDES AGENDA, 26 JANUARY 2005 AND 01 DECEMBER 2004 MEETING MINUTES, SIGN-IN SHEETS, AND VARIOUS HANDOUTS] {ALSO INCLUDES PRIVACY ACT INFORMATION}	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101008-3/7	
AR_M60050_003258 NONE REPORT N62742-94-D-0048 25	**04-01-2005** 04-19-2005 5090.3.A. CTO 0078	EARTH TECH, INC. BRAC PMO WEST	FINAL WORK PLAN FOR THE LANDFILL COVER TEST FILL CONSTRUCTION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	

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AR_M60050_003309 1002-002 REPORT N68711-04-C-1016 300	**04-01-2005** 08-23-2005 5090.3.A. NONE	RAWAL, D. ENVIRO COMPLIANCE SOLUTIONS, INC. NAVFAC - SOUTHWEST DIVISION	FINAL WORK PLAN AQUIFER CHARACTERIZATION AND TREATABILITY TESTING AT FORMER EXPLOSIVE ORDNANCE DISPOSAL RANGE (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT, DATED 01 JANUARY 2005, TO FINAL)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000795 SITE 00001 WELL 00001_PZ07 WELL 00001_PZ09 WELL 00001_PZ10 WELL 00001-MW102 WELL 00001-MW201 WELL 00001-MW202 WELL 00001-MW203 WELL 00001-MW204 WELL 00001-MW206 WELL 00001-MW208 WELL 00001-MW209 WELL 00001-MW210 WELL 00001-MW222	CHOICE IMAGING SOLUTIONS SW-20101008-5/7	
AR_M60050_003270 BRAC SER BPMOW.CPA/0601 CORRESPONDENCE NONE 14	**04-06-2005** 05-19-2005 5090.3.A. NONE	PISZKIN, F. BRAC PMO WEST CHENG, F. DTSC - CYPRESS, CA	TRANSMITTAL OF THE DRAFT FEASIBILITY STUDY ADDENDUM EXECUTIVE SUMMARIES AND TABLES TO FACILITATE THE REVIEW AND IDENTIFICATION OF ANY NEW OR POTENTIAL STATE CHEMICAL-SPECIFIC, ACTION-SPECIFIC AND LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE…	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101008-4/7	

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AR_M60050_004919 BRAC SER BPMOW.FAP/0613 CORRESPONDENCE NONE 2	**04-12-2005** 12-03-2010 5090.3.A. NONE	PISZKIN, F. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL WORK PLAN FOR THE LANDFILL COVER TEST FILL CONSTRUCTION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	
AR_M60050_003441 NONE CORRESPONDENCE NONE 4	**05-16-2005** 01-30-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY ADDENDUM	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	
AR_M60050_004845 BRAC SER BPMOW.GLB/0737 CORRESPONDENCE NONE 3	**05-19-2005** 08-11-2010 5090.3.A. NONE	PISZKIN, F. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT LANDFILL TEST FILL CONSTRUCTION AND BORROW SOURCE EVALUATION REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	
AR_M60050_003378 NONE CORRESPONDENCE NONE 60	**05-24-2005** 10-26-2005 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	TRANSMITTAL OF THE CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL, CALIFORNIA DEPARTMENT OF FISH AND GAME, AND AIR RESOURCES BOARD APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE DRAFT FEASIBILITY STUDY ADDENDUM [WITH ENCLOSURES]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	

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AR_M60050_003275 126463/003/2.4 MINUTES N68711-00-D-0004 21	**05-25-2005** 05-23-2005 5090.3.A. DO 0069	BROWN AND CALDWELL NAVFAC - SOUTHWEST DIVISION	25 MAY 2005 75TH RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS (INCLUDES AGENDA, PUBLIC NOTICE, 30 MARCH 2005 MEETING MINUTES, AND SIGN-SHEET)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000242 BLDG 0000243 BLDG 0000295 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 000083 BLDG 0000832 BLDG 0001789 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101008-4/7	

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AR_M60050_003282 126463/003-3.5 MINUTES N68711-00-D-0004 150	**05-25-2005** 06-13-2005 5090.3.A. DO 0069	BROWN AND CALDWELL PUBLIC	PUBLIC INFORMATION MATERIALS PACKAGE FOR THE 25 MAY 2005 75TH RESTORATION ADVISORY BOARD (RAB) MEETING [INCLUDES AGENDA, PUBLIC NOTICE, 30 MARCH 2005 MEETING MINUTES AND VARIOUS HANDOUTS] {ALSO INCLUDES PRIVACY ACT INFORMATION}	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000242 BLDG 0000243 BLDG 0000244 BLDG 0000295 BLDG 0000319 BLDG 0000360 BLDG 0000787 BLDG 0000832 BLDG 0001789 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101008-4/7	
AR_M60050_003374 NONE CORRESPONDENCE NONE 1	**05-26-2005** 10-26-2005 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT LANDFILL TEST FILL CONSTRUCTION AND BORROW SOURCE EVALUATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_003375 NONE CORRESPONDENCE NONE 2	**06-03-2005** 10-26-2005 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT LANDFILL TEST FILL CONSTRUCTION AND BORROW SOURCE EVALUATION REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_004846 BRAC SER BPMOW.FAP/0795 CORRESPONDENCE NONE 4	**06-03-2005** 08-11-2010 5090.3.A. NONE	PISZKIN, F. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT PHASE II REMEDIAL INVESTIGATION REPORT, EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	

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AR_M60050_003293 NONE CORRESPONDENCE NONE 2	**06-10-2005** 07-25-2005 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. BRAC PMO WEST	COMMENTS ON THE DRAFT LANDFILL TEST FILL CONSTRUCTION AND BORROW SOURCE EVALUATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101008-5/7	
AR_M60050_003299 BRAC SER BPMOW.CPA/0850 CORRESPONDENCE NONE 6	**06-20-2005** 08-12-2005 5090.3.A. NONE	HILL, J. BRAC PMO WEST MULTIPLE AGENCIES	REQUEST FOR AN EXTENSION ON THE FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE FOR PRIMARY DOCUMENTS (INCLUDES SCHEDULE WITH REVISED PRIMARY MILESTONES)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 OU 0000002B SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20100702-8/8	
AR_M60050_003372 NONE CORRESPONDENCE NONE 1	**06-23-2005** 10-26-2005 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF THE EXTENSION REQUEST AND UPDATED FEDERAL FACILITY AGREEMENT (FFA) APPENDIX A SCHEDULES FOR GROUNDWATER	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_003360 NONE CORRESPONDENCE NONE 1	**07-05-2005** 10-26-2005 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	REQUEST FOR A 30-DAY EXTENSION FOR THE REVIEW OF THE DRAFT REMEDIAL INVESTIGATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	
AR_M60050_003363 NONE CORRESPONDENCE NONE 3	**07-06-2005** 10-26-2005 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA PISZKIN, F. MCAS EL TORO - SANTA ANA, CA	CONCURRENCE WITH THE EXTENSION REQUEST FOR THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE FOR THE DRAFT PROPOSED PLAN, GROUNDWATER	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	

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AR_M60050_003313 FILE NO. 126463/007/2.1 REPORT N68711-00-D-0004 100	**08-01-2005** 09-06-2005 5090.3.A. DO 0069	BROWN AND CALDWELL BRAC PMO WEST	FINAL UPDATED COMMUNITY RELATIONS PLAN [INCLUDES STREET LEVEL MAP(S) OF MILITARY INSTALLATION OR FEDERAL BUILDINGS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101008-6/7	
AR_M60050_003308 BRAC SER BPMOW.CAP/1032 CORRESPONDENCE NONE 4	**08-02-2005** 08-17-2005 5090.3.A. NONE	DUNAWAY, J. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT (FFA) APPENDIX A SCHEDULE EXTENSION REQUEST FOR THE DRAFT PROPOSED PLAN [INCLUDES FFA APPENDIX A SCHEDULE]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101008-5/7	
AR_M60050_003440 NONE CORRESPONDENCE NONE 3	**08-10-2005** 01-30-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA PISZKIN, F. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY ADDENDUM	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	
AR_M60050_003356 NONE CORRESPONDENCE NONE 2	**08-15-2005** 10-26-2005 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	CONCURRENCE WITH THE REQUEST FOR EXTENSION TO THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE FOR THE DRAFT PROPOSED PLAN, GROUNDWATER	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101124-1/2	

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AR_M60050_004181 NONE CORRESPONDENCE NONE 13	**08-24-2005** 02-05-2008 5090.3.A. NONE	MUZA, R U.S. EPA - SAN FRANCISCO, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT PHASE II REMEDIAL INVESTIGATION (RI) REPORT FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE [SEE RECORD # 3279 - DRAFT PHASE II REMEDIAL INVESTIGATION REPORT FOR THE EXPLOSIVE ORDNANCE DISPOSAL RANGE]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	

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AR_M60050_003320 DOC NO. 7190 REPORT N68711-00-D-0004 300	**08-31-2005** 09-12-2005 5090.3.A. DO 0006	LANGE, D. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL GROUNDWATER MONITORING REPORT MARCH 2005 MONITORING ROUND 21 (CD COPY OF APPENDICES C THROUGH F ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002 OU 0000002A OU 0000002B OU 0000002C OU 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024 WELL 00001_MW201 WELL 00002_NEW7 WELL 00004_DGMW66A WELL 00016_MW03 WELL 00016_MW10 WELL 00016_MW14 WELL 00016_MW16 WELL 00017_NEW1 WELL 00018_BGMW03E	CHOICE IMAGING SOLUTIONS SW-20110114-3/6	

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					WELL 00018_BGMW04 B WELL 00024EX30B1 WELL 00024EX50B1 WELL 00024EX60B2 WELL 00024NEW7		
AR_M60050_003322 126463/006/3.4 FACT SHEET N68711-00-D-0004 4	**09-01-2005** 09-19-2005 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL FACT SHEET: CLOSURE OF INACTIVE LANDFILLS [INCLUDES STREET LEVEL MAP(S) OF MILITARY INSTALLATION OR FEDERAL BUILDINGS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101008-6/7	
AR_M60050_003803 NONE CORRESPONDENCE NONE 2	**09-01-2005** 11-20-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PHASE II REMEDIAL INVESTIGATION REPORT, EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003325 NONE CORRESPONDENCE NONE 25	**09-02-2005** 09-21-2005 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT PHASE II REMEDIAL INVESTIGATION REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101008-6/7	
AR_M60050_003331 BRAC SER BPMOW.RJP/1238 CORRESPONDENCE NONE 11	**09-20-2005** 10-07-2005 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT (FFA) APPENDIX A SCHEDULE EXTENSION REQUEST FOR THE FORMER EXPLOSIVE ORDNANCE DISPOSAL RANGE, MAGAZINE ROAD LANDFILL, AND OTHER LANDFILL SITE REMEDIAL INVESTIGATION / FEASIBILITY STUDIES, PROPOSED PLANS, AND RECORDS OF DECISION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101008-6/7	

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AR_M60050_003341 NONE CORRESPONDENCE NONE 2	**09-27-2005** 10-24-2005 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. NAVFAC - SOUTHWEST DIVISION	RESPONSE TO FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE EXTENSION REQUEST	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	
AR_M60050_004214 NONE CORRESPONDENCE NONE 3	**10-01-2005** 03-18-2008 5090.3.A. NONE	NAVFAC - SOUTHWEST CHENG, F. DTSC - PASADENA, CA	RESPONSE TO FORMAL REVIEW COMMENTS ON THE FIELD CHANGE JUSTIFICATION NO. 7 REGARDING AQUIFER TESTS 3 AND 4 [SEE RECORD # 3435 - FIELD CHANGE JUSTIFICATION NO. 7]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-4/7	
AR_M60050_004215 NONE CORRESPONDENCE NONE 1	**10-01-2005** 03-18-2008 5090.3.A. NONE	NAVFAC - SOUTHWEST MUZA, R. U.S. EPA - SAN FRANCISCO, CA	RESPONSE TO FORMAL REVIEW COMMENTS ON THE FIELD CHANGE JUSTIFICATION NO. 7 REGARDING AQUIFER TESTS 3 AND 4 [SEE RECORD # 3435 - FIELD CHANGE JUSTIFICATION NO. 7]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-4/7	
AR_M60050_004216 NONE CORRESPONDENCE NONE 1	**10-01-2005** 03-18-2008 5090.3.A. NONE	NAVFAC - SOUTHWEST BRODERICK, J. CRWQCB - RIVERSIDE, CA	RESPONSE TO FORMAL REVIEW COMMENTS ON THE FIELD CHANGE JUSTIFICATION NO. 7 REGARDING AQUIFER TESTS 3 AND 4 [SEE RECORD # 3435 - FIELD CHANGE JUSTIFICATION NO. 7]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-4/7	
AR_M60050_003346 NONE CORRESPONDENCE NONE 3	**10-06-2005** 10-24-2005 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	RESPONSE TO THE FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101008-7/7	

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AR_M60050_003435 NONE REPORT N68711-04-C-1016 13	**10-18-2005** 01-05-2006 5090.3.A. NONE	ENVIRO COMPLIANCE SOLUTIONS, INC. NAVFAC - SOUTHWEST DIVISION	FIELD CHANGE JUSTIFICATION NO. 7 REGARDING AQUIFER TESTS 3 AND 4	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 WELL 00001-EW-01 WELL 00001-EW-03 WELL 00001-EW-05 WELL 00001-EW-06 WELL 00001-EX-04 WELL 00001-MW201 WELL 00001-MW202 WELL 00001-MW205 WELL 00001-MW210 WELL 00001-MW219 WELL 00001-MW223 WELL 00001-PZ-03 WELL 00001-PZ-04 WELL 00001-PZ-07 WELL 00001-PZ-10 WELL 00001-PZ-11	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003529 NONE CORRESPONDENCE NONE 2	**10-20-2005** 05-16-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FIELD CHANGE JUSTIFICATION NO. 7, AQUIFER TESTS 3 AND 4	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	

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AR_M60050_003406 NONE CORRESPONDENCE NONE 8	**10-27-2005** 11-15-2005 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	TRANSMITTAL OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE DRAFT FEASIBILITY STUDY ADDENDUM [W/ENCLOSURES]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B OU 0000002C SITE 00002 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003401 NONE CORRESPONDENCE NONE 2	**11-01-2005** 11-15-2005 5090.3.A. NONE	ALONZO, M. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE REVISED DRAFT FINAL DESIGN SUBMITTAL AND RESPONSES TO COMMENTS ON THE PREVIOUS DESIGN SUBMITTAL	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003409 BRAC SER BPMOW.CPA/1385 CORRESPONDENCE NONE 5	**11-10-2005** 11-22-2005 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST FOR THE DRAFT PROPOSED PLAN AND THE DRAFT RECORD OF DECISION [INCLUDES APPENDIX A SUBMITTAL MILESTONES AND PROJECT SCHEDULES]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003433 NONE CORRESPONDENCE NONE 2	**11-17-2005** 12-30-2005 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. BRAC PMO WEST	REVIEW AND NON-CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003412 NONE MINUTES N68711-00-D-0004 40	**11-30-2005** 12-06-2005 5090.3.A. DO 0069	COLEMAN, B. BROWN AND CALDWELL BRAC PMO WEST	30 NOVEMBER 2005 78TH RESTORATION ADVISORY BOARD MEETING MINUTES (INCLUDES AGENDA, 28 SEPTEMBER 2005 MEETING MINUTES, SIGN IN SHEETS, AND MAILER)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00016 SITE 00017 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	

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AR_M60050_004929 BRAC SER BPMOW.CPA/1452 CORRESPONDENCE NONE 2	**12-08-2005** 12-03-2010 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT PROPOSED PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	
AR_M60050_003449 NONE CORRESPONDENCE NONE 3	**01-06-2006** 02-16-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PROPOSED PLAN, GROUNDWATER	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003445 NONE CORRESPONDENCE NONE 3	**01-09-2006** 02-14-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	RESPONSE TO RESPONSES TO COMMENTS AND ADDITIONAL DISCUSSION ON THE DRAFT PHASE II REMEDIAL INVESTIGATION REPORT, FORMER EXPLOSIVE ORDNANCE DISPOSAL RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-1/4	
AR_M60050_003446 NONE CORRESPONDENCE NONE 3	**01-17-2006** 02-14-2006 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PROPOSED PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003450 NONE CORRESPONDENCE NONE 3	**01-24-2006** 02-16-2006 5090.3.A. NONE	CHENG, F. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL FEASIBILITY STUDY ADDENDUM, GROUNDWATER	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-1/4	

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AR_M60050_003437 126463/003/2.8 MINUTES N68711-00-D-0004 14	**01-25-2006** 01-25-2006 5090.3.A. DO 0069	COLEMAN, B. BROWN AND CALDWELL BRAC PMO WEST	25 JANUARY 2006 79TH RESTORATION ADVISORY BOARD (RAB) MEETING MAILER [INCLUDES AGENDA, PUBLIC NOTICE AND 30 NOVEMBER 2005 MEETING MINUTES]	ADMIN RECORD BASE INFO REPOSITORY	BLDG 0000296 SITE 00001 SITE 00003 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101124-2/2	
AR_M60050_003458 NONE MINUTES N68711-00-D-0004 80	**01-25-2006** 02-28-2006 5090.3.A. DO 0069	MCAS EL TORO - SANTA ANA, CA RESTORATION ADVISORY BOARD	25 JANUARY 2006 79TH RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES [INCLUDES AGENDA, 30 NOVEMBER 2005 MEETING MINUTES, AGENCY COMMENTS AND LETTERS, AND VARIOUS HANDOUTS] {ALSO INCLUDES STREET LEVEL MAP(S) OF MILITARY INSTALLATION OR FEDERAL BUILDINGS}	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	PARCEL 0001 PARCEL 0002 PARCEL 0003 PARCEL 0004 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-1/4	
AR_M60050_003486 NONE CORRESPONDENCE NONE 1	**02-14-2006** 04-03-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT PROPOSED PLAN GROUNDWATER	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003464 BRAC SER BPMOW.CA/0172 CORRESPONDENCE NONE 12	**02-27-2006** 03-14-2006 5090.3.A. NONE	GOULD, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE EXTENSION REQUEST FOR INSTALLATION RESTORATION PROGRAM SITES AND ANOMALY AREA (INCLUDES PROJECT SCHEDULES)	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012	CHOICE IMAGING SOLUTIONS SW-20101203-1/4	

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AR_M60050_003465 NONE REPORT N62742-94-D-0048 500	**02-27-2006** 03-14-2006 5090.3.A. CTO 0078	WILLIAMS, S. EARTH TECH, INC. BRAC PMO WEST	FINAL TECHNICAL MEMORANDUM, AQUIFER TEST, MAGAZINE ROAD LANDFILL	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 WELL 00002DGM59 WELL 00002DGMW60 WELL 00002DGMW61 WELL 00002HP02 WELL 00002NEW02 WELL 00002NEW08A WELL 00002NEW11 WELL 00002NEW13 WELL 00002NEW15 WELL 00002NEW16 WELL 00002NEW17 WELL 00002NEW18 WELL 00002NEW19 WELL 00002NEW22 WELL 00002NEW26 WELL 00002NEW27 WELL 00002NEW28 WELL 00002PZ04 WELL 00002PZ05 WELL 00002PZ10	CHOICE IMAGING SOLUTIONS SW-20101203-1/4	

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AR_M60050_003481 NONE CORRESPONDENCE NONE 2	**03-02-2006** 04-03-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF THE FEDERAL FACILITY AGREEMENT (FFA) APPENDIX A SCHEDULE AND EXTENSION REQUEST	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003482 NONE CORRESPONDENCE NONE 3	**03-06-2006** 04-03-2006 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003472 NONE CORRESPONDENCE NONE 12	**03-21-2006** 04-03-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT REMEDIAL INVESTIGATION / FEASIBILITY STUDY REPORT	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 OU 0000002C SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003523 BRAC SER BPMOW.CPA/0291 CORRESPONDENCE NONE 10	**03-28-2006** 05-15-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST HAKIM, S. DTSC - CYPRESS, CA	REQUEST FOR IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) FOR A POTENTIAL RESPONSE ACTION AT THE FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE FOR EVALUATION DURING THE FEASIBILITY STUDY FOR THE SITE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003574 BRAC SER BPMOW.CPA/0291 CORRESPONDENCE NONE 8	**03-28-2006** 06-13-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST HAKIM, S. DTSC - CYPRESS, CA	REQUEST FOR IDENTIFICATION OF POTENTIAL STATE CHEMICAL-SPECIFIC, ACTION-SPECIFIC, AND LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR A POTENTIAL RESPONSE ACTION (W/ ENCLOSURE - SITE SUMMARY)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_003471 126463/003/2.9 MINUTES N68711-00-D-0004 36	**03-29-2006** 03-28-2006 5090.3.A. DO 0069	COLEMAN, B. BROWN AND CALDWELL PUBLIC	29 MARCH 2006 80TH RESTORATION ADVISORY BOARD (RAB) PUBLIC MEETING MINUTES [INCLUDES AGENDA, 25 JANUARY 2006 MEETING MINUTES AND SIGN IN SHEET]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000296 BLDG 0000297 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00024 WELL 00077 WELL 00078 WELL ET-2	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003541 126463/003/3.10 MINUTES N68711-00-D-0004 96	**03-29-2006** 05-17-2006 5090.3.A. DO 0069	COLEMAN, B. BROWN AND CALDWELL BRAC PMO WEST	29 MARCH 2006 80TH RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS [INCLUDES AGENDA, PUBLIC NOTICE, 25 JANUARY 2006 MEETING MINUTES, SIGN-IN SHEETS AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00002 SITE 00011 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003524 NONE CORRESPONDENCE NONE 1	**03-31-2006** 05-15-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE DRAFT TECHNICAL MEMORANDUM (TM), EVALUATION OF THE SELECTED REMEDY WITH RESPECT TO RADIONUCLIDES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	
AR_M60050_003526 BRAC SER BPMOW.ART/0315 CORRESPONDENCE NONE 3	**04-04-2006** 05-15-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	EXTENSION OF SUBMITTAL DATE OF THE DRAFT FINAL REMEDIAL INVESTIGATION IN ACCORDANCE WITH THE FEDERAL FACILITY AGREEMENT (FFA)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000003 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-2/4	

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AR_M60050_003658 NONE CORRESPONDENCE NONE 3	**04-17-2006** 07-20-2006 5090.3.A. NONE	PRIBYL, R. BRAC PMO WEST MULTIPLE AGENCIES	LETTER REGARDING THE REPLACEMENT OF TCE (TRICHLOROETHENE) GROUNDWATER MONITORING WELLS DESTROYED DURING CONSTRUCTION (W/ ATTACHMENT)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 WELL 00002DGMW60 WELL 00002NEW17 WELL 00002NEW29 WELL 00002NEW30	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003575 NONE CORRESPONDENCE NONE 2	**04-19-2006** 06-13-2006 5090.3.A. NONE	ALONZO, M. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	REVIEW AND CONCURRENCE WITH THE DRAFT TECHNICAL MEMORANDUM (TM) EVALUATION OF THE SELECTED REMEDY WITH RESPECT TO RADIONUCLIDES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003659 NONE CORRESPONDENCE NONE 3	**04-25-2006** 07-20-2006 5090.3.A. NONE	HAKIM, S. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE REPLACEMENT OF TCE (TRICHLOROETHENE) GROUNDWATER MONITORING WELLS DESTROYED DURING CONSTRUCTION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003578 NONE CORRESPONDENCE NONE 5	**04-26-2006** 06-13-2006 5090.3.A. NONE	HAKIM, S. DTSC - CYPRESS, CA MULTIPLE AGENCIES	REVIEW AND COMMENTS ON THE REQUEST FOR IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003557 NONE REPORT N62742-94-D-0048 100	**05-01-2006** 05-31-2006 5090.3.A. CTO 0078	EARTH TECH, INC. BRAC PMO WEST	FINAL TECHNICAL MEMORANDUM, EVALUATION OF THE SELECTED REMEDY WITH RESPECT TO RADIONUCLIDES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003580 NONE CORRESPONDENCE NONE 5	**05-12-2006** 06-13-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	RESPONSE TO REQUEST FOR APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_003581 NONE CORRESPONDENCE NONE 2	**05-18-2006** 06-13-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT CONTAMINANT DISTRIBUTION IN GROUNDWATER AND MICROCOSM STUDY FINDINGS REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003556 BRAC SER BPMOW.JTC/0456 CORRESPONDENCE NONE 2	**05-19-2006** 05-31-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL TECHNICAL MEMORANDUM, EVALUATION OF THE SELECTED REMEDY WITH RESPECT TO RADIONUCLIDES	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003583 NONE CORRESPONDENCE NONE 1	**05-22-2006** 06-13-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. BRAC PMO WEST	REVIEW AND NO COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM (TM), EVALUATION OF THE SELECTED REMEDY WITH RESPECT TO RADIONUCLIDES	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003587 BRAC SER BPMOW.ART/0462 CORRESPONDENCE NONE 2	**05-24-2006** 06-14-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT AQUIFER CHARACTERIZATION AND BENCH-SCALE TREATABILITY TESTING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003569 BRAC SER BPMOW.JTC/0479 CORRESPONDENCE NONE 2	**05-30-2006** 06-01-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL GROUNDWATER MONITORING REPORT, SEPTEMBER 2005 MONITORING ROUND 22	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_003560 126463/003/2.10 MINUTES N68711-00-D-0004 26	**05-31-2006** 05-31-2006 5090.3.A. DO 0069	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	31 MAY 2006 81ST RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS [INCLUDES AGENDA, PUBLIC NOTICE, 29 MARCH 2006 MEETING MINUTES AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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AR_M60050_003570 7506 & 7591 REPORT N68711-00-D-0004 200	**05-31-2006** 06-01-2006 5090.3.A. DO 0084	CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL GROUNDWATER MONITORING REPORT, SEPTEMBER 2005 MONITORING ROUND 22 (INCLUDES REPLACEMENT PAGES, ISSUED ON 25 SEPTEMBER 2006, AND CD COPY OF APPENDICES C, D, AND E)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024 WELL 00007_DBMW70 WELL 00007_DGMW91 WELL 00008_DGMW73 WELL 00012_UGMW31 WELL 00016_MW1 WELL 00016_MW2 WELL 00016_MW3 WELL 00016_MW5 WELL 00016_MW81 WELL 00018_BGMP10A WELL 00018_BGMP10B WELL 00018_BGMW03A WELL 00018_BGMW03B	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	

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Doc. Control No.	Prc. Date	Author							
Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL 00018_BGMW03C		
							WELL 00018_BGMW103		
							WELL 00018_MCAS01-1		
							WELL 00018_MCAS01-2		
							WELL 00018_MCAS02-1		
							WELL 00018_MCAS02-2		
							WELL 00018_MCAS02-7		
							WELL 00018_MCAS02-8		
							WELL 00018_MCAS07-1		
							WELL 00018_MCAS07-6		
							WELL 00018_MCAS07-7		
							WELL 00018_MCAS07-8		
							WELL 00018_MCAS07-9		
							WELL 00018_PS1		
							WELL 00018_PS5		

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					WELL 00018_PS6 WELL 00018_PS8 WELL 00021_UGMW37 WELL 00024_IN03 WELL 00024EX10 WELL 00024EX11 WELL 00024EX12A WELL 00024EX12B WELL 00024EX12C WELL 00024EX13A WELL 00024EX13B WELL 00024EX13C WELL 00024EX14 WELL 00024EX30B1 WELL 00024EX60B1 WELL 00024EX9 WELL 00024MW05A WELL 00024MW05B WELL 00024MW06 WELL 00024MW07		

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AR_M60050_003589 126463/003/3.14 MINUTES N68711-00-D-0004 50	**05-31-2006** 06-19-2006 5090.3.A. DO 0069	BROWN AND CALDWELL RESTORATION ADVISORY BOARD	31 MAY 2006 81ST RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES [INCLUDES AGENDA, 29 MARCH 2006 MEETING MINUTES, AND VARIOUS HANDOUTS] {CONTAINS STREET LEVEL MAP(S) OF MILITARY INSTALLATION OR FEDERAL BUILDINGS}	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00011 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101203-3/4	
AR_M60050_003652 NONE CORRESPONDENCE NONE 2	**06-12-2006** 07-17-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE FEDERAL FACILITY AGREEMENT (FFA) EXTENSTION REQUEST FOR THE DRAFT REMEDIAL INVESTIGATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003655 NONE CORRESPONDENCE NONE 53	**06-21-2006** 07-17-2006 5090.3.A. NONE	HAKIM, S. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	RESPONSE TO REQUEST FOR IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003681 NONE CORRESPONDENCE NONE 2	**06-26-2006** 08-04-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT AQUIFER CHARACTERIZATION AND BENCH-SCALE TREATABILITY TESTING, FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	
AR_M60050_003656 NONE CORRESPONDENCE NONE 4	**06-27-2006** 07-17-2006 5090.3.A. NONE	HAKIM, S. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT CONTAMINANT DISTRIBUTION IN GROUNDWATER AND MICROCOSM STUDY FINDINGS REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101203-4/4	
AR_M60050_003683 NONE CORRESPONDENCE NONE 1	**07-06-2006** 08-04-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. BRAC PMO WEST	REVIEW AND NO COMMENTS ON THE DRAFT CONTAMINANT DISTRIBUTION IN GROUNDWATER AND MICROCOSM STUDY FINDINGS REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	

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AR_M60050_003680 BRAC SER BPMOW.ART/0606 CORRESPONDENCE NONE 5	**07-12-2006** 07-27-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST (INCLUDES FEDERAL FACILITY AGREEMENT APPENDIX A, SUBMITTAL MILESTONES)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	
AR_M60050_003688 NONE CORRESPONDENCE NONE 6	**07-17-2006** 08-04-2006 5090.3.A. NONE	HAKIM, S. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT AQUIFER CHARACTERIZATION AND BENCH-SCALE TREATABILITY TESTING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000795 SITE 00001 WELL 00001-EW-01 WELL 00001-EW-02B	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	
AR_M60050_003673 126463/003/2.11 MINUTES N68711-00-D-0004 25	**07-26-2006** 07-25-2006 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	26 JULY 2006 82ND RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS [INCLUDES AGENDA, PUBLIC NOTICE, 31 MAY 2006 MEETING MINUTES AND VARIOUS HANDOUT MATERIALS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00011 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	
AR_M60050_003692 PROJECT NOS. 126463/003/3.15 MINUTES N68711-00-D-0004 75	**07-26-2006** 08-08-2006 5090.3.A. DO 0069	CDM BROWN AND CALDWELL BRAC PMO WEST	PUBLIC INFORMATION MATERIALS PACKAGE FOR THE 26 JULY 2006 82ND RESTORATION ADVISORY BOARD (RAB) MEETING [INCLUDES AGENDA, PUBLIC NOTICE, 31 MAY 2006 MEETING MINUTES AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000369 SITE 00002 SITE 00011 SITE 00017 SITE 00018 SITE 00024 WELL 00078 WELL ET-1 WELL ET-2	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	
AR_M60050_003694 2011 REPORT N68711-01-D-6010 150	**08-01-2006** 08-11-2006 5090.3.A. DO 0002	WESTON SOLUTIONS, INC. BRAC PMO WEST	FINAL RADIOLOGICAL RELEASE REPORT, FORMER SITES OF THE SUSPECTED RADIUM PLAQUE ADAPTOMETER BUILDING AND AIRCRAFT PARTS YARD (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00017 SITE 00025	CHOICE IMAGING SOLUTIONS SW-20101217-1/4	

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AR_M60050_003755 NONE CORRESPONDENCE NONE 2	**08-01-2006** 09-22-2006 5090.3.A. NONE	GOEBEL, K. U.S. FISH AND WILDLIFE SERVICE - CARLSBAD, CA NEWTON, D. BRAC PMO WEST	REVIEW AND CONCURRENCE WITH THE PROPOSED REMEDIAL INVESTIGATION AND CLEANUP ACTIVITIES	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003699 BRAC SER BPMOW.ART/0701 CORRESPONDENCE NONE 5	**08-10-2006** 08-22-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR THE FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE DOCUMENTS (INCLUDES FFA APPENDIX A, SUBMITTAL MILESTONES)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003711 NONE CORRESPONDENCE NONE 2	**08-14-2006** 08-29-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT AQUIFER CHARACTERIZATION AND BENCH-SCALE TESTING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003712 NONE CORRESPONDENCE NONE 15	**08-14-2006** 08-29-2006 5090.3.A. NONE	HAKIM, S. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE II REMEDIAL INVESTIGATION REPORT, EXPLOSIVE ORDNANCE DISPOSAL RANGE [INCLUDES HUMAN AND ECOLOGICAL RISK DIVISION COMMENTS DATED 10 AUGUST 2006 AND CALIFORNIA DEPARTMENT OF FISH AND GAME COMMENTS…	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003713 NONE CORRESPONDENCE NONE 2	**08-18-2006** 08-29-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FINAL GROUNDWATER MONITORING REPORT, SEPTEMBER 2005 MONITORING ROUND 22	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	

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AR_M60050_003737 NONE CORRESPONDENCE NONE 6	**08-21-2006** 09-07-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, DEMILITARIZATION OF MUNITIONS AND EXPLOSIVES OF CONCERN (MEC), EXPLOSIVE ORDNANCE DISPOSAL (EOD), TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003738 NONE CORRESPONDENCE NONE 1	**08-24-2006** 09-07-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT RADIOLOGICAL RELEASE REPORT, FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE, FORMER DEFENSE REUTILIZATION AND MARKETING OFFICE (DRMO) YARD 3, AND FORMER NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) COMPLEX	ADMIN RECORD BASE INFO REPOSITORY	APHO 00038 BLDG 0000295 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003739 NONE CORRESPONDENCE NONE 1	**08-28-2006** 09-07-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT RADIOLOGICAL RELEASE REPORT, FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE, FORMER DEFENSE REUTILIZATION AND MARKETING OFFICE (DRMO) YARD 3, FORMER NUCLEAR, BIOLOGICAL & CHEMICAL (NBC) COMPLEX	ADMIN RECORD BASE INFO REPOSITORY	APHO 00038 BLDG 0000295 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003756 NONE CORRESPONDENCE NONE 6	**08-31-2006** 09-22-2006 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE II REMEDIAL INVESTIGATION (RI) REPORT, FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003757 NONE CORRESPONDENCE NONE 8	**09-13-2006** 09-22-2006 5090.3.A. NONE	HAKIM, S. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN DEMILITARIZATION OF MUNITIONS AND EXPLOSIVES OF CONCERN, EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE [INCLUDES DEPARTMENT OF HEALTH SERVICES COMMENTS DATED 06 SEPTEMBER 2006]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	

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AR_M60050_003773 NONE CORRESPONDENCE NONE 1	**09-18-2006** 09-25-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT WORK PLAN, DEMILITARIZATION OF MUNITIONS AND EXPLOSIVES OF CONCERN, EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-2/4	
AR_M60050_003937 BRAC SER BPMOW.GWC/0810 CORRESPONDENCE NONE 3	**09-27-2006** 03-15-2007 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL GROUNDWATER MONITORING REPORT, MARCH 2006 MONITORING ROUND 23 (W/OUT ENCLOSURE) [SEE RECORD # 3938 - FINAL GROUNDWATER MONITORING REPORT]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110114-4/6	
AR_M60050_003938 7592 REPORT N68711-00-D-0004 650	**09-27-2006** 03-15-2007 5090.3.A. CTO 0084	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL GROUNDWATER MONITORING REPORT, MARCH 2006 MONITORING ROUND 23 (CD COPY OF APPENDIX B ENCLOSED) [SEE RECORD # 3937 - BRAC PMO WEST TRANSMITTAL LETTER]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110114-4/6	
AR_M60050_003794 NONE CORRESPONDENCE NONE 2	**09-29-2006** 11-14-2006 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL PHASE II REMEDIAL INVESTIGATION REPORT, EXPLOSIVE ORDNANCE DISPOSAL (EOD) RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003787 BRAC SER BPMOW.AT/0021 CORRESPONDENCE NONE 4	**10-10-2006** 10-25-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST, FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	

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AR_M60050_003792 BRAC SER BPMOW.CPA/0052 CORRESPONDENCE NONE 6	**10-18-2006** 11-14-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	REVISED FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST, FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003796 NONE CORRESPONDENCE NONE 2	**10-19-2006** 11-14-2006 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	AGREEMENT TO SCHEDULE EXTENSION REQUEST FOR PRIMARY DOCUMENT SUBMITTAL, FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	
AR_M60050_003860 1002-003 REPORT N68711-04-C-1016 200	**11-01-2006** 12-18-2006 5090.3.A. NONE	RAWAL, D. ENVIRO COMPLIANCE SOLUTIONS, INC. BRAC PMO WEST	FINAL CONTAMINANT DISTRIBUTION IN GROUNDWATER AND MICROCOSM STUDY FINDINGS REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 WELL 00002-DGMW-59 WELL 00002-DGMW-60 WELL 00002-DGMW-61 WELL 00002-NEW-02 WELL 00002-NEW-13 WELL 00002-NEW-15 WELL 00002-NEW-16 WELL 00002-NEW-8A	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	
AR_M60050_003905 1002-003 REPORT N68711-04-C-1016 650	**11-09-2006** 02-14-2007 5090.3.A. NONE	RAWAL, D. ENVIRO COMPLIANCE SOLUTIONS, INC. BRAC PMO WEST	FINAL AQUIFER CHARACTERIZATION AND TREATABILITY TESTING REPORT (CD COPY OF APPENDICES C & E ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	

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AR_M60050_003859 BRAC SER BPMOW.ART/0141 CORRESPONDENCE NONE 4	**11-20-2006** 12-18-2006 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL CONTAMINANT DISTRIBUTION IN GROUNDWATER AND MICROCOSM STUDY FINDINGS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	
AR_M60050_003904 BRAC SER BPMOW.ART/0136 CORRESPONDENCE NONE 2	**11-20-2006** 02-14-2007 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL AQUIFER CHARACTERIZATION AND BENCH-SCALE TREATABILITY TESTING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	
AR_M60050_003853 FILE NO. 126463/003/2.13 MINUTES N68711-00-D-0004 20	**11-29-2006** 12-06-2006 5090.3.A. DO 0069	COLEMAN, B. BROWN AND CALDWELL RESTORATION ADVISORY BOARD	29 SEPTEMBER 2006 84TH RESTORATION ADVISORY BOARD (RAB) MEETING MAILER [INCLUDES AGENDA, PUBLIC NOTICE, 27 SEPTEMBER 2006 MEETING MINUTES AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00011 SITE 00016 SITE 00017 SITE 00018 SITE 00024 WELL 00078 WELL ET-1 WELL ET-2	CHOICE IMAGING SOLUTIONS SW-20101217-3/4	

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AR_M60050_003861 126463/003/3.17 MINUTES N68711-00-D-0004 100	**11-29-2006** 12-19-2006 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	29 NOVEMBER 2006 84TH RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS [INCLUDES AGENDA, 27 SEPTEMBER 2006 MEETING MINUTES, PUBLIC NOTICE, MEMBER ROSTER, FACT SHEET, AND VARIOUS HANDOUTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 APHO 00038 BLDG 0000244 BLDG 0000295 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00024 SITE 00046	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	
AR_M60050_003916 NONE REPORT N62742-94-D-0048 250	**12-01-2006** 03-01-2007 5090.3.A. CTO 0072	EARTH TECH, INC. BRAC PMO WEST	FINAL PHASE II REMEDIAL INVESTIGATION REPORT FOR FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE (INCLUDES CD COPY OF APPENDICES) [SEE RECORD # 3915 - BRAC PMO WEST TRANSMITTAL LETTER]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-4/6	
AR_M60050_003915 BRAC SER BPMOW.JTC/0229 CORRESPONDENCE NONE 3	**12-29-2006** 03-01-2007 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL PHASE II REMEDIAL INVESTIGATION REPORT FOR FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE (W/OUT ENCLOSURE) [SEE RECORD # 3916 - FINAL PHASE II REMEDIAL INVESTIGATION REPORT]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-3/6	
AR_M60050_003879 NONE CORRESPONDENCE NONE 1	**01-02-2007** 01-11-2007 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FINAL CONTAMINANT DISTRIBUTION IN GROUNDWATER AND MICROCOSM STUDY FINDINGS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	

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AR_M60050_003934 NONE CORRESPONDENCE NONE 1	**01-02-2007** 03-07-2007 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON FINAL AQUIFER CHARACTERIZATION AND BENCH-SCALE TREATABILITY TESTING REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-4/6	
AR_M60050_003866 NONE REPORT N68711-00-D-0004 300	**01-04-2007** 01-05-2007 5090.3.A. DO 0084	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL WORK PLAN, GROUNDWATER SAMPLING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 WELL 00002NEW7 WELL 00002NEW8A	CHOICE IMAGING SOLUTIONS SW-20101217-4/4	
AR_M60050_004049 NONE CORRESPONDENCE NONE 6	**01-18-2007** 09-06-2007 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE FINAL MARCH 2006 GROUNDWATER MONITORING REPORT, MONITORING ROUND 23	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_003907 BRAC SER BPMOW.JTC/0298 CORRESPONDENCE NONE 2	**01-30-2007** 02-14-2007 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT FEASIBILITY STUDY REPORT, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-3/6	
AR_M60050_003922 NONE CORRESPONDENCE NONE 1	**02-02-2007** 03-05-2007 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. BRAC PMO WEST	REVIEW AND CONCURRENCE OF DRAFT FINAL RADIOLOGICAL RELEASE REPORT FOR FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE, FORMER DEFENSE REUTILIZATION AND MARKETING OFFICE YARD (DRMO), AND FORMER NUCLEAR, BIOLOGICAL, ***SEE COMMENTS	ADMIN RECORD BASE INFO REPOSITORY	APHO 00038 BLDG 0000295 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-4/6	

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AR_M60050_003948 NONE CORRESPONDENCE NONE 8	**02-23-2007** 04-06-2007 5090.3.A. NONE	ALONZO, M. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	CONCURRENCE ON FINAL PHASE II REMEDIAL INVESTIGATION REPORT FOR EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE (INCLUDES DTSC - CYPRESS MEMORANDA BY R. DONOHOE, DATED 31 JANUARY 2007 AND BY R. SARMIENTO, DATED 30 JANUARY 2007) [***SEE COMMENTS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003945 ET-1837-0025-0005 REPORT N62742-03-D-1837 40	**03-01-2007** 04-04-2007 5090.3.A. CTO 0025	EARTH TECH, INC. BRAC PMO WEST	FINAL LETTER REPORT, SUPPLEMENTAL GROUNDWATER SAMPLING (INCLUDES REPLACEMENT PAGES CONVERTING THE DRAFT FINAL DATED 01 MARCH 2007 TO FINAL AND CD COPY) [SEE RECORD # 3944 - BRAC PMO WEST TRANSMITTAL LETTER] {SEE COMMENTS}	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110114-4/6	
AR_M60050_004396 BRAC SER BPMOW.DN/0412 CORRESPONDENCE NONE 2	**03-06-2007** 09-08-2008 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST RESTORATION ADVISORY BOARD	LETTER OF NOTIFICATION ON THE FORMATION OF A SUBCOMMITTEE TO REVIEW THE FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING FACILITY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	
AR_M60050_003950 NONE CORRESPONDENCE NONE 1	**03-12-2007** 04-06-2007 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. BRAC PMO WEST	COMMENTS ON FINAL PHASE II REMEDIAL INVESTIGATION REPORT FOR EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003958 NONE CORRESPONDENCE NONE 2	**03-28-2007** 04-26-2007 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY (FS) REPORT, INSTALLATION RESTORATION PROGRAM (IRP), EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003944 BRAC SER BPMOW.RLC/0449 CORRESPONDENCE NONE 2	**03-29-2007** 04-04-2007 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT LETTER REPORT, SUPPLEMENTAL GROUNDWATER SAMPLING (W/OUT ENCLOSURE) [SEE RECORD # 3945 - DRAFT LETTER REPORT]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110114-4/6	

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AR_M60050_003959 NONE CORRESPONDENCE NONE 3	**03-30-2007** 04-26-2007 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY (FS) REPORT, INSTALLATION RESTORATION PROGRAM (IRP), EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003960 NONE CORRESPONDENCE NONE 10	**03-30-2007** 04-26-2007 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT FEASIBILITY STUDY (FS) REPORT, INSTALLATION RESTORATION PROGRAM (IRP), EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003953 2016 REPORT N68711-01-D-6010 100	**04-01-2007** 04-17-2007 5090.3.A. CTO 0002	WESTON SOLUTIONS, INC. BRAC PMO WEST	FINAL RADIOLOGICAL RELEASE REPORT FOR FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE, FORMER DEFENSE REUTILIZATION AND MARKETING OFFICE (DRMO), FORMER NUCLEAR, BIOLOGICAL AND CHEMICAL COMPLEX INCLUDING AERIAL PHOTOGRAPH ANOMALY (APHO) - CD INCLUDED	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	APHO 00038 BLDG 0000295 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003961 NONE CORRESPONDENCE NONE 3	**04-04-2007** 04-26-2007 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL RADIOLOGICAL RELEASE REPORT FOR FORMER EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING RANGE, FORMER DEFENSE REUTILIZATION AND MARKETING OFFICE (DRMO) YARD 3, FORMER NUCLEAR, BIOLOGICAL & CHEMICAL (NBC) COMPLEX	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	APHO 00038 BLDG 0000295 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003952 BRAC SER BPMOW.JTC/0472 CORRESPONDENCE NONE 2	**04-12-2007** 04-17-2007 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL RADIOLOGICAL RELEASE REPORT FOR FORMER EOD TRAINING RANGE, FORMER DRMO, FORMER NBC COMPLEX, INCLUDING APHO ANOMALY, AND PAVED AREA (W/OUT ENCLOSURE) {***SEE COMMENTS}	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	APHO 00038 BLDG 0000295 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_003962 NONE CORRESPONDENCE NONE 1	**04-16-2007** 04-26-2007 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA NEWTON, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE ON DRAFT LETTER REPORT, SUPPLEMENTAL GROUNDWATER SAMPLING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	

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AR_M60050_003982 BRAC SER BPMOW.CPA/0519 CORRESPONDENCE NONE 10	**04-30-2007** 05-17-2007 5090.3.A. NONE	NEWTON, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST AND SCHEDULE UPDATE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110114-5/6	
AR_M60050_004026 NONE CORRESPONDENCE NONE 1	**05-09-2007** 08-15-2007 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA WEISSENBORN, R. BRAC PMO WEST	APPROVAL OF FEDERAL FACILITY AGREEMENT (FFA) EXTENSION REQUEST FOR PRIMARY SUBMITTAL DOCUMENTS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_004035 NONE CORRESPONDENCE NONE 1	**05-09-2007** 08-27-2007 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA WEISSENBORN, R. BRAC PMO WEST	REVIEW AND NO COMMENTS ON THE DRAFT LETTER REPORT, SUPPLEMENTAL GROUNDWATER SAMPLING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-2/7	
AR_M60050_004031 NONE CORRESPONDENCE NONE 2	**05-10-2007** 08-15-2007 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA WEISSENBORN, R. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF EXTENSION REQUESTS FOR THE DRAFT PROPOSED PLAN AND DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_004119 BRAC SER BPMOW.RP/610 CORRESPONDENCE NONE 6	**06-11-2007** 12-28-2007 5090.3.A. NONE	WEISSENBORN, R. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT EXTENSION REQUEST FOR MAGAZINE ROAD LANDFILL AND COMMUNICATION STATION LANDFILL PRIMARY DOCUMENTS (INCLUDES APPENDIX A - SUBMITTAL MILESTONES)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110214-3/7	
AR_M60050_003993 BRAC SER BPMOW.RLC/0641 CORRESPONDENCE NONE 2	**06-26-2007** 07-03-2007 5090.3.A. NONE	WEISSENBORN, R. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT GROUNDWATER MONITORING WORK PLAN FOR ANOMALY AREA	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110114-6/6	

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AR_M60050_004017 NONE CORRESPONDENCE NONE 2	**07-16-2007** 07-30-2007 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA WEISSENBORN, R. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN GROUNDWATER MONITORING	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_004013 NONE CORRESPONDENCE NONE 1	**07-20-2007** 07-30-2007 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA WEISSENBORN, R. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, GROUNDWATER MONITORING	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_004022 BRAC SER BPMOW.JTC/0720 CORRESPONDENCE NONE 6	**07-27-2007** 08-06-2007 5090.3.A. NONE	WEISSENBORN, R BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE UPDATE FOR PRIMARY SUBMITAL DOCUMENTS (INCLUDES SUBMITTAL MILESTONES AND PROJECT SCHEDULE)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00008 SITE 00012	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_004041 NONE CORRESPONDENCE NONE 3	**08-03-2007** 09-06-2007 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA WEISSENBORN, R. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT LETTER REPORT, SUPPLEMENTAL GROUNDWATER SAMPLING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 WELL 02NEW07 WELL 02NEW26 WELL 02NEW27	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_004044 NONE CORRESPONDENCE NONE 10	**08-16-2007** 09-06-2007 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA WEISSENBORN, R. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT WORK PLAN, GROUNDWATER MONITORING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-4/5	
AR_M60050_004090 BRAC SER BPMOW.RLC/0013 CORRESPONDENCE NONE 2	**10-04-2007** 10-11-2007 5090.3.A. NONE	WEISSENBORN, R BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL GROUNDWATER MONITORING (W/OUT ENCLOSURE) [SEE RECORD # 4091 - FINAL GROUNDWATER MONITORING]	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	

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AR_M60050_004091 JNS-1110-0006-0119 REPORT N68711-04-D-1110 700	**10-05-2007** 10-11-2007 5090.3.A. CTO 0006	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL GROUNDWATER MONITORING (CD COPY ENCLOSED) [SEE RECORD # 4090 - BRAC PMO WEST TRANSMITTAL LETTER]	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110128-5/5	
AR_M60050_004233 JNS-1110-0006-0119 REPORT N68711-04-D-1110 350	**10-05-2007** 04-07-2008 5090.3.A. CTO 0006	DUNK, J. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL WORK PLAN GROUNDWATER MONITORING (CD COPY ENCLOSED) [SEE RECORD # 4234 - REVISED FINAL WORK PLAN GROUNDWATER MONITORING]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 WELL 02NEW07 WELL AA3MW01 WELL AA3MW02 WELL AA3MW06 WELL AA3MW08 WELL AA3MW11 WELL AA3MW12	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_004234 JNS-1110-0006-0129 REPORT N68711-04-D-1110 350	**11-15-2007** 04-07-2008 5090.3.A. CTO 0006	DUNK, J. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	REVISED FINAL WORK PLAN GROUNDWATER MONITORING (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 WELL 02NEW07 WELL AA3MW01 WELL AA3MW02 WELL AA3MW06 WELL AA3MW08 WELL AA3MW11 WELL AA3MW12	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_004345 BRAC SER BPMOW.RLC/0103 CORRESPONDENCE NONE 3	**11-15-2007** 08-01-2008 5090.3.A. NONE	WEISSENBORN, R. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE REVISED FINAL WORK PLAN GROUNDWATER MONITORING	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-7/7	

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AR_M60050_004402 NONE CORRESPONDENCE NONE 5	**12-06-2007** 09-08-2008 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA WEISSENBORN, R. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT ENVIRONMENTAL SUMMARY DOCUMENT (ESD) FOR FEDERAL AVIATION ADMINISTRATION [SEE RECORD # 4282 - DRAFT ESD FOR FEDERAL AVIATION ADMINISTRATION]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	
AR_M60050_004280 BRAC SER BPMOW.CPA/0211 CORRESPONDENCE NONE 4	**01-22-2008** 04-23-2008 5090.3.A. NONE	WEISSENBORN, R. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT (FFA) SCHEDULE EXTENSION REQUEST FOR PRIMARY DOCUMENTS, REMEDIAL ACTION COMPLETION REPORT (INCLUDES APPENDIX A SCHEDULE)	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-5/7	
AR_M60050_004285 CDM-0004-0069-0178 MINUTES N68711-00-D-0004 50	**02-13-2008** 05-05-2008 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	30 JANUARY 2008 90TH RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS (INCLUDES AGENDA, PUBLIC NOTICE, 28 NOVEMBER 2007 RAB MEETING MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	
AR_M60050_004225 BRAC SER BPMOW.JTC/0345 CORRESPONDENCE NONE 2	**03-19-2008** 03-21-2008 5090.3.A. NONE	THEROUX, D. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT LETTER REPORT, GROUNDWATER MONITORING FOR PETROLEUM HYDROCARBONS (W/OUT ENCLOSURE) [SEE RECORD # 4226 - DRAFT LETTER REPORT, GROUNDWATER MONITORING FOR PETROLEUM HYDROCARBONS]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-4/7	
AR_M60050_004303 BRAC SER BPMOW.CPA/0344 CORRESPONDENCE NONE 7	**03-19-2008** 05-30-2008 5090.3.A. NONE	THEROUX, D. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE EXTENSION REQUEST FOR PRIMARY DOCUMENTS, DRAFT FINAL SOIL FEASIBILITY STUDY, DRAFT PROPOSED PLAN, AND DRAFT RECORD OF DECISION (INCLUDES APPENDIX A AND SCHEDULE)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	

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AR_M60050_004328 NONE CORRESPONDENCE NONE 2	**03-26-2008** 06-09-2008 5090.3.A. NONE	SCANDURA, J. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	APPROVAL OF THE FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE EXTENSION REQUEST FOR PRIMARY DOCUMENTS, DRAFT FINAL SOIL FEASIBILITY STUDY, DRAFT PROPOSED PLAN, AND DRAFT RECORD OF DECISION [SEE RECORD # 4303 - REQUEST]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	
AR_M60050_004286 CDM-0004-0069-0182 MINUTES N68711-00-D-0004 20	**04-16-2008** 05-05-2008 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	23 APRIL 2008 91ST RESTORATION ADVISORY BOARD MEETING MAILER (INCLUDES AGENDA, PUBLIC NOTICE, AND 30 JANUARY 2008 MEETING MINUTES AND SIGN-IN SHEETS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	
AR_M60050_004291 BRAC SER BPMOW.JTC/0400 CORRESPONDENCE NONE 5	**04-17-2008** 05-06-2008 5090.3.A. NONE	LARSON, E. BRAC PMO WEST DICKINSON, D. THE IRVINE COMPANY	LETTER REQUESTING CONSENT TO ENTER AND SURVEY THE PROPERTY (INCLUDES PROJECT LOCATION MAP AND MUNITIONS AND EXPLOSIVES OF CONCERN INVESTIGATION RESULTS FROM THE JANUARY 2007 DRAFT FEASIBILITY STUDY REPORT)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	
AR_M60050_004316 NONE CORRESPONDENCE NONE 1	**04-25-2008** 06-03-2008 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA THEROUX, D. BRAC PMO WEST	REVIEW AND NO COMMENTS ON THE DRAFT LETTER REPORT, GROUNDWATER MONITORING FOR PETROLEUM HYDROCARBONS [SEE RECORD # 4226 - DRAFT LETTER REPORT]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	

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AR_M60050_004329 CDM-0004-0069-0184 MINUTES N68711-00-D-0004 80	**04-29-2008** 06-10-2008 5090.3.A. DO 0069	CDM BROWN AND CALDWELL NAVFAC - SOUTHWEST	23 APRIL 2008 91ST RESTORATION ADVISORY BOARD (RAB) MEETING PUBLIC INFORMATION MATERIALS (INCLUDES AGENDA, PUBLIC NOTICE, 30 JANUARY 2008 RAB MEETING MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024 WELL ET-1 WELL ET-2	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	
AR_M60050_004298 BRAC SER BPMOW.JTC/0450 CORRESPONDENCE NONE 2	**05-13-2008** 05-16-2008 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT MUNITIONS CHARACTERIZATION WORK PLAN, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE (W/OUT ENCLOSURE) [SEE RECORD # 4299 - DRAFT MUNITIONS CHARACTERIZATION WORK PLAN]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000079C SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-6/7	
AR_M60050_004341 NONE CORRESPONDENCE NONE 2	**06-25-2008** 07-09-2008 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT LETTER REPORT, GROUNDWATER MONITORING FOR PETROLEUM HYDROCARBONS	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-7/7	
AR_M60050_004358 NONE CORRESPONDENCE NONE 2	**07-03-2008** 08-05-2008 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT MUNITIONS CHARACTERIZATION WORK PLAN, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE [SEE RECORD # 4299 - DRAFT MUNITIONS CHARACTERIZATION WORK PLAN]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-7/7	

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AR_M60050_004359 NONE CORRESPONDENCE NONE 1	**07-07-2008** 08-05-2008 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT MUNITIONS CHARACTERIZATION WORK PLAN, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE (SEE RECORD # 4299 - DRAFT MUNITIONS CHARACTERIZATION WORK PLAN)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110214-7/7	
AR_M60050_004370 ET-0048-0072-0003 REPORT N62742-94-D-0048 100	**08-01-2008** 08-14-2008 5090.3.A. CTO 0072	EARTH TECH, INC. BRAC PMO WEST	FINAL MUNITIONS CHARACTERIZATION WORK PLAN, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE (INCLUDES RESPONSE TO COMMENTS ON THE DRAFT WORK PLAN AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000795 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-3/6	
AR_M60050_004371 BRAC SER BPMOW.CA/0628 CORRESPONDENCE NONE 5	**08-04-2008** 08-18-2008 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR INSTALLATION RESTORATION PROGRAM (IRP) FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE, MAGAZINE ROAD LANDFILL, AND COMMUNICATION STATION LANDFILL (INCLUDES FFA APPENDIX A SCHEDULE)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-3/6	
AR_M60050_004369 BRAC SER BPMOW.JC/0626 CORRESPONDENCE NONE 2	**08-05-2008** 08-14-2008 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE 1) FINAL MUNITIONS CHARACTERIZATION WORK PLAN, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE, AND 2) RESPONSE TO COMMENTS ON THE DRAFT WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000795 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-3/6	
AR_M60050_004372 BRAC SER BPMOW.EAL/0652 CORRESPONDENCE NONE 2	**08-13-2008** 08-18-2008 5090.3.A. NONE	LARSON, E. BRAC PMO WEST DICKINSON, D. THE IRVINE COMPANY	TRANSMITTAL OF THE FINAL MUNITIONS CHARACTERIZATION WORK PLAN, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE (INCLUDES RESPONSE TO COMMENTS ON THE DRAFT DATED MAY 2008), AND NOTIFICATION OF FIELD SURVEY IN SEPTEMBER 2008 [W/OUT ENCLOSURE] {***SEE COMMENTS}	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-3/6	

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AR_M60050_004411 CDM-0004-0069-0197 MINUTES N68711-00-D-0004 60	**08-20-2008** 09-12-2008 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	20 AUGUST 2008 92ND RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS (INCLUDES AGENDA, PUBLIC NOTICE, 23 APRIL 2008 RAB MEETING MINUTES, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 BLDG 0000297 SITE 00001 SITE 00002 SITE 00008 SITE 00012 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	
AR_M60050_004428 CDM-0004-0069-0193 MINUTES N68711-00-D-0004 30	**08-20-2008** 10-15-2008 5090.3.A. DO 0069	CDM BROWN AND CALDWELL RESTORATION ADVISORY BOARD	20 AUGUST 2008 RESTORATION ADVISORY BOARD (RAB) MEETING MAILER (INCLUDES PUBLIC NOTICE, AGENDA, AND 23 APRIL 2008 RAB MEETING MINUTES AND SIGN-IN SHEETS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000296 BLDG 0000297 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 TAA 000155B	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	
AR_M60050_004378 BRAC SER BPMOW.JC/0783 CORRESPONDENCE NONE 2	**08-29-2008** 09-02-2008 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE 1) DRAFT FINAL VADOSE ZONE FEASIBILITY STUDY REPORT, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE; AND 2) RESPONSES TO COMMENTS ON THE DRAFT FEASIBILITY STUDY REPORT DATED 01 JANUARY 2007 [W/OUT ENCLOSURES]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-3/6	
AR_M60050_004433 NONE CORRESPONDENCE NONE 1	**09-12-2008** 10-24-2008 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	COMMENTS ON THE DRAFT FINAL VADOSE ZONE FEASIBILITY STUDY REPORT, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	

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AR_M60050_004419 NONE CORRESPONDENCE NONE 2	**09-29-2008** 10-07-2008 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO FURTHER COMMENTS ON THE FINAL MUNITIONS CHARACTERIZATION WORK PLAN, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE [SEE RECORD # 4370 - FINAL MUNITIONS CHARACTERIZATION WORK PLAN]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	BLDG 0000395 SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	
AR_M60050_004456 NONE CORRESPONDENCE NONE 2	**10-15-2008** 12-09-2008 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT FINAL VADOSE ZONE FEASIBILITY STUDY REPORT, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004512 BRAC SER BPMOW.MPS/1027 CORRESPONDENCE NONE 2	**10-16-2008** 02-17-2009 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD), FINALIZING THE INTERIM FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004547 BRAC SER BPMOW.MS/1040 CORRESPONDENCE NONE 4	**10-29-2008** 03-24-2009 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE 1) DRAFT REMEDIATION VERIFICATION REPORT, SITE 2, AND THE 2) DRAFT REMEDIATION VERIFICATION REPORT, SITE 17	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004440 BRAC SER BPMOW.JC/1063 CORRESPONDENCE NONE 2	**10-31-2008** 12-03-2008 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT PILOT STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004435 BRAC SER BPMOW.CA/1062 CORRESPONDENCE NONE 4	**11-03-2008** 11-26-2008 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE UPDATE (INCLUDES FFA APPENDIX A)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-4/6	

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AR_M60050_004439 CDM-0004-0069-0329 MINUTES N68711-00-D-0004 80	**11-26-2008** 12-02-2008 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	03 DECEMBER 2008 93RD RESTORATION ADVISORY BOARD (RAB) MEETING MAILER (INCLUDES AGENDA, PUBLIC NOTICE, 20 AUGUST 2008 DRAFT RAB MEETING MINUTES AND SIGN-IN SHEETS, AND 23 APRIL 2008 FINAL RAB MEETING MINUTES)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004467 NONE CORRESPONDENCE NONE 2	**11-26-2008** 12-24-2008 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PILOT STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004518 ET-0048-0068-0010 REPORT N62742-94-D-0048 25	**12-01-2008** 02-17-2009 5090.3.A. CTO 0068	EARTH TECH, INC. BRAC PMO WEST	FINAL EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD), FINALIZING THE INTERIM FINAL RECORD OF DECISION (ROD) [CD COPY ENCLOSED]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B SITE 00002 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110214-1/7	
AR_M60050_004519 ERRG-6016-0007-0004 REPORT N68711-01-D-6016 25	**12-01-2008** 10-21-2009 5090.3.A. CTO 0007	ENGINEERING/REMEDIATION RESOURCES GROUP, INC. MCAS EL TORO - SANTA ANA, CA	FINAL BIOMONITORING REPORT (CD COPY ENCLOSED) {DOCUMENT CONTAINS PRIVACY ACT INFORMATION}	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-1/6	
AR_M60050_004514 GEOTRACKER NO. DOD100131200 & DOD100139500 CORRESPONDENCE NONE 1	**12-02-2008** 02-17-2009 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD), FINALIZING THE INTERIM FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	

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AR_M60050_004450 CDM-0004-0069-0334 MINUTES N68711-00-D-0004 40	**12-03-2008** 12-08-2008 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	03 DECEMBER 2008 93RD RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS (INCLUDES RESTORATION ADVISORY BOARD MEETING MAILER, AGENDA, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004468 NONE CORRESPONDENCE NONE 4	**12-05-2008** 12-24-2008 5090.3.A. NONE	THAN, Q DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT PILOT STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004472 BRAC SER BPMOW.JC/1127 CORRESPONDENCE NONE 2	**12-10-2008** 01-08-2009 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL LETTER REPORT GROUNDWATER MONITORING FOR PETROLEUM HYDROCARBONS [W/OUT ENCLOSURE]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004551 NONE CORRESPONDENCE NONE 1	**12-15-2008** 03-24-2009 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT REMEDIATION VERIFICATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004515 NONE CORRESPONDENCE NONE 2	**12-16-2008** 02-17-2009 5090.3.A. NONE	MUZA, R. U.S. EPA - SAN FRANCISCO, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD), FINALIZING THE INTERIM FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	

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AR_M60050_004517 BRAC SER BPMOW.MPS/1155 CORRESPONDENCE NONE 3	**12-24-2008** 02-17-2009 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD), FINALIZING THE INTERIM FINAL RECORD OF DECISION (ROD) [W/OUT ENCLOSURE]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000001 OU 0000002A OU 0000002B SITE 00002 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110214-7/7	
AR_M60050_004516 NONE CORRESPONDENCE NONE 3	**01-02-2009** 02-17-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD), FINALIZING THE INTERIM FINAL RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004484 NONE CORRESPONDENCE NONE 1	**01-05-2009** 01-22-2009 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO ADDITIONAL COMMENTS ON THE DRAFT PILOT STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004485 DOD100136000 CORRESPONDENCE NONE 1	**01-05-2009** 01-22-2009 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT FINAL VADOSE ZONE FEASIBILITY STUDY REPORT, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004552 NONE CORRESPONDENCE NONE 1	**01-05-2009** 03-24-2009 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT REMEDIATION VERIFICATION REPORT	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004553 NONE CORRESPONDENCE NONE 2	**01-08-2009** 03-24-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT REMEDIATION VERIFICATION REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	

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AR_M60050_004556 NONE CORRESPONDENCE NONE 2	**01-09-2009** 03-24-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT REMEDIATION VERIFICATION REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004475 CDM-0004-0069-0352 MINUTES N68711-00-D-0004 80	**01-15-2009** 01-21-2009 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	28 JANUARY 2009 RESTORATION ADVISORY BOARD (RAB) MEETING MAILER [INCLUDES AGENDA, PUBLIC NOTICE, 03 DECEMBER 2008 DRAFT RAB MEETING MINUTES AND SIGN-IN SHEETS, AND 20 AUGUST 2008 FINAL RAB MEETING MINUTES]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004507 NONE CORRESPONDENCE NONE 2	**01-16-2009** 02-12-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO FURTHER COMMENTS ON THE FINAL 2006 ANNUAL LONG TERM MONITORING REPORT, CRASH CREW TRAINING PIT NO. 2	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00016	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004504 NONE CORRESPONDENCE NONE 2	**01-23-2009** 02-12-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FINAL APRIL 2007 MONITORING ROUND DATA SUMMARY REPORT, CRASH CREW TRAINING PIT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002 SITE 00016 WELL 16-MW01 WELL 16-MW02 WELL 16-MW04 WELL 16-MW09	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	

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AR_M60050_004492 CDM-0004-0069-0366 MINUTES N68711-00-D-0004 65	**01-29-2009** 02-02-2009 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	28 JANUARY 2009 94TH RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS (INCLUDES RESTORATION ADVIROSY BOARD MEETING MAILER, AGENDA, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 PRL GROUP VI SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004500 BRAC SER BPMOW.RLC/0060 CORRESPONDENCE NONE 3	**02-05-2009** 02-10-2009 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT 2007 ANNUAL GROUNDWATER REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-5/6	
AR_M60050_004550 BRAC SER BPMOW.MPS/0065 CORRESPONDENCE NONE 4	**02-05-2009** 03-24-2009 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF REPLACEMENT PAGES CONVERTING THE 1) DRAFT REMEDIATION VERIFICATION REPORT, SITE 2 TO FINAL, AND 2) DRAFT REMEDIATION VERIFICATION REPORT, SITE 17 TO FINAL	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004526 NONE CORRESPONDENCE NONE 2	**02-13-2009** 02-26-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRANCE WITH THE FINAL LETTER REPORT GROUNDWATER MONITORING FOR PETROLEUM HYDROCARBONS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004563 NONE CORRESPONDENCE NONE 2	**03-20-2009** 04-17-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND ACCEPTANCE OF THE FINAL REMEDIATION VERIFICATION REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	

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AR_M60050_004564 NONE CORRESPONDENCE NONE 1	**03-20-2009** 04-17-2009 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA THEROUX, D. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT 2007 ANNUAL GROUNDWATER REPORT	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004558 CDM-0004-0069-0386 MINUTES N68711-00-D-0004 50	**04-01-2009** 04-03-2009 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	15 APRIL 2009 95TH RESTORATION ADVISORY BOARD MEETING MAILER [INCLUDES AGENDA, PUBLIC NOTICE, 28 JANUARY 2009 DRAFT RAB MEETING MINUTES AND SIGN-IN SHEETS, AND 03 DECEMBER 2008 FINAL RAB MEETING MINUTES]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004880 ECS-1016-0000-0102 REPORT N68711-04-C-1016 309	**04-01-2009** 09-21-2010 5090.3.A. NONE	RAWAL, D. ENVIRO COMPLIANCE SOLUTIONS, INC. BRAC PMO WEST	FINAL PILOT STUDY WORK PLAN (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-7/9	

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AR_M60050_004573 CDM-0004-0069-0393 MINUTES N68711-00-D-0004 80	**04-15-2009** 04-23-2009 5090.3.A. DO 0069	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	15 APRIL 2009 95TH RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS (INCLUDES 15 APRIL 2009 RAB MEETING MAILER, AGENDA, AND VARIOUS HANDOUTS)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002C PRL GROUP V SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024 TAA 000005B TAA 000130C TAA 000371B TAA 000771	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	
AR_M60050_004879 BRAC SER BPMOW.JC/0267 CORRESPONDENCE NONE 2	**04-30-2009** 09-21-2010 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL PILOT STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	
AR_M60050_004761 BRAC SER BPMOW.MPS/0276 CORRESPONDENCE NONE 3	**05-05-2009** 05-20-2010 5090.3.A. NONE	MEGLIOLA, A. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE 1) DRAFT FINAL EXPLANATION OF SIGNIFICANT DIFFERENCES FINALIZING THE INTERIM FINAL RECORD OF DECISION, 2) RESPONSES TO COMMENTS THE DRAFT, AND 3) SUMMARY OF REVISIONS	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	
AR_M60050_004895 NONE CORRESPONDENCE NONE 2	**05-08-2009** 10-21-2010 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE FINAL PILOT STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	

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AR_M60050_004684 ET-1837-0025-0014 REPORT N62472-03-D-1837 31	**06-01-2009** 01-05-2010 5090.3.A. CTO 0025	EARTH TECH, INC. BRAC PMO WEST	FINAL EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD) FINALIZING THE INTERIM FINAL RECORD OF DECISION (ROD) [CD COPY ENCLOSED]	ADMIN RECORD BASE INFO REPOSITORY	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110311-2/5	
AR_M60050_004598 NONE CORRESPONDENCE NONE 2	**06-29-2009** 06-29-2009 5090.3.A. NONE	COLLACOTT, D. COUNTY OF ORANGE ENVIRONMENTAL MANAGEMENT AGENCY - SANTA ANA, CA FAUNCE, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT SITE SAMPLING AND ANALYSIS PLAN, COMPREHENSIVE WORK PLAN FOR REMEDIAL INVESTIGATION / FEASIBILITY STUDY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00003 SITE 00005 SITE 00007 SITE 00009 SITE 00014	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	
AR_M60050_004896 NONE CORRESPONDENCE NONE 1	**07-01-2009** 10-21-2010 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE FINAL PILOT STUDY WORK PLAN	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	
AR_M60050_004638 BRAC SER BPMOW.NW/0452 CORRESPONDENCE NONE 2	**07-07-2009** 09-18-2009 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL SPRING 2008 MONITORING REPORT ROUND DATA SUMMARY REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110311-4/5	
AR_M60050_004639 JNS-1110-0006-0420 REPORT N68711-04-D-1110 3063	**07-07-2009** 09-18-2009 5090.3.A. DO 0006	GREAZEL, A. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	FINAL SPRING 2008 MONITORING REPORT ROUND DATA SUMMARY REPORT (CD COPY ENCLOSED)	ADMIN RECORD BASE SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110311-2/5	

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AR_M60050_004672 ERRG-6016-0007-0003 REPORT N68711-01-D-6016 126	**08-01-2009** 12-10-2009 5090.3.A. CTO 0007	ENGINEERING/REMEDIATION RESOURCES GROUP, INC. BRAC PMO WEST	IMPLEMENTATION PLAN AND PROJECT PROGRESS REPORT, JANUARY 2008 - FEBRUARY 2009, LANDFILL (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-2/6	
AR_M60050_004627 CDM-0004-0069-0422 MINUTES N68711-00-D-0004 92	**08-07-2009** 08-31-2009 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	19 AUGUST 2009 RESTORATION ADVISORY BOARD MEETING MAILER (INCLUDES AGENDA, PUBLIC NOTICE, DRAFT 15 APRIL 2009 MEETING MINUTES AND SIGN-IN SHEET, FINAL 28 JANUARY 2009 MEETING MINUTES, AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 BLDG 0000746 HANGAR 0296 OU 0000002C SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110311-1/5	
AR_M60050_004683 BRAC SER BPMOW.MPS/0569 CORRESPONDENCE NONE 3	**08-18-2009** 01-05-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD) FINALIZING THE INTERIM FINAL RECORD OF DECISION (ROD)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	OU 0000002B SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	

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AR_M60050_004641 CDM-0004-0069-0427 MINUTES N68711-00-D-0004 73	**08-19-2009** 10-22-2009 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. ARNOLD, C. BRAC PMO WEST	19 AUGUST 2009 RESTORATION ADVISORY BOARD (RAB) MEETING MATERIALS [CD COPY ENCLOSED] {INCLUDES AGENDA, DRAFT 15 APRIL 2009 RAB MEETING MINUTES, SIGN-IN SHEET, AND VARIOUS HANDOUTS}	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 BLDG 0000746 OU 0000002C SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024 WELL 00078 WELL ET-1 WELL ET-2	CHOICE IMAGING SOLUTIONS SW-20110311-2/5	
AR_M60050_004671 BRAC SER BPMOW.MPS/0605 CORRESPONDENCE NONE 3	**08-26-2009** 12-10-2009 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE 1) IMPLEMENTATION PLAN AND PROJECT PROGRESS REPORT, JANUARY 2008 - FEBRUARY 2009, LANDFILL; AND 2) FINAL BIOMONITORING REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110302-6/6	
AR_M60050_004647 NONE CORRESPONDENCE NONE 2	**09-15-2009** 10-22-2009 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE SPRING 2008 GROUNDWATER MONITORING ROUND DATA SUMMARY REPORT	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	
AR_M60050_004685 BRAC SER BPMOW.JD/0022 CORRESPONDENCE NONE 8	**10-19-2009** 01-06-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST THAN, Q. DTSC - CYPRESS, CA	REQUEST FOR IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE TIME-CRITICAL REMOVAL ACTION (TCRA) ON PROPERTY ADJACENT TO SITE [CD COPY ENCLOSED]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-2/5	

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AR_M60050_004739 TRVT-0607-0000-0009 REPORT N62473-09-C-0607 211	**11-01-2009** 04-22-2010 5090.3.A. NONE	STANG, P. TREVET BRAC PMO WEST	FINAL ACCIDENT PREVENTION PLAN, GROUNDWATER MONITORING AND ASSOCIATED ACTIVITIES (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00016	CHOICE IMAGING SOLUTIONS SW-20110325-4/9	
AR_M60050_004698 TRVT-0607-0000-0013 REPORT N62473-09-C-0607 18	**11-09-2009** 01-12-2010 5090.3.A. NONE	TAMASHIRO, G. TREVET BRAC PMO WEST	FINAL ADDENDUM 1 TO THE REVISED FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN) GROUNDWATER MONITORING [CD COPY ENCLOSED]	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110214-7/7	
AR_M60050_004686 NONE CORRESPONDENCE NONE 7	**11-23-2009** 01-06-2010 5090.3.A. NONE	DONOHOE, R. CALIFORNIA DEPARTMENT OF FISH AND GAME - MONTEREY, CA THAN, Q. DTSC - CYPRESS, CA	RESPONSE TO NAVY'S REQUEST FOR IDENTIFICATION OF STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE TIME-CRITICAL REMOVAL ACTION (TCRA) ON PROPERTY ADJACENT TO SITE [CD COPY ENCLOSED]	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-2/5	
AR_M60050_004691 BRAC SER BPMOW.JD/0116 CORRESPONDENCE NONE 3	**11-30-2009** 01-06-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT ACTION MEMORANDUM (AM), TIME-CRITICAL REMOVAL ACTION (TCRA), ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	
AR_M60050_004770 NONE PUBLIC NOTICE NONE 3	**12-02-2009** 05-27-2010 5090.3.A. NONE	LOS ANGELES TIMES - LOS ANGELES, CA PUBLIC	PUBLIC NOTICE ANNOUNCING THE 09 DECEMBER 2009 97TH RESTORATION ADVISORY BOARD MEETING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	

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AR_M60050_004677 CDM-0004-0069-0476 MINUTES N68711-00-D-0004 89	**12-09-2009** 12-21-2009 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	09 DECEMBER 2009 RESTORATION ADVISORY BOARD (RAB) MEETING HANDOUTS (INCLUDES AGENDA, PUBLIC NOTICE, 19 AUGUST 2009 DRAFT RAB MEETING MINUTES AND SIGN-IN SHEET, 15 APRIL 2009 FINAL RAB MEETING MINUTES, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 BLDG 0000127 BLDG 0000307 BLDG 0000388 SITE 00001 SITE 00002 SITE 00008 SITE 00012 SITE 00017 SITE 00018 SITE 00024 TAA 000297 UST 000367	CHOICE IMAGING SOLUTIONS SW-20110311-2/5	
AR_M60050_004680 CDM-0004-0069-0470 MINUTES N68711-00-D-0004 88	**12-09-2009** 12-30-2009 5090.3.A. DO 0069	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. ARNOLD, C. BRAC PMO WEST	09 DECEMBER 2009 RESTORATION ADVISORY BOARD (RAB) MEETING MAILER [INCLUDES AGENDA, PUBLIC NOTICE, DRAFT 19 AUGUST 2009 RAB MEETING MINUTES AND SIGN-IN SHEET, FINAL 15 APRIL 2009 RAB MEETING MINUTES, VARIOUS HANDOUTS, AND CD COPY]	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 OU 0000002C SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110311-2/5	
AR_M60050_004887 NONE PUBLIC NOTICE NONE 1	**12-09-2009** 10-04-2010 5090.3.A. NONE	ORANGE COUNTY REGISTER - SANTA ANA, CA NAVFAC - SOUTHWEST	PUBLIC NOTICE ANNOUNCING 97TH RESTORATION ADVISORY BOARD (RAB) MEETING PUBLISHED IN THE ORANGE COUNTY REGISTER (INCLUDES PROOF OF PUBLICATION)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00002 SITE 00017	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	
AR_M60050_004716 BRAC SER BPMOW.JD/0165 CORRESPONDENCE NONE 3	**12-18-2009** 03-02-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE DRAFT TIME-CRITICAL REMOVAL ACTION WORK PLAN, ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	

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AR_M60050_004681 BRAC SER BPMOW.JD/0178 CORRESPONDENCE NONE 12	**12-22-2009** 01-05-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT SCHEDULE EXTENSION REQUEST FOR THE DRAFT FINAL FEASIBILITY STUDY, THE DRAFT PROPOSED PLAN, AND THE DRAFT RECORD OF DECISION (INCLUDES FEDERAL FACILITY AGREEMENT [FFA] APPENDIX A SCHEDULE AND COMPREHENSIVE SCHEDULE)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	
AR_M60050_004708 NONE CORRESPONDENCE NONE 2	**12-24-2009** 02-11-2010 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND COMMENTS ON THE DRAFT ACTION MEMORANDUM (AM), TIME-CRITICAL REMOVAL ACTION, ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	
AR_M60050_004699 NONE CORRESPONDENCE NONE 1	**01-05-2010** 01-21-2010 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT ACTION MEMORANDUM (AM), TIME-CRITICAL REMOVAL ACTION (TCRA), ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	
AR_M60050_004700 CDM-0004-0069-0482 MINUTES N68711-00-D-0004 120	**01-27-2010** 01-27-2010 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	27 JANUARY 2010 RESTORATION ADVISORY BOARD (RAB) MEETING MAILER (INCLUDES, 27 JANUARY 2010 RAB MEETING AGENDA & PUBLIC NOTICE, 09 DECEMBER 2009 DRAFT RAB MEETING MINUTES & SIGN-IN SHEET, 19 AUGUST 2009 FINAL RAB MEETING MINUTES, MAILING LIST, AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024 UST 000398	CHOICE IMAGING SOLUTIONS SW-20110311-3/5	

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AR_M60050_004704 CDM-0004-0069-0487 MINUTES N68711-00-D-0004 88	**01-27-2010** 02-04-2010 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	27 JANUARY 2010 RESTORATION ADVISORY BOARD (RAB) MEETING HANDOUTS (INCLUDES AGENDA, PUBLIC NOTICE, 09 DECEMBER 2009 DRAFT RAB MEETING MINUTES AND SIGN-IN SHEET, 19 AUGUST 2009 FINAL RAB MEETING MINUTES, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110311-3/5	
AR_M60050_004719 ET-1837-0032-0010 REPORT N62742-03-D-1837 437	**02-01-2010** 03-03-2010 5090.3.A. CTO 0032	EARTH TECH, INC. BRAC PMO WEST	FINAL ACTION MEMORANDUM, TIME-CRITICAL REMOVAL ACTION, ADJACENT PROPERTY (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-3/5	
AR_M60050_004746 ET-1837-0032-0011 REPORT N62742-03-D-1837 296	**02-01-2010** 05-06-2010 5090.3.A. CTO 0032	WANYOIKE, C. AECOM TECHNICAL SERVICES, INC. BRAC PMO WEST	FINAL TIME-CRITICAL REMOVAL ACTION WORK PLAN, ADJACENT PROPERTY (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-5/9	
AR_M60050_004718 BRAC SER BPMOW.JED/0285 CORRESPONDENCE NONE 2	**02-05-2010** 03-03-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL ACTION MEMORANDUM, TIME-CRITICAL REMOVAL ACTION, ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110311-5/5	
AR_M60050_004745 BRAC SER BPMOW.JD/0289 CORRESPONDENCE NONE 3	**02-09-2010** 05-06-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL TIME-CRITICAL REMOVAL ACTION WORK PLAN, ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	

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AR_M60050_000067 BRAC SER BPMOW.SOM/0327 CORRESPONDENCE NONE 2	**02-24-2010** 03-23-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	TRANSMITTAL OF THE FINAL SPRING 2009 MONITORING ROUND DATA SUMMARY REPORT (W/OUT ENCLOSURE)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20100702-3/8	
AR_M60050_000646 JNS-1110-0006-0001 REPORT N68711-04-D-1110 1678	**02-24-2010** 03-23-2010 5090.3.A. DO 0006	VARGAS, G. JONAS AND ASSOCIATES, INC. BRAC PMO WEST	FINAL SPRING 2009 MONITORING ROUND DATA SUMMARY REPORT (CD COPY ENCLOSED)	ADMIN RECORD BASE SENSITIVE	AA 0000003 OU 0000002A OU 0000002B OU 0000002C SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00021 SITE 00022 SITE 00023 SITE 00024 WELL 00002_NEW11 WELL 00002_NEW16	CHOICE IMAGING SOLUTIONS SW20100702-2/8	
AR_M60050_004754 NONE CORRESPONDENCE NONE 2	**03-08-2010** 05-11-2010 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE FINAL ACTION MEMORANDUM, TIME-CRITICAL REMOVAL ACTION, ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	

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AR_M60050_004747 NONE CORRESPONDENCE NONE 2	**03-09-2010** 05-06-2010 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND CONCURRENCE WITH THE FINAL TIME-CRITICAL REMOVAL ACTION WORK PLAN, ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	
AR_M60050_004732 BRAC SER BPMOW.JC/0389 CORRESPONDENCE NONE 5	**03-18-2010** 04-14-2010 5090.3.A. NONE	CALLIAN, J. BRAC PMO WEST MULTIPLE AGENCIES	FEDERAL FACILITY AGREEMENT APPENDIX A SCHEDULE EXTENSION REQUEST FOR THE FORMER EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE SOIL DRAFT PROPOSED PLAN AND DRAFT RECORD OF DECISION	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001 SITE 00008 SITE 00012	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	
AR_M60050_004768 NONE PUBLIC NOTICE NONE 2	**03-24-2010** 05-26-2010 5090.3.A. NONE	LOS ANGELES TIMES - LOS ANGELES, CA PUBLIC	PUBLIC NOTICE ANNOUNCING THE 30-DAY PUBLIC COMMENT PERIOD ON THE DRAFT ACTION MEMORANDUM, TIME-CRITICAL REMOVAL ACTION, ADJACENT PROPERTY	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	
AR_M60050_004769 NONE PUBLIC NOTICE NONE 4	**03-24-2010** 05-26-2010 5090.3.A. NONE	ORANGE COUNTY REGISTER - SANTA ANA, CA PUBLIC	PUBLIC NOTICE ANNOUNCING THE 30-DAY PUBLIC COMMENT PERIOD ON THE DRAFT ACTION MEMORANDUM, TIME-CRITICAL REMOVAL ACTION, ADJACENT PROPERTY (INCLUDES PROOF OF PUBLICATION)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	
AR_M60050_004779 NONE CORRESPONDENCE NONE 1	**04-06-2010** 06-08-2010 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE FINAL SPRING 2009 MONITORING ROUND DATA SUMMARY REPORT	ADMIN RECORD BASE INFO REPOSITORY	AA 0000003 SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	

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AR_M60050_004748 CDM-0004-0069-0511 MINUTES N68711-00-D-0004 80	**04-28-2010** 05-10-2010 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	28 APRIL 2010 RESTORATION ADVISORY BOARD MEETING MAILER (INCLUDES AGENDA, PUBLIC NOTICE, 27 JANUARY 2010 DRAFT MINUTES, 09 DECEMBER 2009 FINAL MINUTES, MAILING LIST, AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	
AR_M60050_004749 CDM-0004-0069-0514 MINUTES N68711-00-D-0004 90	**04-28-2010** 05-10-2010 5090.3.A. DO 0069	CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	28 APRIL 2010 RESTORATION ADVISORY BOARD MEETING HANDOUTS (INCLUDES AGENDA, PUBLIC NOTICE, 27 JANUARY 20010 DRAFT MINUTES, 09 DECEMBER 2009 FINAL MINUTES, VARIOUS HANDOUTS, AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00002 SITE 00003 SITE 00005 SITE 00016 SITE 00017 SITE 00018 SITE 00024	CHOICE IMAGING SOLUTIONS SW-20110325-2/9	
AR_M60050_004897 NONE CORRESPONDENCE NONE 1	**08-03-2010** 10-21-2010 5090.3.A. NONE	BRODERICK, J. CRWQCB - RIVERSIDE, CA CALLIAN, J. MCAS EL TORO - SANTA ANA, CA	REVIEW AND NO COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM IN-SITU BIOREMEDIATION PILOT STUDY, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	
AR_M60050_004869 NONE PUBLIC NOTICE NONE 3	**08-18-2010** 09-01-2010 5090.3.A. NONE	ORANGE COUNTY REGISTER - SANTA ANA, CA PUBLIC	PUBLIC NOTICE ANNOUNCING THE 100TH RESTORATION ADVISORY BOARD MEETING FOR THE GROUNDWATER PILOT STUDY (INCLUDES PROOF OF PUBLICATION)	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	
AR_M60050_004940 NONE PUBLIC NOTICE NONE 2	**08-18-2010** 12-09-2010 5090.3.A. NONE	LOS ANGELES TIMES - LOS ANGELES, CA PUBLIC	PUBLIC NOTICE OF 25 AUGUST 2010 100TH RESTORATION ADVISORY BOARD MEETING	ADMIN RECORD BASE INFO REPOSITORY	SITE 00001	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	

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AR_M60050_001642 CDM-0004-0069-0540 MINUTES N68711-00-D-0004 45	**08-25-2010** 09-27-2010 5090.3.A. DO 0069	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. RESTORATION ADVISORY BOARD	25 AUGUST 2010 RESTORATION ADVISORY BOARD (RAB) MEETING AGENDA (INCLUDES 28 APRIL 2010 DRAFT 99TH RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, VARIOUS HANDOUTS, SIGN-IN SHEET ***SEE COMMENTS***	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00004 SITE 00005 SITE 00006 SITE 00007 SITE 00008 SITE 00009 SITE 00010 SITE 00011 SITE 00012 SITE 00013 SITE 00014 SITE 00015 SITE 00016 SITE 00017 SITE 00018 SITE 00019 SITE 00020 SITE 00021 SITE 00022 SITE 00023 SITE 00024 SITE 00025 WELL 00001-DGMW57 WELL 00001-DGMW58 WELL 00001-MW101 WELL 00001-MW102 WELL 00001-MW201	CHOICE IMAGING SOLUTIONS SW-20110325-4/9	

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Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL 00001-MW202		
							WELL 00001-MW203		
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							WELL 00001-MW222		

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Record Type	SSIC No.	Author Affil.						Location	FRC Accession No.
Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
							WELL 00001-MW223		
							WELL 00001-MW224		
							WELL 00002_DGMW59		
							WELL 00002_DGMW61		
							WELL 00002_UGMW25		
							WELL 00007DBMW43A		
							WELL 00007DBMW70		
							WELL 00007DGMW91		
							WELL 00008DGMW73		
							WELL 00008UGMW29A		
							WELL 00009DGMW75		
							WELL 00010DGMW77		
							WELL 00015DBMW51		
							WELL 00018BGMW03 A-E		
							WELL 00018BGMW101 A		
							WELL 00018BGMW103		
							WELL 00018-BGMW24		
							WELL 00021UGMW37		
							WELL 00022DBMW47		
							WELL 00024MW05 A-B		

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					WELL 00024MW06 WELL 00024MW07 WELL 00024MW09 A-F WELL 00024MW10 A-D WELL 00024MW11 A-D WELL 00024MW13 A-D WELL 00024MW14 A-D WELL 00024MW15 A-D		
AR_M60050_004881 CDM-0004-0069-0539 MINUTES N68711-00-D-0004 96	**08-25-2010** 09-23-2010 5090.3.A. DO 0069	DAVIDSON, L. CDM FEDERAL PROGRAMS CORP. BRAC PMO WEST	25 AUGUST 2010 RESTORATION ADVISORY BOARD (RAB) MEETING AGENDA (INCLUDES SIGN-IN SHEET, VARIOUS HANDOUTS, 28 APRIL 2010 DRAFT 99TH RESTORATION ADVISORY BOARD (RAB) MEETING MINUTES, MAILING LIST, AND CD COPY)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00018 SITE 00024 WELL ET-1 WELL ET-2 WELL IRWD-78	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	
AR_M60050_004912 NONE CORRESPONDENCE NONE 3	**08-30-2010** 10-29-2010 5090.3.A. NONE	THAN, Q. DTSC - CYPRESS, CA CALLIAN, J. BRAC PMO WEST	REVIEW AND COMMENTS ON THE DRAFT TECHNICAL MEMORANDUM IN-SITU BIOREMEDIATION PILOT STUDY, EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	SITE 00001 SITE 00002	CHOICE IMAGING SOLUTIONS SW-20110325-3/9	

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AR_M60050_004914 TRVT-0607-0000-0030 REPORT N62473-09-C-0607 626	**09-01-2010** 10-29-2010 5090.3.A. NONE	STANG, P. TREVET BRAC PMO WEST	FINAL SPRING 2010 DATA SUMMARY REPORT (CD COPY ENCLOSED)	ADMIN RECORD BASE INFO REPOSITORY SENSITIVE	AA 0000003 SITE 00001 SITE 00002 SITE 00003 SITE 00005 SITE 00008 SITE 00011 SITE 00012 SITE 00016 SITE 00017 SITE 00018 SITE 00024 WELL 00001-EW03 WELL 00001-MW102 WELL 00001-MW201 WELL 00001-MW202 WELL 00001-MW203 WELL 00001-MW204 WELL 00001-MW209 WELL 00001-MW211 WELL 00001-MW215 WELL 00001-MW218 WELL 00001-MW219 WELL 00001-MW223 WELL 00001-PZ01	CHOICE IMAGING SOLUTIONS SW-20110325-9/9	

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Contract No.	CTO No.	Recipient						SWDIV Box No(s)	FRC Warehouse
Approx. # Pages		Recipient Affil.		Subject		Distribution	Sites	CD No.	FRC Box No(s)
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							WELL 00001-PZ07		
							WELL 00001-PZ08		
							WELL 00001-PZ09		
							WELL 00001-PZ11		
							WELL 00001-PZ12		
							WELL 00001-PZ21A		
							WELL 00002_NEW02		
							WELL 00002_NEW07		
							WELL 00002_NEW08A		
							WELL 00002_NEW11		
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Total Records: 875

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No Keywords

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No Classification

Attachment 2 – References

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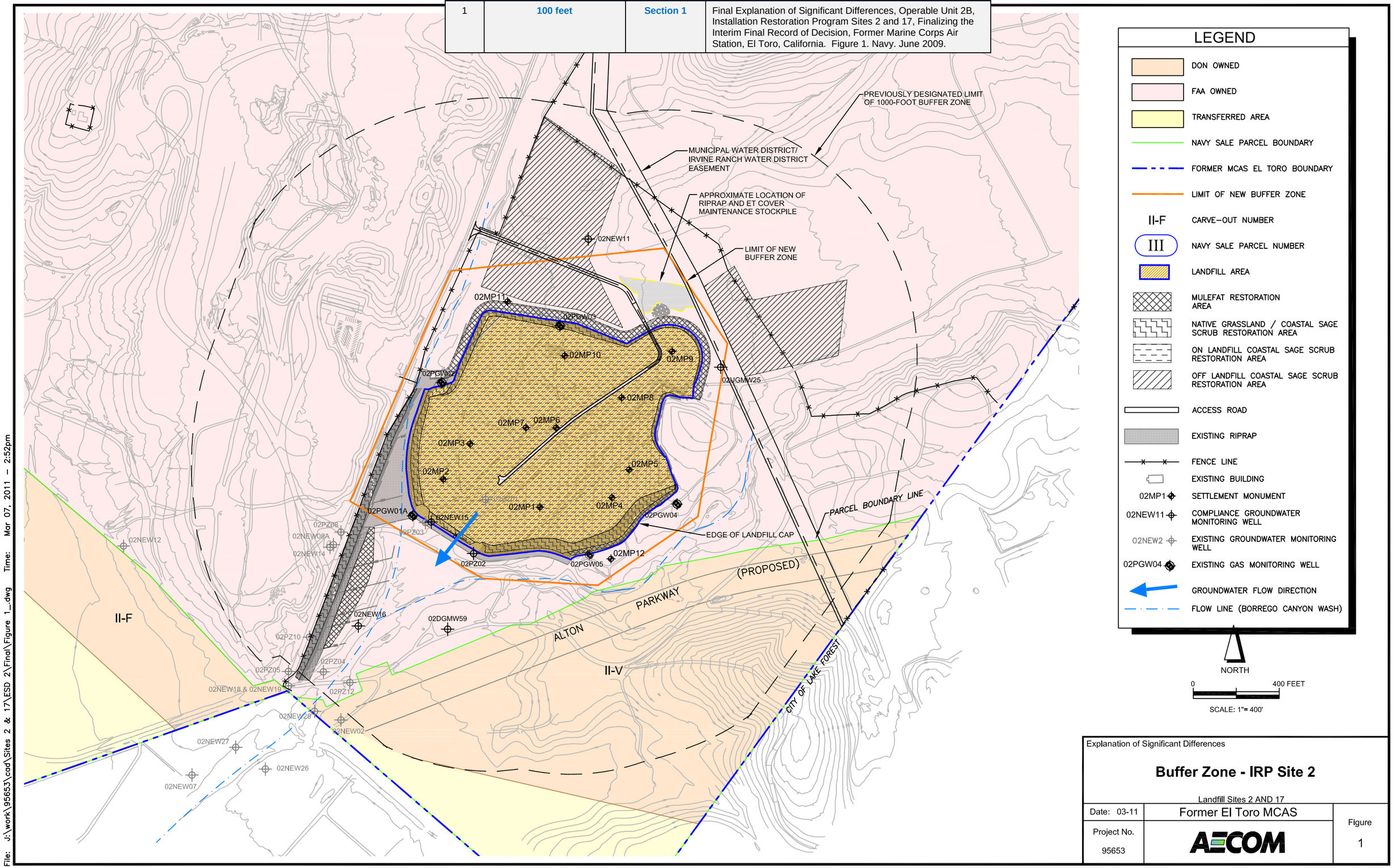
Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
1	**100 feet**	**Section 1**	Final Explanation of Significant Differences, Operable Unit 2B, Installation Restoration Program Sites 2 and 17, Finalizing the Interim Final Record of Decision, Former Marine Corps Air Station, El Toro, California. Figure 1. Navy. June 2009.
2	**EOD training**	**Section 2.1.1**	Final Work Plan, Phase II Remedial Investigation/Feasibility Study, MCAS El Toro, California. Site Description. Bechtel National, Inc. July 1995.
3	**low-level radioactive material**	**Section 2.1.1**	Initial Assessment Study of Marine Corps Sir Station, El Toro, California. Section 2.2.1. Naval Energy and Environmental Support Activity. May 1986.
4	**unrestricted release**	**Section 2.1.1**	Recommendation for Unrestricted Release of Former Explosive Ordnance Disposal Training Range – IRP Site 1, Marine Corps Air Station El Toro, California. Memorandum from Robin R. Hook, Chief, Environmental Management Branch, California Department of Public Health. September 25, 2007
5	**munitions characterization activities**	**Section 2.1.1**	Final Time-Critical Removal Action Work Plan, Installation Restoration Program Site 1, Adjacent Property, Former Marine Corps Air Station El Toro, California. Appendix A. AECOM. February 2010.
6	**(FBI) used IRP Site 1 for training purposes**	**Section 2.1.1**	Letter Report stating the FBI's Use of the MCAS El Toro EOD Range. Entire Document. March 2000.
7	**suspected types of waste**	**Section 2.1.2**	Draft Phase II Remedial Investigation Report, Operable Unit 2B – Site 2, Marine Corps Air Station, El Toro, California. Section 1.2.2.3. March 1996.
8	**remedial action for soil**	**Section 2.1.2**	Final Remedial Action Completion Report, Installation Restoration Program Sites 2 and 17, Marine Corps Air Station, El Toro, California. Section 4. March 2009.
9	**The geology in the vicinity of IRP Site 1**	**Section 2.3.1.1**	Final Phase II Remedial Investigation Report, IRP Site 1, Explosive Ordnance Disposal Range, Former Marine Corps Air Station, El Toro, California. Sections 3.1 and 3.2. December 2006.
10	**pump tests conducted in 2005 and 2006**	**Section 2.3.1.1**	Final Aquifer Characterization and Bench-Scale Treatability Testing, Installation Restoration Program Site 1, Former Marine Corps Air Station El Toro, Irvine, California. Section 8.1.2, and Tables 8 and 11. Enviro Compliance Solutions, Inc. November 2006.
11	**The geology in the vicinity of IRP Site 2**	**Section 2.3.1.2**	Final Technical Memorandum, Aquifer Test, IRP Site 2, Magazine Road Landfill, Former Marine Corps Air Station, El Toro, California. Sections 5.3 and 5.4. February 2006.
12	**pump tests conducted in 2002 and 2003**	**Section 2.3.1.2**	Final Technical Memorandum, Aquifer Test, IRP Site 2, Magazine Road Landfill, Former Marine Corps Air Station, El Toro, California. Section 5.2.4. February 2006.
13	**nature and extent of releases in IRP Site 1 groundwater**	**Section 2.3.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 3.2.1. AECOM. April 2011.
14	**Perchlorate was reported in groundwater**	**Section 2.3.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 3-7. AECOM. April 2011.
15	**nature and extent of releases in IRP Site 2 groundwater**	**Section 2.3.2.2**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 3.2.2. AECOM. April 2011.
16	**TCE exceeded its Federal MCL**	**Section 2.3.2.2**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 3-8. AECOM. April 2011.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
17	**Some of the other VOCs**	**Section 2.3.2.2**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 3-12. AECOM. April 2011.
18	**IRP Site 1**	**Section 2.5**	Final Phase II Remedial Investigation Report, IRP Site 1, Explosive Ordnance Disposal Range, Former Marine Corps Air Station, El Toro, California. Section 6. December 2006.
19	**IRP Site 2**	**Section 2.5**	Draft Final Phase II Remedial Investigation Report, Operable Unit 2B – Site 2, Marine Corps Air Station, El Toro, California. Section 6. September 1996.
20	**preliminary remediation goals (PRGs)**	**Section 2.5.1.1**	EPA Region 9 PRGs. November 2004.
21	**FS**	**Section 2.5.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix C. AECOM. April 2011.
22	**2009 Annual Groundwater Monitoring Report**	**Section 2.5.2.3**	2009 Annual Groundwater Monitoring Report, Marine Corps Air Station, El Toro, California. Table 7, pages 8 of 15 through 15 of 15. Trevet Environmental Consultants. 2009.
23	**Final Interim ROD for IRP Sites 2 and 17**	**Section 2.5.2.3, Table 2-4**	Final Interim Record of Decision, Operable Unit 2B, Landfill Sites 2 and 17, Marine Corps Air Station El Toro, California. Table 6-2. Navy. 2000.
24	**RAOs**	**Section 2.7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 4.2. AECOM. April 2011.
25	**screening of technologies and process options**	**Section 2.8**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 4.5 and Tables 4-2 and 4-3. AECOM. April 2011.
26	**remedial alternatives developed for IRP Site 1 perchlorate-impacted groundwater**	**Section 2.8.1.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 5.1 and Figures 5-3 through 5-6. AECOM. April 2011.
27	**Present Worth Cost[d]: $3,223,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1, page 3-1; and Tables 2 and 3. AECOM. April 2011.
28	**Timeframe[e]: Greater than 200 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.1; Table E5-1; and Figure E4-1. AECOM. April 2011.
29	**areas requiring ICs (ARICs)**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 5-2. AECOM. April 2011.
30	**Present Worth Cost[d]:$9,378,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1, page 3-1; and Tables 4 and 5. AECOM. April 2011.
31	**Timeframe[e]: Greater than 200 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.2; Table E5-1; and Figure E4-2. AECOM. April 2011.
32	**Present Worth Cost[d]: $12,479,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1.3; and Tables 6 and 7. AECOM. April 2011.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
33	**Timeframe[e]: Greater than 200 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.3; Table E5-1; and Figure E4-3. AECOM. April 2011.
34	**Present Worth Cost[g]: $9,218,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1.4; and Tables 8 and 9. AECOM. April 2011.
35	**Timeframe[e]: 19 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.4; Table E5-1; and Figure E4-4. AECOM. April 2011.
36	**Present Worth Cost[i]: $24,280,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1.5; and Tables 10 and 11. AECOM. April 2011.
37	**Timeframe[e]: 49 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.5; Table E5-1; and Figure E4-5. AECOM. April 2011.
38	**remedial alternatives developed for IRP Site 2 VOC-impacted groundwater**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 5.2 and Figures 5-9 and 5-10. AECOM. April 2011.
39	**Present Worth Cost[d]: $1,755,000**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.2.1; and Tables 12 and 13. AECOM. April 2011.
40	**Timeframe[e]: 30 years**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix F, Section F3, pages F3-1 and F3-2; Table F3-1; and Figures F3-4 through F3-6. AECOM. April 2011.
41	**ARICs**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 5-8. AECOM. April 2011.
42	**Present Worth Cost[g]: $3,665,000**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.2.2; and Tables 14 and 15. AECOM. April 2011.
43	**Timeframe[e]: 29 Years**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix F, Section F3, page F3-2; Table F3-1; and Figures F3-7 through F3-9. AECOM. April 2011.
44	**Present Worth Cost[i]: $2,167,000**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.2.3; and Tables 16 and 17. AECOM. April 2011.
45	**Timeframe[e]: 21 Years**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix F, Section F3, page F3-2; Table F3-1; and Figures F3-11 through F3-13. AECOM. April 2011.
46	**Individual and comprehensive analyses of IRP Site 1 groundwater remedial alternatives**	**Section 2.8.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Sections 6.2.1 and 6.3.1, and Table 6-1. AECOM. April 2011.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
47	**nine evaluation criteria identified in the NCP**	**Section 2.8.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 6.1 and Figures 5-3 through 5-6. AECOM. April 2011.
48	**all identified ARARs**	**Section 2.8.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Tables A2-2, A2-3, A3-1, A3-2, A4-1, and A4-2. AECOM. April 2011.
49	**Individual and comparative analyses of IRP Site 2 groundwater remedial alternatives**	**Section 2.8.2.2**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Sections 6.2.2 and 6.3.2, and Table 6-2. AECOM. April 2011.
50	**design configurations**	**Section 2.9.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 5-5. AECOM. April 2011.
51	**Memorandum of Agreement (MOA)**	**Section 2.9.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix D. AECOM. April 2011.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
1	100 feet	Section 1	Final Explanation of Significant Differences, Operable Unit 2B, Installation Restoration Program Sites 2 and 17, Finalizing the Interim Final Record of Decision, Former Marine Corps Air Station, El Toro, California. Figure 1. Navy. June 2009.



Explanation of Significant Differences

Buffer Zone - IRP Site 2

Landfill Sites 2 AND 17

Date: 03-11	Former El Toro MCAS	Figure
Project No. 95653	AECOM	1

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Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
2	EOD training	Section 2.1.1	Final Work Plan, Phase II Remedial Investigation/Feasibility Study, MCAS El Toro, California. Site Description. Bechtel National, Inc. July 1995.

ange

Site Description

Site 1, the EOD Range, is located in the northeast portion of Marine Corps Air Station (MCAS) El Toro in the foothills of the Santa Ana Mountains (Figure A-1). The site is situated within a tributary canyon to Borrego Canyon Wash at an elevation of about 625 feet mean sea level (MSL). Site boundaries for MCAS El Toro Phase I RI were determined by consensus between the Navy and regulatory agencies prior to initiation of the Phase I RI. Areas of concern were generally grouped together into sites based on common historical activities, aerial photograph review, and their respective locations to each other.

Disposal and detonation of munitions have been conducted at this site since 1952. Military ordnance disposed at the site has included hand grenades, land mines, cluster bombs, smoke bombs, and rocket warheads. Civilian and commercial explosives, such as 2,4,6-trinitrotoluene (TNT), dynamite, and plastic and gelatinous explosives, were also disposed at the EOD Range.

In 1982, approximately 2,000 gallons of drummed FS smoke was burned in trenches located at the northern end of the site (Figure A-2). The disposal method consisted of partially burying the drums containing FS smoke and rupturing them with a small explosive charge. It is not known if petroleum fuel was used to facilitate the burning of the drums.

Sources of potential contaminants include disposed ordnance (exploded and unexploded) and petroleum fuels (gasoline, kerosene, and diesel fuel) used in the disposal process. An estimated 30,000 tons of munitions and explosives have been disposed at this site. In addition, an estimated 300,000 gallons of petroleum fuels were used in burning these disposed materials (Jacobs Engineering 1993a).

The EOD Range continues to operate. Munitions are detonated in trenches and pits that are continually filled with soil and reexcavated. The top soil is frequently disked for weed control, which mixes the shallow soils and removes identifiable site features. Undetonated explosives or drums may still be present at the EOD Range, buried beneath the soil.

Previous Investigations

Previous investigations at Site 1 are the geophysical survey, Phase I RI, aerial photograph surveys, and employee interviews. The sections below provide a summary of these investigations.

GEOPHYSICAL SURVEY

A surface geophysical survey was conducted at Site 1 in 1991 to facilitate the identification of subareas within the site where disposal activities had occurred and where buried material (drums, vehicles, etc.) may be present (Jacobs Engineering 1991). The surveys were conducted by making a series of linear traverses across the site at equally spaced intervals. Two types of surveys were conducted: ground-penetrating radar (GPR)

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
3	low-level radioactive material	Section 2.1.1	Initial Assessment Study of Marine Corps Sir Station, El Toro, California. Section 2.2.1. Naval Energy and Environmental Support Activity. May 1986.

Some sulfur trioxide chlorosulfonic acid may remain in the pits as a result of the insufficient addition of water by rainfall or containment in unexploded drums. The pH of the soils at the site will be decreased as a result of sulfuric acid formation.

In addition, it was reported that low-level radioactive waste may have been disposed of in the EOD range. Although no information could be obtained concerning the location of this site within the EOD range or the specific material disposed of, the possibility of its existence there should be recognized.

The soils at the site are sand and gravel which are conducive to percolation and migration of contaminants. Contaminants from the site may migrate to the agricultural-use lands at the base of the canyon or be carried further downstream to the upper Newport Bay Ecological Reserve. Because of the low annual net precipitation rate at the station, migration of these materials will be slow and would most likely occur during periods of heavy rainfall, further diluting the concentration levels of the contaminants which are migrating. This site poses a potential threat to human health through direct contact at the site and indirect food chain consumption, and to the environment from the indirect affects on the rare or endangered species present in the upper Newport Bay Ecological Reserve which feed at the station.

Based on the type and characteristic of the waste disposed of, the high potential for surface migration and the presence of potential receptors of contamination, Site 1 is recommended for a Confirmation Study.

2.2.2. Site 2, Magazine Road Landfill. Site 2 consists of a 22 acre landfill that lies along Borrego Canyon Wash adjacent to Building 1752. From the late 1960s until 1980 all solid wastes generated at the station, plus those from MCAS Tustin, were disposed of in this landfill. Some liquid wastes (as described below) were also deposited in the landfill. The landfill is situated in an old borrow pit which was backfilled in a series of lifts. Based on the overall dimensions, it is estimated a total volume of 800,000 to 1,000,000 cubic yards of material were placed in this landfill. Unlike earlier landfills, the majority of wastes placed in this landfill were not burned for volume reduction.

Wastes disposed of in the landfill reportedly include inert solid wastes such as construction debris, concrete, and asphalt; municipal solid waste, lead-batteries, scrap metal, household refuse, waste crankcase oil, hydraulic fluid, fuels, lead-based paint residue, solvents and possibly transformers. Individual quantities, and the actual makeup of these "categories" of wastes listed above, could not be determined, though reportedly almost any type of waste generated on station may have been disposed of at the landfill. (See Section 8.3 for further site details.)

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
4	unrestricted release	Section 2.1.1	Recommendation for Unrestricted Release of Former Explosive Ordnance Disposal Training Range – IRP Site 1, Marine Corps Air Station El Toro, California. Memorandum from Robin R. Hook, Chief, Environmental Management Branch, California Department of Public Health. September 25, 2007

MEMORANDUM

DATE: September 25, 2007

TO: Mr. Rick Moss, Chief
Office of Military Facilities
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826-3200

FROM: Robin R. Hook, Chief
Environmental Management Branch
P.O. Box 997413
1616 Capitol Avenue, MS 7405
Sacramento, California 95899-7413
(916) 449-5667

SUBJECT: Recommendation for Unrestricted Release of Former Explosive Ordnance Disposal Training Range – IRP Site 1, Marine Corps Air Station El Toro, California.

Upon the request of The Department of Toxic Substance Control (DTSC), the California Department of Public Health (CDPH) reviewed radiological issues associated with the above-mentioned site. CDPH reviewed site documentation, surveys and history for the site as provided by the Navy. The derived dose for this site was less than 5 mrem per year. CDPH has therefore concluded that, with respect to radiological issues, this site is acceptable for unrestricted release.

If you need further assistance please contact Penny Leinwander of my staff at (916) 449-5921.

cc: Mr. Quang Than
Remedial Project Manager
Department of Toxic Substances Control (DTSC)
5796 Corporate Way
Cypress, California 90630

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
5	**munitions characterization activities**	**Section 2.1.1**	Final Time-Critical Removal Action Work Plan, Installation Restoration Program Site 1, Adjacent Property, Former Marine Corps Air Station El Toro, California. Appendix A. AECOM. February 2010.

Appendix A
Munitions Characterization Technical Memorandum

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ACRONYMS AND ABBREVIATIONS

BCT	BRAC Cleanup Team
bgs	below ground surface
BNI	Bechtel National, Inc.
BRAC	Base Realignment and Closure
CD	cultural debris
CSS	Coastal Sage Scrub
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	chemical of potential concern
DDESB	Department of Defense Explosives Safety Board
DON	Department of the Navy
Earth Tech	Earth Tech, Inc.
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
ESQD	Explosives Safety Quantity-Distance
ESS	Explosives Safety Submission
FBI	Federal Bureau of Investigation
FS	Feasibility Study
FS smoke	sulfur-trioxide chlorosulfonic acid
ICM	improved conventional munition
IRP	Installation Restoration Program
JATO	jet-assisted take-off
JEG	Jacobs Engineering Group
MARCORSYSCOM	Marine Corps Systems Command
MC	munitions constituents
MCAS	Marine Corps Air Station
MD	munitions debris
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mm	millimeter
MPPEH	material potentially presenting explosive hazard
msl	mean sea level
NA	not applicable
NAVFAC Pacific	Naval Facilities Engineering Command Pacific
NAVFAC SW	Naval Facilities Engineering Command Southwest
PRGs	preliminary remediation goals
RI	Remedial Investigation
STLC	soluble threshold limit concentration
SUXOS	Senior UXO Supervisor
TCLP	toxicity characteristic leaching procedure
TP	Technical Paper
TTLC	total threshold limit concentration
U.S.	United States
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist

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1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This Technical Memorandum presents the results of the additional munitions characterization at Installation Restoration Program (IRP) Site 1, the Explosive Ordnance Disposal (EOD) Training Range, at former Marine Corps Air Station (MCAS) El Toro, California. This characterization was conducted as a supplemental investigation in support of the Feasibility Study (FS) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at IRP Site 1. The scope of this characterization was to:

- Characterize munitions on-site and on property adjacent to and northwest of IRP Site 1;
- Characterize items contained within soil-filled ammunition cans stacked outside a former EOD training observation bunker near the eastern portion of IRP Site 1; and
- Evaluate and subsequently dispose of potential munitions and explosives of concern (MEC) items currently contained in a 55-gallon drum near Building 795 at IRP Site 1, which were encountered during the field activities conducted in 2002 as part of a MEC range evaluation (Earth Tech 2006).

1.2 SITE BACKGROUND AND SETTING

1.2.1 MCAS El Toro Description and Background

Former MCAS El Toro is located in a semi-urban area of southern California, approximately 8 miles southeast of Santa Ana and 12 miles northeast of Laguna Beach (see Figure 1-1). Former MCAS El Toro covers approximately 4,738 acres. Land use around former MCAS El Toro includes commercial, light industrial, and residential. MCAS El Toro closed on 2 July 1999, as part of Base Realignment and Closure (BRAC).

1.2.2 IRP Site 1 Location and Description

IRP Site 1 is situated within a tributary canyon of Borrego Canyon Wash at elevations ranging from approximately 610 feet to 760 feet above mean sea level (msl) (Figure 1-2). Training for EOD and detonation of munitions was conducted at IRP Site 1 from 1952 until closure of former MCAS El Toro on 2 July 1999 (BNI 1995). IRP Site 1 includes the Northern EOD Training Range (16.9 acres) and the Southern EOD Training Range (16.6 acres) (BNI 1995) (Figure 1-2).

1.2.3 Explosive Ordnance Disposal Training Activities at IRP Site 1

The majority of military EOD training at IRP Site 1 took place at the Northern EOD Training Range. The Southern EOD Training Range was used for EOD training by the Orange County Sheriff's Department and Federal agencies (BNI 1995). Several demolition pits, a range building (Building 795), and a former observation bunker constructed from metal ammunition cans are present at IRP Site 1. Many of these ammunition cans were reported to be filled with the burned residue of disposed munitions, such as cartridge-actuated devices and 20 millimeter (mm) ammunition (USACE 1998).

Military ordnance used at the site included hand grenades, land mines, cluster bombs, smoke bombs, and rocket warheads. Civilian and commercial explosives, such as dynamite, and plastic and gelatinous explosives were used at the EOD Training Range. Munitions were detonated in trenches and pits, which were periodically filled with soil and then re-excavated. Limited historical information suggests that rocket motors or Jet-Assisted Take-Off (JATO) units were handled at IRP Site 1. In 1982, approximately 2,000 gallons of sulfur-trioxide chlorosulfonic acid (FS smoke) were

reportedly burned in trenches located in the northern portion of the site. An estimated 300,000 gallons of petroleum fuels were burned during activities from 1952 through 1993 (JEG 1993).

1.2.4 Federal Bureau of Investigation Training Activities at IRP Site 1

For many years, the Department of Justice, Federal Bureau of Investigation (FBI) used IRP Site 1 for training purposes (FBI 2000). The following paragraphs summarize the FBI's training and emergency response operations.

Bomb Technician Training. Bomb technician training consisted of "hands-on" explosive training one day per month. Bomb technicians demonstrated proficiency in firing both an electrical and nonelectrical charge. This training also included testing of new explosive products to determine their applicability to EOD operations. Generally, this involved only a few ounces of the material, and demolition was initiated off the ground on a hard target surface.

Post-Blast Investigation Training. Post-blast investigation training was held about four times per year and emphasized the identification, location, access, and recovery of explosive devices and any products surviving demolition. Various devices were detonated, and students secured and located, collected, and identified the fragments and components from the devices to reconstruct them.

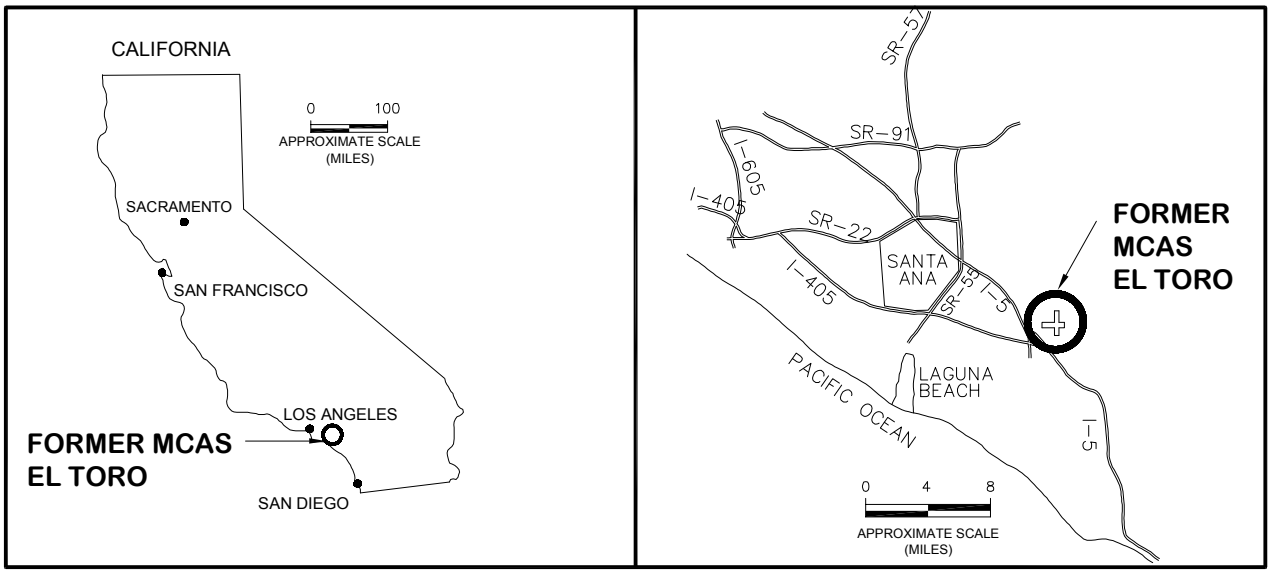
Emergency Response Operations. The EOD Training Range at IRP Site 1 served as a technical training area for the use and study of emergency explosive device responses. However, during emergency response operations, the FBI periodically transported improvised explosive devices to IRP Site 1 and rendered them safe either by disassembly or by the use of counter-charges. These types of operations occurred intermittently when devices were located by the FBI or by local law enforcement.

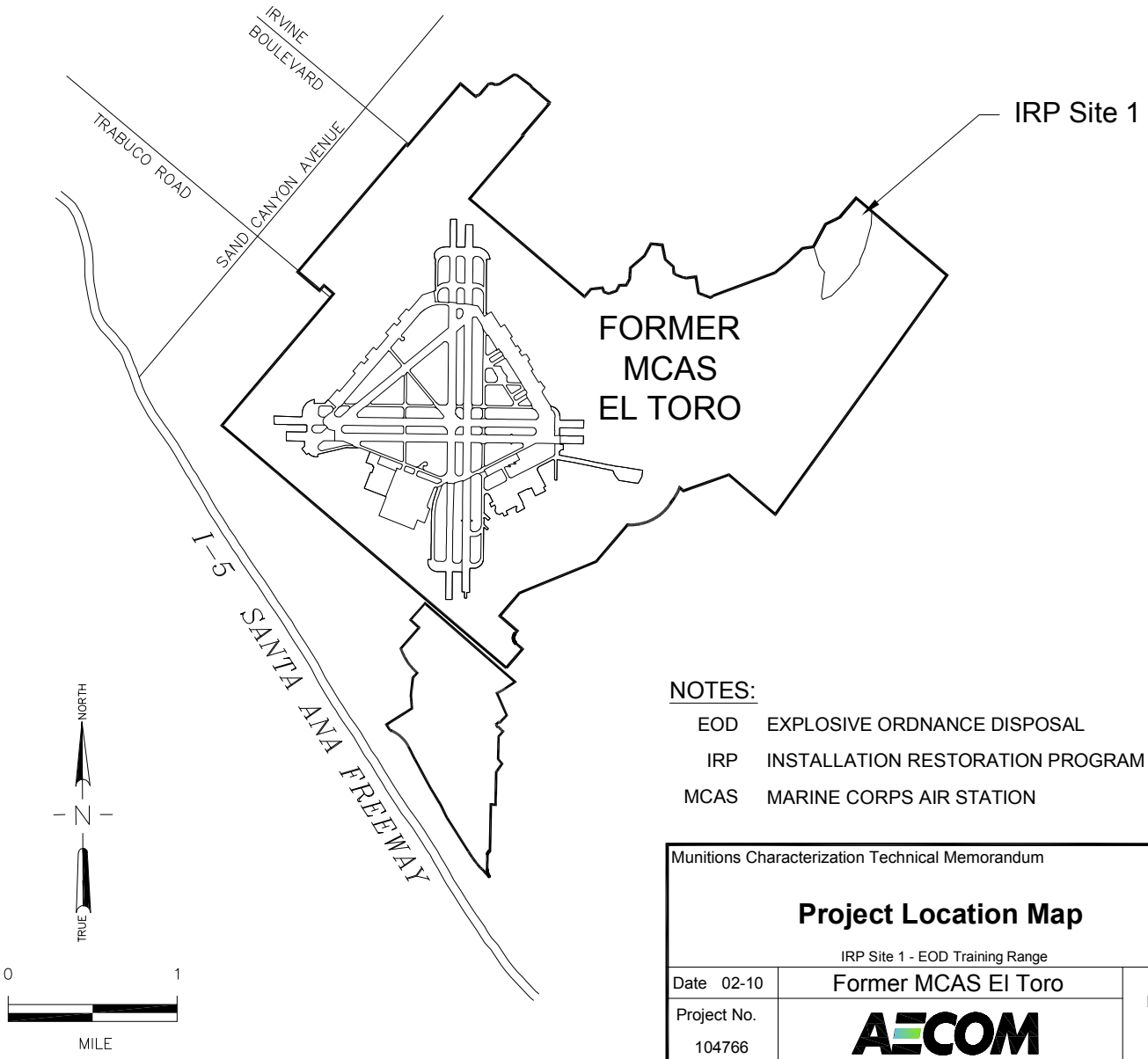
1.2.5 Previous Investigations Pertaining to Munitions

Various environmental investigations have been performed at IRP Site 1 as a part of the CERCLA process to characterize the physical attributes of IRP Site 1, including geology and hydrogeology, nature and extent of contamination, risks to human-health and the environment, and feasibility of potential remediation technologies. The detailed procedures and results of these investigations are presented in the Final Phase II Remedial Investigation (RI) Report (Earth Tech 2006). The investigations pertaining to munitions at IRP Site 1 are briefly summarized in the following sections.

1.2.5.1 Range Identification and Preliminary Range Assessment

This investigation was conducted to provide a historical baseline for former MCAS El Toro's active and inactive Ranges (USACE 1998). The study compiled information from existing sources and did not include sampling of the Ranges. A list of the types of munitions and their estimated quantities employed to destroy unserviceable items was presented. Unexploded ordnance (UXO) was estimated at less than 1 per acre. The penetration depth of munitions was estimated at approximately 18 inches or less, which is the approximate depth of tilling at the site.





NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION

Munitions Characterization Technical Memorandum — Final

Project Location Map

IRP Site 1 - EOD Training Range

Date 02-10	Former MCAS El Toro	Figure
Project No. 104766	AECOM	1-1

File: L:\work\104766\cad\Munitions Characterization Tech Memo\Final\FIGURE 1-1.dwg Time: Feb 05, 2010 - 4:08pm

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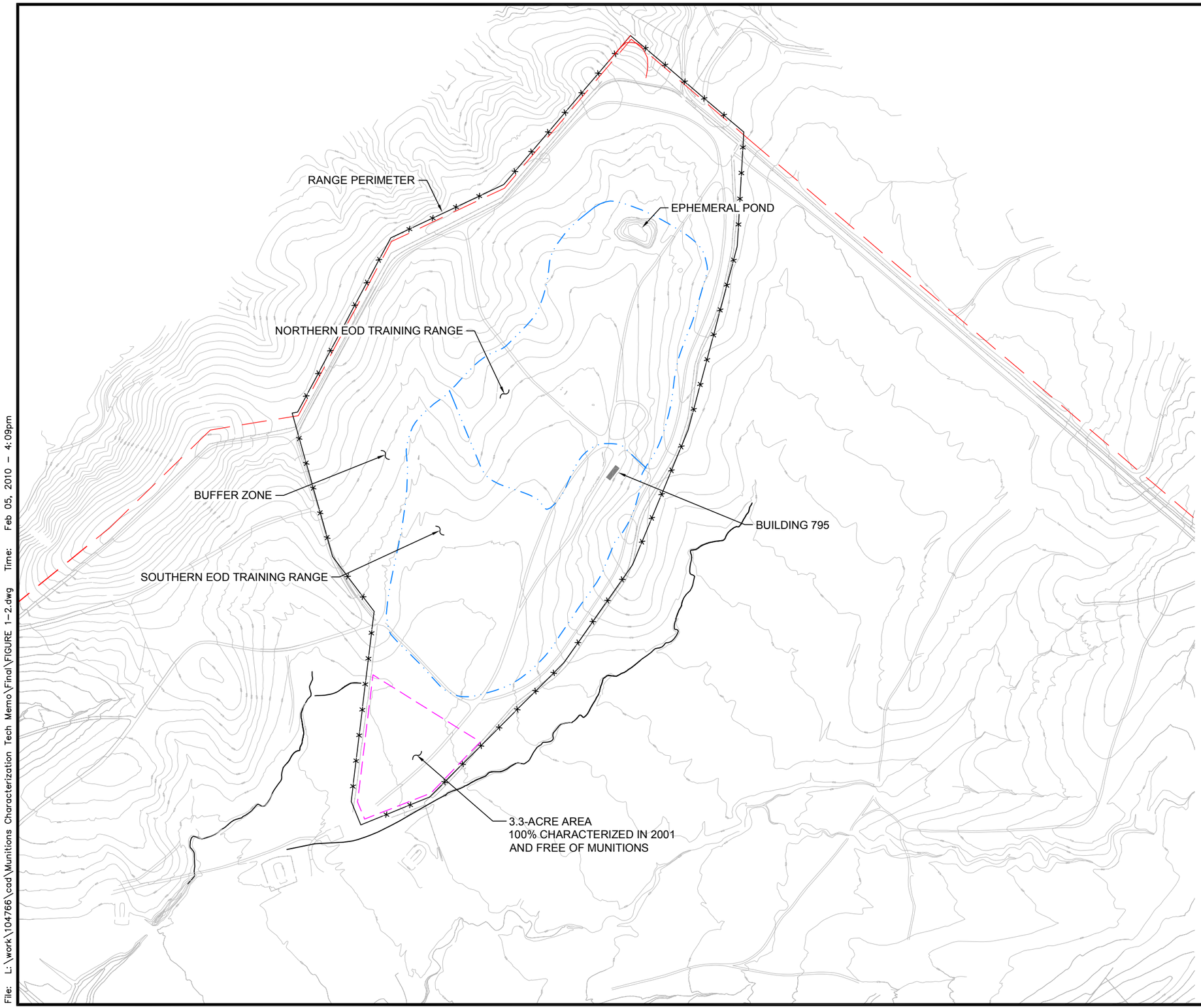

LEGEND:

- MCAS EL TORO BOUNDARY
- 3.3 ACRE AREA FOR IMMEDIATE USE
- SECURITY FENCE/ IRP SITE 1 BOUNDARY
- EOD TRAINING RANGE BOUNDARY
- STREAM OR WASH

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION

NORTH

0 200' 400'

SCALE: 1"= 400'

Munitions Characterization Technical Memorandum — Final

Site Plan

IRP Site 1 - EOD Training Range

Date: 02-10	Former MCAS El Toro	Figure
Project No. 104766	AECOM	1-2

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1.2.5.2 RANGE EVALUATION FOR MEC CONDUCTED IN 2002

A range evaluation for MEC was performed concurrent with the Phase II RI field activities from January 2002 to April 2002 (Earth Tech 2006). The detailed methodology and results of this investigation are presented in Appendix C of the *Final Phase II Remedial Investigation Report, Installation Restoration Program Site 1, Explosive Ordnance Disposal Training Range, Former Marine Corps Air Station, El Toro, California* (Earth Tech 2006).

1.2.5.2.1 Summary of Methodology

The scope of the 2002 MEC range evaluation was to evaluate explosives risk at IRP Site 1 (due to remnant MEC items originating from past EOD training) by characterizing the types, locations, and depths of material potentially presenting an explosive hazard (MPPEH) at the site. Four areas were investigated: the Northern EOD Training Range, the Southern EOD Training Range, the Buffer Zone (the 40.2-acre area immediately surrounding the Northern and Southern EOD Training Ranges), and the Range Perimeter (Figure 1-3). The investigation included surface and geophysical surveys and intrusive investigations.

A surface survey was conducted to identify and remove any near-surface MEC, munitions debris (MD), and metallic debris larger than 1-inch by 2 inches that would interfere with geophysical mapping or be a physical hazard for the field crew. A geophysical survey was conducted to identify subsurface anomalies indicative of buried wastes or buried munitions, for the subsequent intrusive munitions investigation. This survey was conducted using an EM-61 electromagnetic instrument.

An intrusive munitions investigation was conducted at the locations of subsurface anomalies identified in the geophysical surveys (Figure 1-4). Subsurface munitions sampling was conducted at 99 pothole locations in the Northern and Southern EOD Training Ranges. Seventy-three of these locations were identified from the geophysical survey conducted during the Verification of Perchlorate Study performed in 1999, and 26 were identified during the geophysical survey conducted during the MEC range evaluation in 2002 (Earth Tech 2006). An additional 95 locations were intrusively investigated in the Buffer Zone, and 89 discrete geophysical anomalies in the Range Perimeter were investigated.

1.2.5.2.2 Summary of 2002 MEC Characterization Results

Four safe-to-move MEC items and 776 MD scrap items (totaling approximately 5,000 pounds) were recovered during munitions field activities at IRP Site 1 (Table 1-1). No unsafe-to-move MEC items were identified. While the MEC items were recovered only in the Northern EOD Training Range, the MD was recovered in all four areas investigated. Figure 1-4 presents the approximate locations of all MEC and MD items recovered during the 2002 field investigation.

Table 1-1: Number and Depth of MEC and MD Scrap Recovered During 2002 MEC Field Investigation

Investigation Area	MEC	MD	Minimum Depth	Maximum Depth (inches bgs)
Northern EOD Training Range	4*	409	Surface	96
Southern EOD Training Range	—	26	Surface	24
Buffer Zone	—	165	Surface	12
Range Perimeter	—	176	Surface	10
Total	4	776	NA	NA

Notes:
* 23 items were initially characterized as safe-to-move MEC; upon post-detonation inspection, 19 were concluded to contain no explosive material (Earth Tech 2006).
bgs = below ground surface
EOD = explosive ordnance disposal
MD = munitions debris
MEC = munitions and explosives of concern
NA = not applicable

Table 1-2 summarizes the type and depth of safe-to-move MEC recovered during the 2002 field investigation, and their characteristics.

Table 1-2: Type and Depth of MEC Recovered During 2002 MEC Field Investigation

Type of MEC *	Quantity	Depth Encountered (inches bgs)	Hazard	Condition	Sensitivity
Flex-linear-shaped charge	1	0	Likely to cause minor injury	Functionable[b]	Sensitive[c]
40 mm cartridge primer	2	12	Likely to cause minor injury	Functionable[a]	Sensitive[b]
Smokeless powder	¼-pound	12	Likely to cause minor injury	Functionable[a]	Sensitive[b]

Notes:
[a]All MEC items were recovered from the Northern EOD Training Range
[b] Functionable items become hazardous when improperly handled
[c]Likely to detonate with moderate effort (dropping, striking, driving over, or exposing to extreme heat)
bgs = below ground surface
EOD = explosive ordnance disposal
MEC = munitions and explosives of concern
mm = millimeter

1.2.6 Objectives of 2008 Munitions Characterization

Munitions characterization field activities were conducted in September 2008 in accordance with the Final *Munitions Characterization Work Plan, Installation Restoration Program Site 1, Explosive Ordnance Disposal Training Range, Former Marine Corps Air Station, El Toro, California* (Earth Tech 2008). The objectives of the investigation were as follows:

1. **Characterization of munitions on-site.** The munitions characterization activities conducted in 2002 as a part of Phase II RI included surface and subsurface geophysical surveys, and subsurface soil sampling of anomalies to characterize the nature and extent of munitions at IRP Site 1. This investigation included the Northern and Southern EOD Training Ranges, the Buffer Zone surrounding training ranges, and the EOD Training Range perimeter. The surface and subsurface geophysical surveys did not cover 100 percent of the Buffer Zone surrounding these ranges partly due to dense vegetation including the Coastal Sage Scrub (CSS) in certain areas. The CSS is part of the habitat for the Federally-listed species coastal California gnatcatcher (Figure 1-5). The October 2007 Santiago Canyon wildfire burned a major portion of the vegetation at IRP Site 1 and the areas that could not be investigated in the past are now accessible for visual inspection and geophysical surveys. Therefore, the first objective of the 2008 investigation was to further verify previous conclusions that the areas contained predominantly MD (from kick-outs) by characterizing the area to a depth of up to one foot below ground surface.
2. **Characterization of munitions on property adjacent to IRP Site 1.** The munitions characterization activities conducted in 2002 as a part of the Phase II RI (Earth Tech 2006) identified the potential for additional MD off-Station, to the northwest of IRP Site 1 (see Figure 1-4). Metallic anomalies, primarily non-munitions items (cultural debris) and MD (fragments), were identified outside the IRP Site 1 fence line during the Phase II RI; however, verification of the extent of MD was not conducted due to difficult terrain and dense vegetation. Verification of the extent of MD in the area to a depth of up to one foot below ground surface was the second objective of this investigation.
3. **Characterization of items contained within soil-filled ammunition cans.** Approximately 100 ammunition cans had been stacked outside the former EOD training observation bunker (Figure 1-5). The purpose of these cans was to reinforce the former observation bunker. The cans were filled with soil that apparently originated from the site, where EOD training was conducted, and

the cans potentially contained MPPEH. The third objective of this investigation was to characterize the contents of the cans to assess if MEC or munitions constituents (MC) are present.

4. **Evaluation and subsequent disposal of potential MEC items contained within a 55-gallon drum at IRP Site 1.** Previous demilitarization activities conducted in 2004 identified three potential MEC items (one 20 mm casing with smokeless powder and potentially live primer, and two 20 mm projectiles suspected to be potentially energized) which were not demilitarized at that time. These items, along with other MPPEH items encountered on site since 2004, were temporarily stored within a sand-filled bucket, inside a 55-gallon steel drum at IRP Site 1 (Figure 1-5). The fourth objective of this investigation was to characterize and subsequently demilitarize these potential MEC items appropriately.

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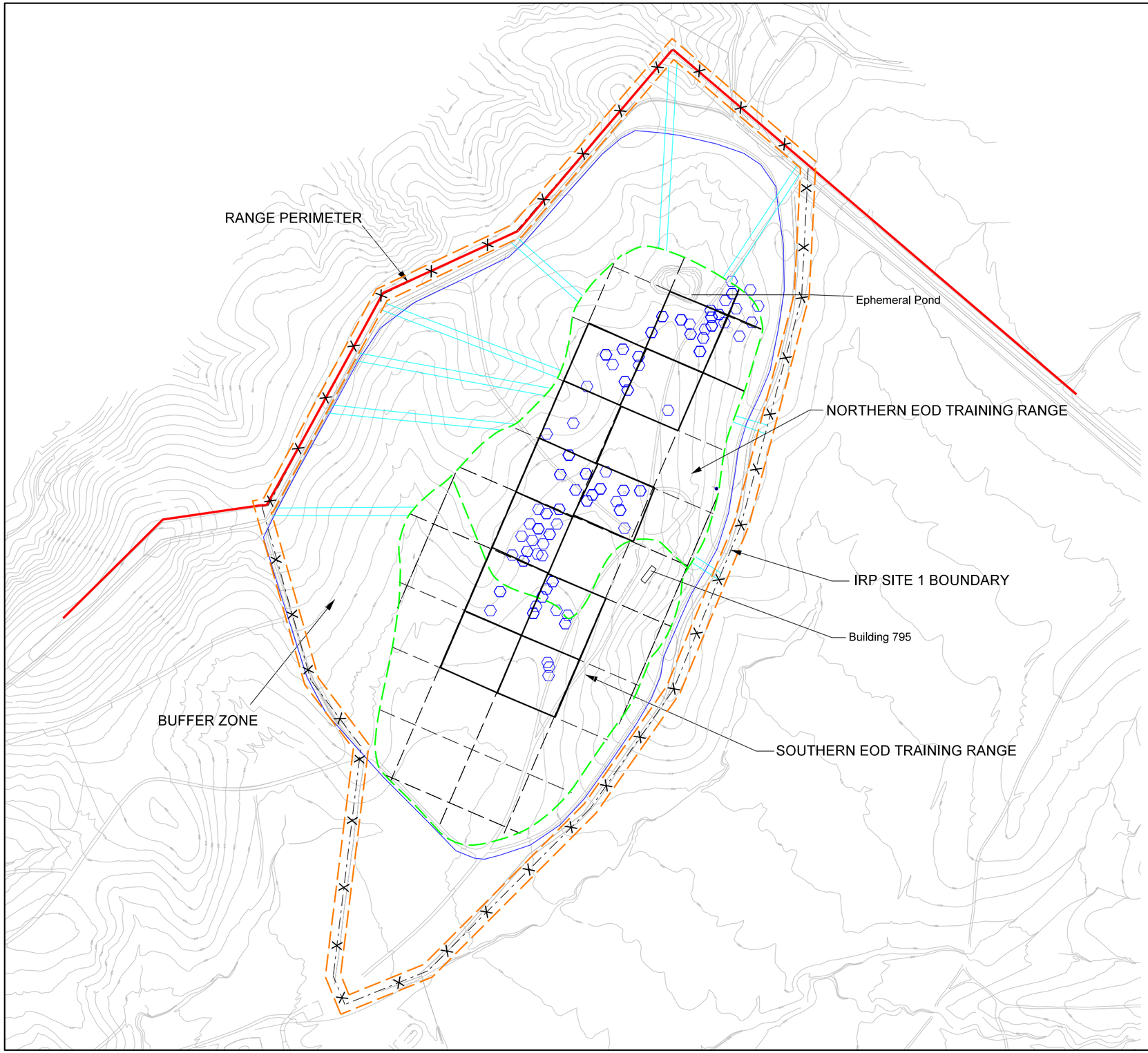

LEGEND

- MCAS EL TORO BOUNDARY
- SECURITY FENCE/IRP SITE 1 BOUNDARY
- EOD TRAINING RANGE BOUNDARY
- SUFACE AND GEOPHYSICAL SURVEY PATHS INSIDE AND OUTSIDE RANGE PERIMETER
- 25 FEET WIDE RADIAL LANES SURFACE CLEARED AND MEANDERING SURFACE SURVEY THROUGH VEGETATION IN RANGE PERIMETER OUTSIDE SITE BOUNDARY
- 1-ACRE GRID SELECTED FOR INTRUSIVE INVESTIGATION OF ALL ANOMALIES WITHIN GRID (ONLY GRIDS SHOWN WITH SOLID LINES WERE INTRUSIVELY SAMPLED FOR MEC)
- POTHOLE LOCATION

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
MD	MUNITIONS DEBRIS
MEC	MUNITIONS AND EXPLOSIVES OF CONCERN

NORTH

0 350 FEET

SCALE: 1" = 350'

Munitions Characterization Technical Memorandum — Final

2002 MEC Investigation Areas

IRP Site 1 – EOD Training Range

Date 02–10	Former MCAS El Toro	Figure
Project No. 104766	AECOM	1–3

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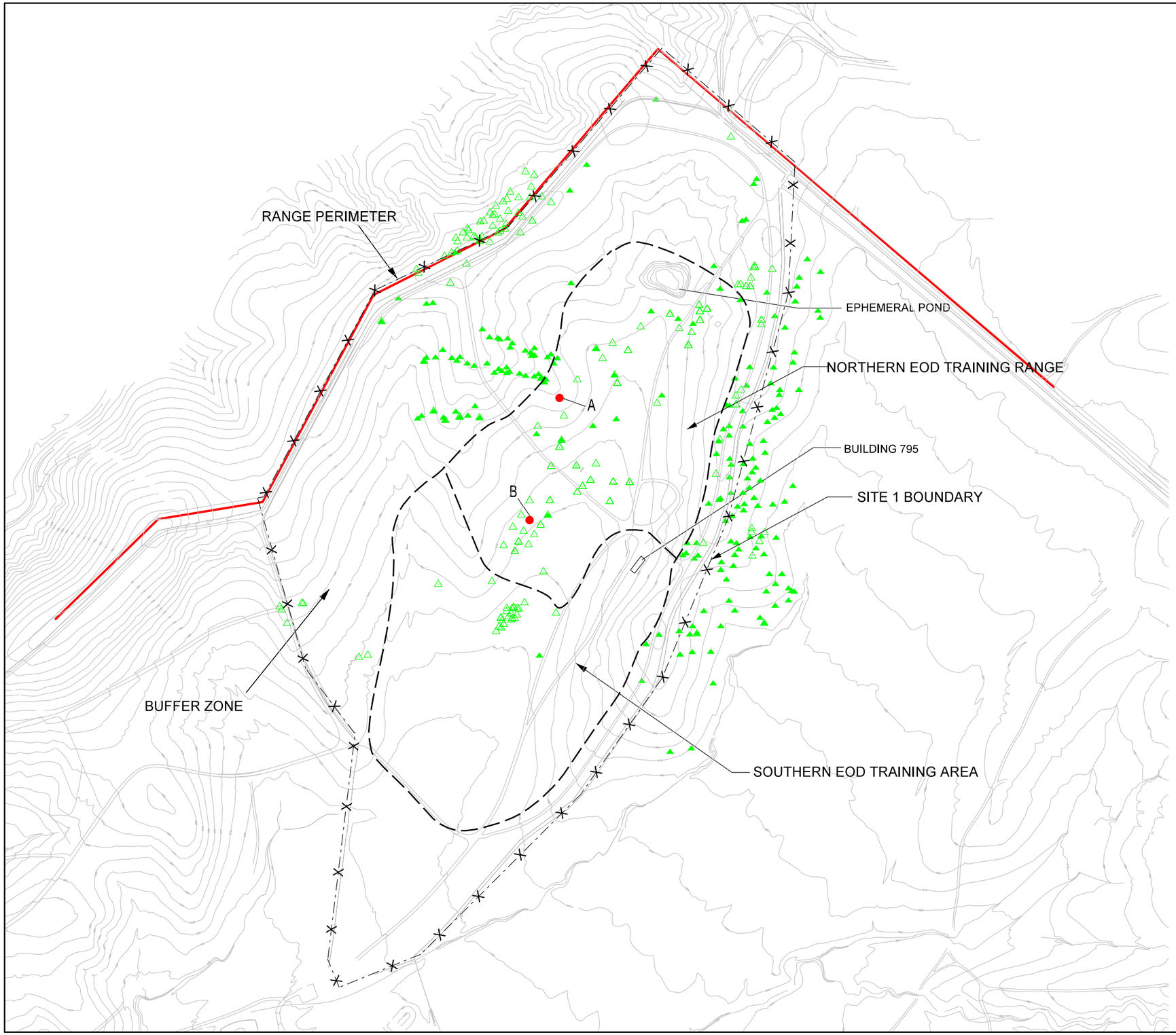

LEGEND

- MCAS EL TORO BOUNDARY
- SECURITY FENCE/SITE 1 BOUNDARY
- EOD TRAINING RANGE BOUNDARY
- MEC RECOVERED DURING FIELD INVESTIGATION
- SURFACE MD RECOVERED DURING FIELD INVESTIGATION
- SUBSURFACE MD RECOVERED DURING FIELD INVESTIGATION
- A — MEC: FLEX LINEAR-SHAPED CHARGE (DEPTH: SURFACE)
- B — MEC: 40mm CASINGS WITH PRIMER (2) AND 1/4-POUNDS OF SMOKELESS POWDER (DEPTH: 12 INCHES BELOW GROUND SURFACE)

NOTES:

1. MULTIPLE MD ITEMS AT ONE LOCATION ARE SHOWN AS ONE POINT

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
MD	MUNITIONS DEBRIS
MEC	MUNITIONS AND EXPLOSIVES OF CONCERN
mm	MILLIMETER

NORTH

0 350 FEET

SCALE: 1"= 350'

Munitions Characterization Technical Memorandum — Final

2002 MEC Investigation Results

IRP Site 1 – EOD Training Range

Date 02–10	Former MCAS El Toro	Figure
Project No. 104766	AECOM	1–4

(LF): workh766\cad\Munitions Characterization Tech Memo\Final\FIGURE 1-4.DGN

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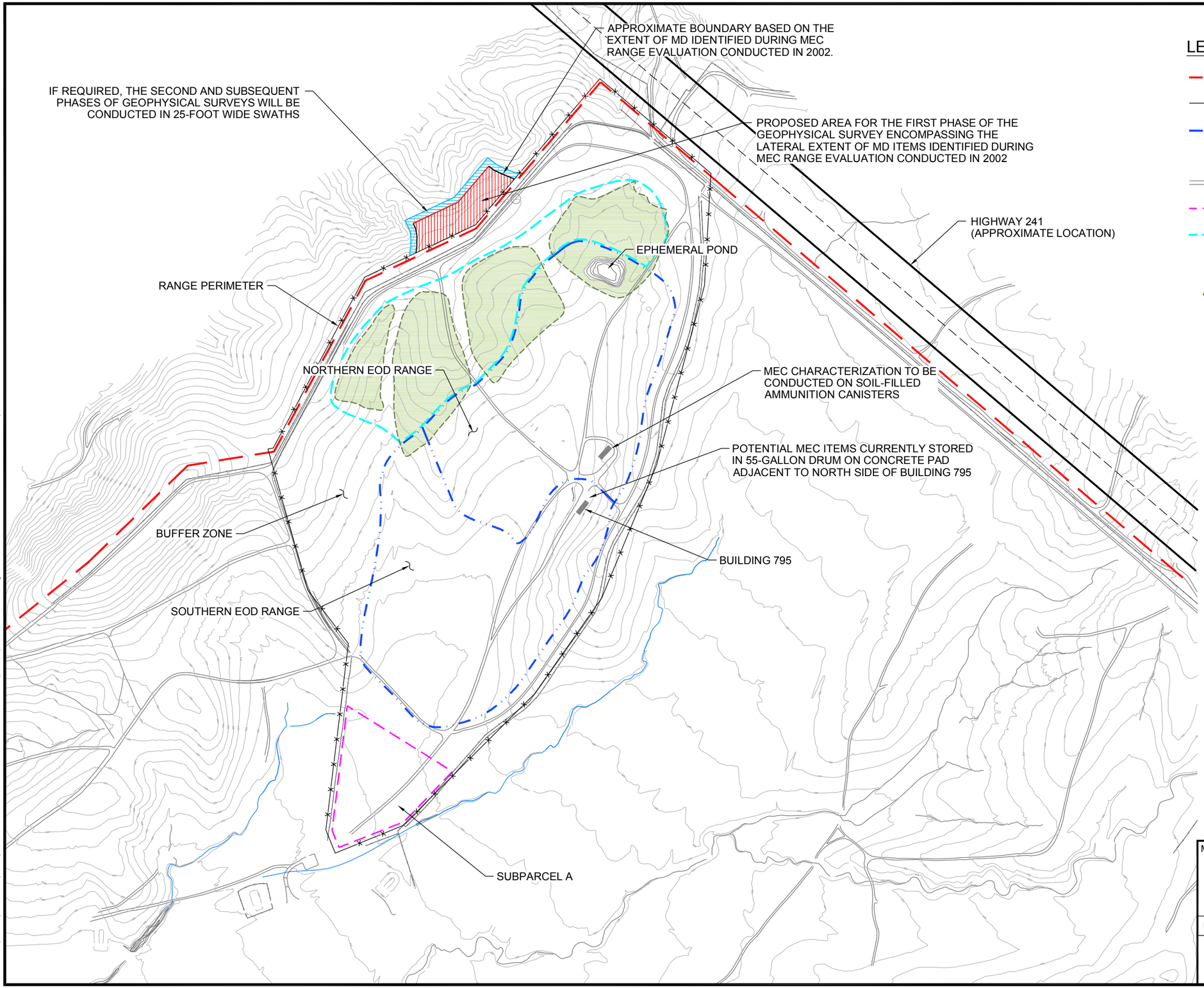

LEGEND:

- MCAS EL TORO BOUNDARY
- SECURITY FENCE/ IRP SITE 1 BOUNDARY
- EOD TRAINING RANGE BOUNDARY
- RANGESTREAM OR WASH
- EXISTING UNPAVED ROAD
- 3.3-ACRE AREA (SUBPARCEL A)
- PROPOSED INVESTIGATION BOUNDARY FOR ON-SITE MD CHARACTERIZATION
- LOCATION OF CSS AND OTHER GNATCATCHER HABITAT BASED ON HABITAT ASSESSMENT AT SITE 1 CONDUCTED IN DECEMBER, 2000 BY LINCER & ASSOCIATES.

NOTES:

CSS	COASTAL SAGE SCRUB
EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
MD	MUNITIONS DEBRIS
MEC	MUNITIONS AND EXPLOSIVES OF CONCERN

NORTH

0 200 400 FEET

SCALE: 1"= 400'

Munitions Characterization Technical Memorandum — Final

2008 Additional Munitions Characterization Plan

IRP Site 1 - EOD Range

Date: 02-10	Former MCAS El Toro	Figure 1-5
Project No. 104766	AECOM	

File: L:\work\104766\cad\Munitions Characterization Tech Memo\Final\FIGURE 1-5.dwg Time: Feb 05, 2010 – 4:10pm

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2. FIELD ACTIVITIES

Prior to conducting munitions characterization, site preparation was performed including delineation of investigation areas for the on- and off-site field activities, and establishment of a geophysical prove-out area using inert 20 mm projectiles to conduct daily tests of the White's Pulse Induction SurfMaster all-metals detectors. In accordance with the Navy's Informal Section 7 Consultation with the United States Fish and Wildlife Service (USFWS), a qualified biologist conducted a site reconnaissance to evaluate potential impact, if any, to CSS and coastal California gnatcatchers (USFWS 2001).

2.1 CHARACTERIZATION OF MUNITIONS ON-SITE

Munitions characterization in the on-site area was conducted on September 17, 18, and 30, 2008 by visual surface sweeps over an approximately 12.6-acre area as shown on Figure 2-1. The visual surface sweeps were conducted by a crew of seven UXO Technicians positioned abreast in a line, separated by approximately five feet. Each UXO Technician used visual techniques to search for metallic objects.

All metallic objects encountered were immediately evaluated for munitions properties. Items determined to be cultural debris (CD) and/or MD were transported to the on-site consolidation location adjacent to Building 795. Items determined to be MEC were further evaluated to determine whether they were safe to move. Safe-to-move MEC items were placed into buckets separate from CD and MD and were transported to the same consolidation location, where they were stored until they could be rendered safe by explosive means. Unsafe-to-move MEC items were flagged, photographed, and appropriately secured in-place until the Marine Corps Camp Pendleton EOD Team responded to render them safe by explosive means.

At the conclusion of each work day, all metallic objects collected from the characterization activities were re-evaluated by the project team to confirm the previous classification. CD items were then placed in a pile for subsequent removal and recycling. MD items were examined by the Senior UXO Supervisor (SUXOS) and the UXO Quality Control Specialist (UXOQCS) to ensure that they were inert and/or free of explosives or other dangerous materials, and placed in a secure bin. Safe-to-move MEC items were placed into a secure container, locked, and stored until the Marine Corps Camp Pendleton EOD team responded to render them safe by explosive means.

In September 2008, one MEC item with the characteristics of an unsafe-to-move improved conventional munition (ICM) was found on-site. Work was immediately stopped and following a thorough evaluation, it was determined that the item had the characteristics of an M38/M39 submunition. Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 16 (DDESB 2005) and Marine Corps Systems Command (MARCORSYSCOM) personnel were consulted to determine an appropriate Explosives Safety Quantity-Distance (ESQD) to be used as an exclusion zone, which was determined to be 396 feet. Work resumed in areas farther than 396 feet from the item until Marine Corps Camp Pendleton EOD Team personnel responded to render the item safe by explosive means.

2.2 CHARACTERIZATION OF MUNITIONS ON PROPERTY ADJACENT TO IRP SITE 1

Munitions characterization on property adjacent to IRP Site 1 was conducted in September 2008. Characterization activities were initially limited to an area approximately 550 feet by 115 feet (500 feet by 90 feet, plus 25-foot swaths on each of three outer sides). Surface sweeps were conducted in a manner similar to those conducted on-site and were followed by near-surface clearance using White's Pulse Induction Surfmaster all-metals detectors. These detectors were used to identify a total of 106 metallic anomalies, all of which were further investigated by digging to a maximum depth of approximately 1 foot below ground surface.

No MEC items were identified within the outer 25-foot swaths on three sides. However, additional MPPEH items were observed immediately outside the area. Therefore, upon consultation with MARCORSYSCOM personnel, the surface sweep areas were expanded based on these observations until either no additional MPPEH items were observed or access was restricted by steep terrain and/or dense vegetation. The surface sweep areas were eventually expanded to include a total of approximately 43 acres, measured from the western IRP Site 1 fenceline to Agua Chinon Wash, roughly between the southern extent of IRP Site 1 and Highway 241 (see Figure 2-1). All CD, MD, and safe-to-move and unsafe-to-move MEC items were handled in accordance with the approved Explosives Safety Submission (ESS). One MEC item, with the characteristics of an unsafe-to-move ICM, was identified near to and outside the IRP Site 1 fenceline. The previously-established ESQD of 396 feet was utilized as the exclusion zone for the area until the Orange County Sheriff's Department Bomb Squad personnel rendered the item safe by explosive means.

2.3 CHARACTERIZATION OF ITEMS CONTAINED WITHIN SOIL-FILLED AMMUNITION CANS.

Characterization of items contained within 104 soil-filled ammunition cans was conducted in September 2008. The soil contained in the ammunition cans was emptied out onto plastic sheeting by UXO Technicians and sifted through metal screens with maximum ½-inch opening to separate any metallic objects from the soil. All metallic objects were characterized for munitions properties and handled in a manner consistent with the on-site munitions characterization activities. No unsafe-to-move MEC items were found in the soil-filled ammunition cans. At the conclusion of field activities for this task, the soil was sampled for contaminants of potential concern (COPCs) and then covered with plastic until a determination was made as to disposal options. Section 4.2 provides further details on the soil analytical results and disposal.

2.4 EVALUATION AND SUBSEQUENT DISPOSAL OF POTENTIAL MEC ITEMS CONTAINED WITHIN A 55-GALLON DRUM AT IRP SITE 1

Evaluation of potential MEC items contained within the 55-gallon drum at IRP Site 1 was conducted on September 16, 2008. All items stored in the drum were removed and evaluated by UXO Technicians to characterize munitions properties. MD and safe-to-move MEC items were handled in a manner consistent with the on-site munitions characterization activities. No CD or unsafe-to-move MEC items were identified in the 55-gallon drum.

2.5 EXPLOSIVE OPERATIONS

In accordance with the approved Work Plan (Earth Tech 2008) and ESS (DON 2008), the Marine Corps Camp Pendleton EOD Team and the Orange County Sheriff's Department Bomb Squad were requested to respond on four occasions, as summarized below, to conduct demilitarization of MEC items by explosive means in the on-site and adjacent properties, respectively. On September 21, prior to the first explosive operation, one MEC item that resembled an unsafe-to-move ICM was located within the IRP Site 1 boundaries. Because an explosive operation could not be conducted on the same day, a security company was utilized to ensure that no unauthorized personnel entered the site prior to conducting demilitarization activities on September 22.

During the explosive operations, all nonessential personnel were evacuated outside the IRP Site 1 security gate at the southern end of the site, which was a minimum of 1,800 feet from each explosive shot, exceeding the maximum ESQD arcs specified in the ESS for all aspects of the project. After each explosive shot, no remnants of the demilitarized MEC items were observed. Attachment A provides photographs of the demolition shot preparation, as well as the surrounding areas after the shots were conducted.

The first explosives operation was conducted by the Marine Corps Camp Pendleton EOD Team on September 22, 2008, and was accomplished in two explosives shots: The first, and smaller explosive shot was conducted to render safe one unsafe-to-move MEC item (M38/M40 submunition, an ICM) located within the on-site munitions characterization area. The second, larger explosive shot was conducted immediately adjacent to the on-site munitions characterization area, just inside the Northern EOD Training Range, to render safe various safe-to-move MEC items identified during all four characterization activities. Detailed descriptions of the MEC items are presented in Section 3.

The second explosives operation was conducted by the Orange County Sheriff's Department Bomb Squad on September 24, 2008 on adjacent property, near the IRP Site 1 fenceline. One explosives shot was conducted in order to render safe one unsafe-to-move MEC item (M38/M40 submunition), and two 20 mm projectiles.

The third explosives operation was conducted by the Marine Corps Camp Pendleton EOD Team on September 25, 2008. One explosives shot was conducted on-site to render safe various safe-to-move MEC items collected on property adjacent to IRP Site 1.

The fourth explosives operation was conducted by the Marine Corps Camp Pendleton EOD Team on October 1, 2008. One explosives shot was conducted on-site to render safe various safe-to-move MEC items collected on-site and on property adjacent to IRP Site 1.

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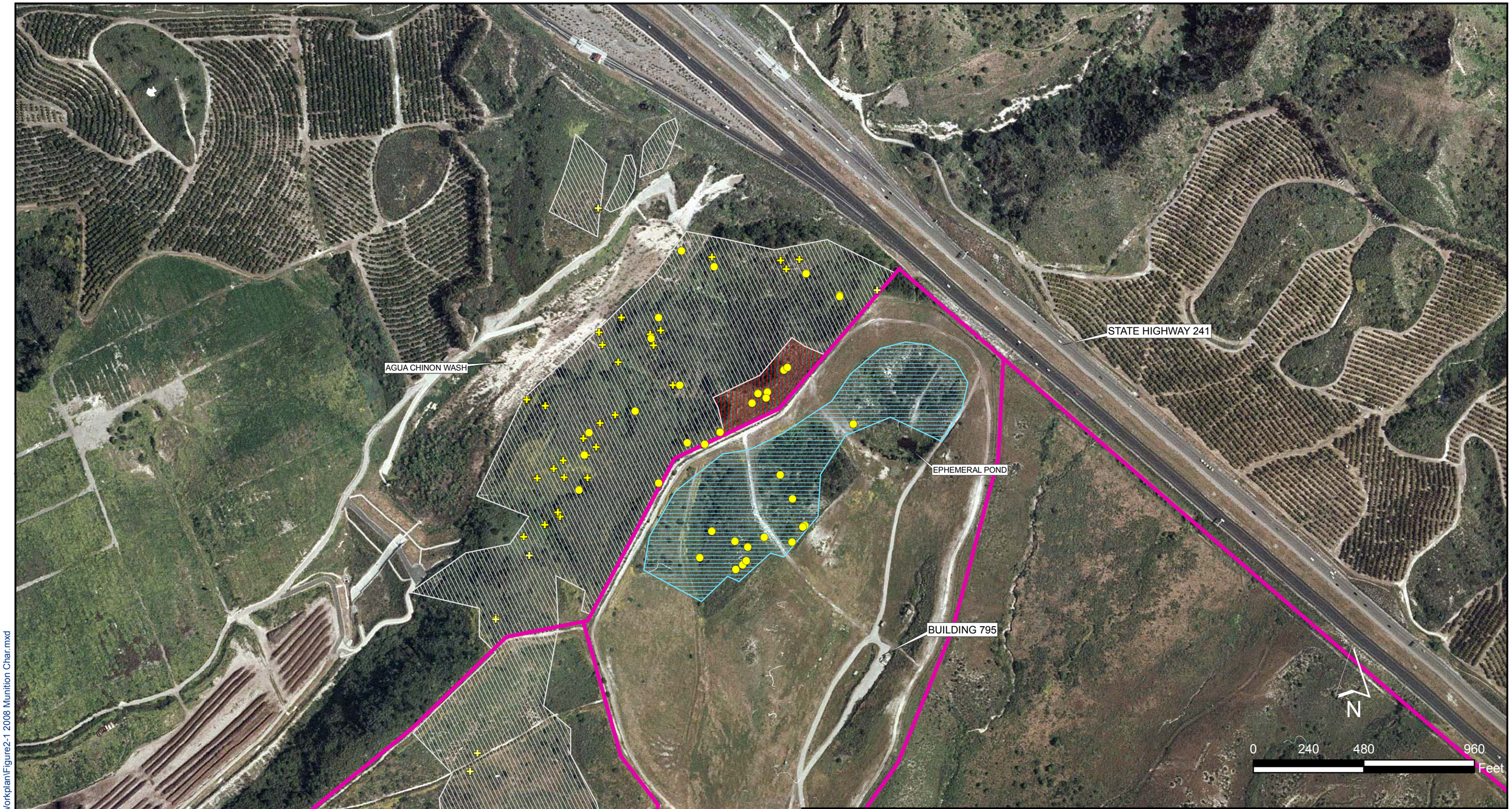

LEGEND

- FORMER MCAS EL TORO AND IRP SITE 1 BOUNDARY
- EXTENT OF 2008 ONSITE SURFACE SWEEP (BOUNDARY APPROXIMATE)
- EXTENT OF OFFSITE AREA SCREENED USING HAND-HELD ALL METALS DETECTOR (BOUNDARY APPROXIMATE)
- EXTENT OF OFFSITE AREA RECONAISSANCE AND VISUAL SWEEP (BOUNDARY APPROXIMATE)
- APPROXIMATE LOCATION OF MEC IDENTIFIED AND RECOVERED FROM 17 SEPTEMBER TO 30 SEPTEMBER 2008
- APPROXIMATE LOCATION OF MD IDENTIFIED AND RECOVERED FROM 26 SEPTEMBER TO 30 SEPTEMBER 2008

NOTE: AERIAL PHOTO, 2003 AE, LLC, 2003 GDT, INC.

Munitions Characterization Technical Memorandum — Final

Areas of 2008 Additional Characterization

IRP Site 1 - EOD Range Training Range

Date: 02-10	FORMER MCAS EL TORO	Figure
Project No. 104766	AECOM	2-1

L:\group\GIS\MXD\ElToro\Site1 Workplan\Figure2-1 2008 Munition Char.mxd

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3. CHARACTERIZATION FINDINGS

During the characterization activities, approximately 200 pounds of CD, 460 pounds of MD, and 179 safe-to-move and two unsafe-to-move MEC items were collected from IRP Site 1 and adjacent areas. The predominant MEC item had the characteristics of the 20 mm projectile. The characterization of 20 mm projectiles as MEC was primarily due to the fact that they had been in the environment for an extended period of time and positive identification to classify them as non-MEC was not possible due to degradation of markings and/or bandings. Two items with M38/M40 submunition (ICM) characteristics were classified as unsafe-to-move MEC. A summary of the MEC items collected from the four characterization activities is presented below. Locations of MEC items identified during the characterization are shown on Figure 2-1. Attachment A includes photographs of representative items.

3.1 CHARACTERIZATION OF MUNITIONS ON-SITE

During the munitions characterization on-site, a total of 24 MEC items were collected from 14 locations as shown on Figure 2-1. All 24 MEC items were subsequently demilitarized (see Section 2.5). Identification of the items is as follows:

- 20 mm projectile
- 20 mm projectile with fuze
- 20 mm fuze
- 20 mm projectile, high explosive
- 40 mm projectile
- 25 mm projectile, high explosive
- M38/M40 submunition (ICM)
- Fuze
- Detonator

3.2 CHARACTERIZATION OF MUNITIONS ON PROPERTY ADJACENT TO IRP SITE 1

During the munitions characterization on property adjacent to IRP Site 1, a total of 25 MEC items were collected from 21 locations as shown on Figure 2-1. All 25 MEC items were subsequently demilitarized (see Section 2.5). Identification of the items is as follows:

- 20 mm projectile
- M38/M40 submunition (ICM)
- Firebomb ignitor (partial)
- Booster

3.3 CHARACTERIZATION OF ITEMS CONTAINED WITHIN SOIL-FILLED AMMUNITION CANS

During the characterization of items contained within soil-filled ammunition cans, a total of 100 MEC items were collected. All 100 MEC items were subsequently demilitarized (see Section 2.5). Identification of the items is as follows:

- 20 mm Projectile

- Fuze
- Booster
- 25 mm Projectile
- Tail Boom
- Grenade Fuze

3.4 EVALUATION AND SUBSEQUENT DISPOSAL OF POTENTIAL MEC ITEMS CONTAINED WITHIN A 55-GALLON DRUM AT IRP SITE 1

During the evaluation of potential MEC items contained within the 55-gallon drum at IRP Site 1, a total of 38 MEC items were collected. All 38 MEC items were subsequently demilitarized (see Section 2.5). Identification of the items is as follows:

- 40 mm projectile
- 20 mm projectile
- 25 mm projectile
- 20 mm cartridge
- Detonator (suspect)

4. INVESTIGATION-DERIVED WASTE

4.1 MUNITIONS DEBRIS AND CULTURAL DEBRIS

Approximately 460 pounds of MD and 200 pounds of CD were collected during characterization activities. At the conclusion of field work, the MD items that had been examined each day by the SUXOS and the UXOQCS, were certified and verified as being inert and/or free of explosives or other dangerous materials. The secure container was then transported to a metal recycling facility, where the certified MD was shredded such that it no longer resembled munitions. Attachment B presents DD Form 1348-1A, certified and verified by the SUXOS and the UXOQCS, as well as the certificate of destruction, issued by the recycling facility. Approximately 200 pounds of CD and 104 empty ammunition cans were also transported to the metal recycling facility.

4.2 SOIL FROM AMMUNITION CANS

During the characterization of items contained within soil-filled ammunition cans, approximately 312 cubic feet (11.5 cubic yards) of soil was removed from the cans and stockpiled on plastic sheeting. Soil samples were collected from the screened soil stockpile on September 24, 2008, and the samples were analyzed in accordance with Table 4-1, below. Attachment C presents the analytical results for the soil.

Table 4-1. Analytical Methods

Analyte/ Analyte Group	Sample Preparation/ Analytical Method(s)
Perchlorate	SW-846 6850
Nitroaromatics/ nitroamines (explosive compounds)	SW-846 8330B
Volatile Organic Compounds (VOCs)	SW-846 5035A/ 8260B
Semivolatile Organic Compounds (SVOCs), Polynuclear Aromatic Hydrocarbons (PAHs)	SW-846 3550B/ 8270C (SIM)
Total Petroleum Hydrocarbons (TPH)	SW-846 3550B/ 8015B
Metals	SW-846 3050B/ 6010/ 7000
pH	SW-846 9045C

The reported chemical concentrations were evaluated and compared to MCAS El Toro background concentrations (BNI 1996), and regulatory threshold values such as United States (U.S.) Environmental Protection Agency (EPA) Region 9 preliminary remediation goals (PRGs) (EPA 2008), California Total Threshold Limits Concentrations (TTLCs), California Soluble Threshold Limits Concentrations (STLC) multiplied by 10, and Toxic Characteristics Leaching Procedure (TCLP) multiplied by 20.

The soil investigation-derived waste (IDW) was classified as non-hazardous based on comparison of analytical results with regulatory thresholds. No reported analyte concentrations exceeded their respective EPA Region 9 Residential PRG (EPA 2008) with the exception of arsenic. Explosive compounds were not reported in the soil; therefore, the IDW was classified as non-explosive. Reported metals concentrations were below MCAS El Toro background concentrations (BNI 1996), with the exception of mercury which slightly exceeded the background value of 0.22 milligrams per kilogram (mg/kg). Therefore, based on this evaluation, and with the concurrence of the BRAC Cleanup Team (BCT), the soil stockpile was spread at IRP Site 1 in the area of the former ammunition can stockpile on March 11, 2009.

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5. CONCLUSIONS

Based on the results obtained during the munitions characterization field activities, the on-site area that was characterized contained MEC, and should be combined with the Northern and Southern EOD Training Ranges during any future remedial design for removal of MEC-impacted soil. A Time-Critical Removal Action is recommended for the adjacent property to further characterize the area using geophysical investigation techniques followed by characterization and removal of anomaly sources.

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6. REFERENCES

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Jacobs Engineering Group, Inc. (JEG) 1993. *Draft Phase I Remedial Investigation Technical Memorandum.* Irvine, CA.

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United States Fish and Wildlife Service (USFWS). 2001. *Memo to Mr. Michael C. Stroud, Natural and Cultural Resources Lead, Department of the Navy, regarding the proposed activities at Site 1 and the measures that the Navy would be taking to prevent impacts to biological resources at Site 1*. Prepared by Ms. Karen A. Evans, Acting Assistant Field Supervisor. May.

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Attachment A
Photographs

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Photograph 1. Visual Surface Sweep Being Conducted in On-site Area

Photograph 2. Adjacent Property Characterization Area, Looking South

Photograph 3. Sieving Soil From Ammunition Cans for Metallic Objects

Photograph 4. Potential MEC Items Recovered From Ammunition Cans (mostly 20 mm projectiles)

Photograph 6. Explosive Shot Prepared for Detonation

Photograph 7. Explosive Shot at On-Site Detonation Location

Photograph 8. On-Site Detonation Location after Explosive Shot

Photograph 9. Former Observation Bunker Area After Completion of Project

Photograph 10. Former Ammo Can Soil Pile After Spreading On-Site

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Attachment B
Munitions Debris Certification Form and Certificate of Destruction

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DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1	2	3	4	5	6	7		23	24	25	26	27	28	29		45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
DI OD CE N		RI FROM		M& S		UI NS IS T		QUANTITY								SER	SUPPLE-MENTARY ADDRESS					SIG	FUND		DIS-TRI-BU-TION			PRO-JECT			PRI	RD EQ D	D EA L E			ADV			RI			O/P	COND		MGT							

1. TOTAL PRICE

UNIT PRICE		DOLLARS	CTS
DOLLARS	CTS		

2. SHIP FROM: EL TORO SITE 1

3. SHIP TO: FILTER RECYCLING SERVICES

4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS
9/30/08			INERT AEDA	

10. QTY. REC'D	11. UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL
1		525 LB	6-YD BIN		

16. FREIGHT CLASSIFICATION NOMENCLATURE: SCRAP METAL

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE
		525 LB (CONTENTS)	

22. RECEIVED BY

23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

We certify and verify that the Ammunition, Explosives, & Dangerous Articles (AEDA) Residue, Range Residue, and/or Explosive Contaminated Property listed has been 100-percent properly inspected by us and to the best of our knowledge and belief, are inert and/or free of explosives or other dangerous materials.

Certified By: E.A. Dan Date: 9/30/08

Verified By: Jim Ross Date: 9/30/08

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Filter Recycling Services Inc.
180 West Monte Avenue
Rialto, California 92376
(909) 873-4141 (800) 698-4377
fax (909) 873-4142

CERTIFICATE OF DESTRUCTION

This document certifies that the materials identified below were accepted and destroyed by Filter Recycling Services. Filter Recycling Services, Inc utilizes a proprietary system of shredders, granulizers, rotary force and magnetic separation known as the ERR* process. ERR mechanically separates the materials into their basic elements, rendering them unrecognizable.

Organization: MCAS El Toro Marine Base **Address:** Irvine Blvd/ Magazine Rd Irvine, Ca 92618	**Organization Contact:** Earth Tech **Address:** 21064 Bake Parkway, Suite 200 Lake Forest, Ca 92603
Date of Destruction: 10/22/08	**Shipping doc** # BOL59513

Description of materials Destroyed: Metallic Munitions Debris

METHOD OF DESTRUCTION:

- ☐ **Incineration**
- ☐ **Pulverizing**
- ☐ **Waste to Energy**
- ☑ **Filter Recycling Services (ERR process)**
- ☐ **Other:** _____

Destroyed By:

If On Site, Witnessed By: Earl Dennis of Earth Tech/AECOM

ALTERNATE STRAIGHT BILL OF LADING - SHORT FORM

Shipper No. CA74425

Original – Not Negotiable

Carrier No.

Environmental Logistics, Inc. BOL59513

Date

(Name of Carrier)

TO:		FROM:	
Consignee	Filter Recycling Services, Inc.	Shipper	MCAS El Toro Caretaker Site Office
Street	180 W. Monte Ave.	Street	Irvine Blvd / Magazine Rd
Destination	Bloomington, CA Zip Code 92316	Origin	Irvine, CA Zip Code 92618
		Vehicle Number	EMERGENCY DELIVERY PHONE NO. 909-721-2038

Route:

No. Shipping Units	+ HM	Kind of Packaging, Description of Articles, Special Marks and Exceptions	Weight (Subject to Correction)	Rate	CHARGES (for Carrier use only)
40 yards		Scrap Metal (Inert Munitions Debris)			
~~40~~		(see enclosed certification, DD Form 1348-1A)			
		Bin 0421			
		W/t # 3586 @ 0.23 tons			
		Mail Bill of Lading to:			
		MCAS El Toro			
		7040 Trabuco Rd, Bldg. 307			
		Irvine, CA 92618			

10-27-08

REMIT C.O.D. TO:

ADDRESS

COD Amt: $

C.O.D. FEE: PREPAID ☐ COLLECT ☐ $

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight".

†Shipper's imprint in lieu of stamp; not a part of bill of lading approved by the Interstate Commerce Commission.

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

$ _____ per _____

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of Consignor)

TOTAL CHARGES $

FREIGHT CHARGES

Check Appropriate Box: ☐ Freight prepaid ☐ Collect

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of the issue of receipt by the carrier of the property described in the Original Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classifications in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation."

SHIPPER	MCAS El Toro Caretaker Site Office	CARRIER	Environmental Logistics, Inc.
PER		PER	DATE 10-27-08

Permanent post office address of shipper

+ MARK WITH "X" TO DESIGNATE HAZARDOUS MATERIAL AS DEFINED IN TITLE 49 OF FEDERAL REGULATIONS.

For further details on SHIPPING HAZARDOUS MATERIALS see Federal Regulations 49 CFR, Part 172.

№ 3586

WEIGHMASTER CERTIFICATE

THIS IS TO CERTIFY that the following described commodity was weighed, measured, or counted by a weighmaster, whose signature is on this certificate, who is a recognized authority of accuracy, as prescribed by Chapter 7 (commencing with Section 12700) of Division 5 of the California Business and Professions Code, administered by the Division of Measurement Standards of the California Department of Food and Agriculture.

NAME OF FIRM **SAL'S PROPANE, INC.**
2312 S. RIVERSIDE AVE.
RIALTO, CA 92377
(888) 797-8077
Website: www.salespropaneinc.com

DATE 10-21-08

WEIGHED FOR/SELLER MCAS El Toro

DELIVERED TO/BUYER Miller Recy

P.O 59513

WEIGHT

ID 3586

GROSS 25660 lb INBOUND

B.0421 10/21/2008 02:16PM

W/T# 3586
@
0.23tons

ID 3586

GROSS 25660 lb RECALLED
TARE 25200 lb
NET 460 lb

02:31PM 10/21/2008

WEIGHMASTER: E Rasmc

GROSS-WEIGHED BY EA DEPUTY, DATE 10-21

TARE-WEIGHTED BY EA DEPUTY, DATE 10-21

COMMODITY Cvr/metal

NUMBER OF PIECES 460 LC DC

WEIGHED AT
2312 S. RIVERSIDE AVE.
RIALTO, CA 92377

DUPLICATE

Attachment C
Analytical Results of Soil from Ammunition Cans

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Table C-1. Analytical Results of Soil From Ammunition Cans

Analyte	Analytical Method	Units	01-SS-IDW11-S01 Discrete Sample LE636	01-SS-IDW11-S02 Discrete Sample LE637	01-SS-IDW11-S03 Discrete Sample LE638	01-SS-IDW11-S04 Composite Sample LE639
VOCs						
1,1,1,2-Tetrachloroethane	8260B	ug/kg	1.4 U	0.7 U	1.4 U	NA
1,1,1-Trichloroethane	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
1,1,2,2-Tetrachloroethane	8260B	ug/kg	2.4 U	1.2 U	2.4 U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
1,1,2-Trichloroethane	8260B	ug/kg	1.0 U	0.5 U	1.0 U	NA
1,1-Dichloroethane	8260B	ug/kg	2.2 U	1.1 U	2.2 U	NA
1,1-Dichloroethene	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
1,2-Dichloroethane	8260B	ug/kg	1.4 U	0.7 U	1.4 U	NA
1,2-Dichloropropane	8260B	ug/kg	1.2 U	0.6 U	1.2 U	NA
1,2-Dichlorotetrafluoroethane	8260B	ug/kg	3.0 U	1.5 U	3.0 U	NA
2-Butanone	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
2-Hexanone	8260B	ug/kg	0.4 U	0.2 U	0.4 U	NA
4-methyl-2-Pentanone	8260B	ug/kg	1.8 U	0.9 U	1.8 U	NA
Acetone	8260B	ug/kg	5.6 U	2.8 U	5.6 U	NA
Benzene	8260B	ug/kg	1.2 U	0.90 J	3.1 J	NA
Bromodichloromethane	8260B	ug/kg	1.4 U	0.7 U	1.4 U	NA
Bromoform	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
Bromomethane	8260B	ug/kg	3.2 U	1.6 U	3.2 U	NA
Carbon disulfide	8260B	ug/kg	2.2 U	1.1 U	2.2 U	NA
Carbon tetrachloride	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
Chlorobenzene	8260B	ug/kg	1.0 U	0.5 U	1.0 U	NA
Chloroethane	8260B	ug/kg	3.2 U	1.6 U	3.2 U	NA
Chloroform	8260B	ug/kg	2.8 U	1.4 U	2.8 U	NA
Chloromethane	8260B	ug/kg	3.6 U	1.8 U	3.6 U	NA
cis-1,2-Dichloroethene	8260B	ug/kg	2.2 U	1.1 U	2.2 U	NA
cis-1,3-Dichloropropene	8260B	ug/kg	1.0 U	0.5 U	1.0 U	NA
Dibromochloromethane	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
Dichlorodifluoromethane	8260B	ug/kg	1.6 U	0.8 U	1.6 U	NA
Diisopropyl ether	8260B	ug/kg	1.4 U	0.7 U	1.4 U	NA
Ethyl tert-butyl ether (ETBE)	8260B	ug/kg	1.2 U	0.6 U	1.2 U	NA
Ethylbenzene	8260B	ug/kg	1.2 U	0.6 U	1.2 U	NA
Methyl tertbutyl ether (MTBE)	8260B	ug/kg	1.8 U	0.94 J	1.8 U	NA
Methylene chloride	8260B	ug/kg	9.2 U	4.6 U	9.2 U	NA
Styrene	8260B	ug/kg	1.4 U	0.7 U	1.4 U	NA
tert-Amyl methyl ether (TAME)	8260B	ug/kg	1.8 U	0.9 U	1.8 U	NA
tert-Butyl alcohol	8260B	ug/kg	55.2 U	27.6 U	55.2 U	NA
Tetrachloroethene	8260B	ug/kg	1.0 U	0.66 J	1.0 U	NA
Toluene	8260B	ug/kg	1.4 U	0.84 J	1.4 U	NA
Total Xylenes	8260B	ug/kg	1.4 U	0.7 U	1.5 J	NA
trans-1,2-Dichloroethene	8260B	ug/kg	2.8 U	1.4 U	2.8 U	NA
trans-1,3-Dichloropropene	8260B	ug/kg	0.8 U	0.4 U	0.8 U	NA
Trichloroethene	8260B	ug/kg	1.4 U	0.7 U	1.4 U	NA
Trichlorofluoromethane	8260B	ug/kg	2.6 U	1.3 U	2.6 U	NA
Vinyl chloride	8260B	ug/kg	3.4 U	1.7 U	3.4 U	NA
SVOCs						
1,2,4-Trichlorobenzene	8270C	ug/kg	NA	NA	NA	49.4 U
1,2-Dichlorobenzene	8270C	ug/kg	NA	NA	NA	51.2 U
1,3-Dichlorobenzene	8270C	ug/kg	NA	NA	NA	50.7 U
1,4-Dichlorobenzene	8270C	ug/kg	NA	NA	NA	48.9 U
2,2'-oxybis (1-Chloropropane)	8270C	ug/kg	NA	NA	NA	47.3 U
2,4,5-Trichlorophenol	8270C	ug/kg	NA	NA	NA	60.1 U
2,4,6-Trichlorophenol	8270C	ug/kg	NA	NA	NA	48.3 U
2,4-Dichlorophenol	8270C	ug/kg	NA	NA	NA	50.5 U
2,4-Dimethylphenol	8270C	ug/kg	NA	NA	NA	43.9 U
2,4-Dinitrophenol	8270C	ug/kg	NA	NA	NA	53.7 U
2-Chloronaphthalene	8270C	ug/kg	NA	NA	NA	52.4 U
2-Chlorophenol	8270C	ug/kg	NA	NA	NA	44.3 U
2-Methylnaphthalene	8270C	ug/kg	NA	NA	NA	50.4 U
2-Methylphenol	8270C	ug/kg	NA	NA	NA	45.2 U
2-Nitroaniline	8270C	ug/kg	NA	NA	NA	62.4 U
2-Nitrophenol	8270C	ug/kg	NA	NA	NA	47.8 U
3,3'-Dichlorobenzidine	8270C	ug/kg	NA	NA	NA	56.3 U
3/4-Methylphenol	8270C	ug/kg	NA	NA	NA	46.4 U
3-Nitroaniline	8270C	ug/kg	NA	NA	NA	61.1 U
4,6-Dinitro-2-methylphenol	8270C	ug/kg	NA	NA	NA	56.4 U
4-Bromophenyl-phenylether	8270C	ug/kg	NA	NA	NA	56.6 U
4-Chloro-3-methylphenol	8270C	ug/kg	NA	NA	NA	58.8 U

Table C-1. Analytical Results of Soil From Ammunition Cans

Analyte	Analytical Method	Units	01-SS-IDW11-S01 Discrete Sample LE636	01-SS-IDW11-S02 Discrete Sample LE637	01-SS-IDW11-S03 Discrete Sample LE638	01-SS-IDW11-S04 Composite Sample LE639
4-Chloroaniline	8270C	ug/kg	NA	NA	NA	16.5 U
4-Chlorophenyl-phenylether	8270C	ug/kg	NA	NA	NA	60.7 U
4-Nitroaniline	8270C	ug/kg	NA	NA	NA	72.8 U
4-Nitrophenol	8270C	ug/kg	NA	NA	NA	59.8 U
Bis(2-chloroethoxy)methane	8270C	ug/kg	NA	NA	NA	49.9 U
Bis(2-chloroethyl) ether	8270C	ug/kg	NA	NA	NA	50.0 U
Bis(2-ethylhexyl) phthalate	8270C	ug/kg	NA	NA	NA	61.6 U
Butylbenzyl phthalate	8270C	ug/kg	NA	NA	NA	55.5 U
Carbazole	8270C	ug/kg	NA	NA	NA	81.6 U
Dibenzofuran	8270C	ug/kg	NA	NA	NA	57.3 U
Diethyl phthalate	8270C	ug/kg	NA	NA	NA	62.1 U
Dimethyl phthalate	8270C	ug/kg	NA	NA	NA	63.3 U
Di-n-butyl phthalate	8270C	ug/kg	NA	NA	NA	65.9 U
Di-n-octyl phthalate	8270C	ug/kg	NA	NA	NA	58.4 U
Hexachlorobenzene	8270C	ug/kg	NA	NA	NA	60.3 U
Hexachlorobutadiene	8270C	ug/kg	NA	NA	NA	51.7 U
Hexachlorocyclopentadiene	8270C	ug/kg	NA	NA	NA	44.0 U
Hexachloroethane	8270C	ug/kg	NA	NA	NA	49.9 U
Indeno(1,2,3-cd)pyrene	8270C	ug/kg	NA	NA	NA	60.4 U
Isophorone	8270C	ug/kg	NA	NA	NA	57.0 U
N-Nitroso-di-n-propylamine	8270C	ug/kg	NA	NA	NA	54.9 U
N-Nitrosodiphenylamine	8270C	ug/kg	NA	NA	NA	50.6 U
Pentachlorophenol	8270C	ug/kg	NA	NA	NA	58.7 U
Phenol	8270C	ug/kg	NA	NA	NA	43.0 U
PAHs						
Acenaphthene	8270C-SIM	ugkg	NA	NA	NA	1.0 U
Acenaphthylene	8270C-SIM	ug/kg	NA	NA	NA	0.9 U
Anthracene	8270C-SIM	ug/kg	NA	NA	NA	1.4 J
Benzo(a)anthracene	8270C-SIM	ug/kg	NA	NA	NA	2.9 J
Benzo(a)pyrene	8270C-SIM	ug/kg	NA	NA	NA	0.9 U
Benzo(b)fluoranthene	8270C-SIM	ug/kg	NA	NA	NA	3.3 J
Benzo(g,h,i)perylene	8270C-SIM	ug/kg	NA	NA	NA	1.3 U
Benzo(k)fluoranthene	8270C-SIM	ug/kg	NA	NA	NA	3.7 J
Chrysene	8270C-SIM	ug/kg	NA	NA	NA	4.2 J
Dibenzo(a,h)anthracene	8270C-SIM	ug/kg	NA	NA	NA	0.9 U
Fluoranthene	8270C-SIM	ug/kg	NA	NA	NA	11
Fluorene	8270C-SIM	ug/kg	NA	NA	NA	1.7 J
Naphthalene	8270C-SIM	ug/kg	NA	NA	NA	7.0
Phenanthrene	8270C-SIM	ug/kg	NA	NA	NA	14
Pyrene	8270C-SIM	ug/kg	NA	NA	NA	6.3
Explosives						
1,3,5-Trinitrobenzene	8330	mg/kg	NA	NA	NA	0.079 U
1,3-Dinitrobenzene	8330	mg/kg	NA	NA	NA	0.063 U
2,4,6-Trinitrotoluene	8330	mg/kg	NA	NA	NA	0.083 U
2,4-Dinitrotoluene	8330	mg/kg	NA	NA	NA	0.083 U
2,6-Dinitrotoluene	8330	mg/kg	NA	NA	NA	0.083 U
2-Amino-4,6-dinitrotoluene	8330	mg/kg	NA	NA	NA	0.083 U
2-Nitrotoluene	8330	mg/kg	NA	NA	NA	0.066 U
3-Nitrotoluene	8330	mg/kg	NA	NA	NA	0.071 U
4-Amino-2,6-dinitrotoluene	8330	mg/kg	NA	NA	NA	0.075 U
4-Nitrotoluene	8330	mg/kg	NA	NA	NA	0.095 U
HMX	8330	mg/kg	NA	NA	NA	0.080 U
Nitrobenzene	8330	mg/kg	NA	NA	NA	0.075 U
RDX	8330	mg/kg	NA	NA	NA	0.080 U
Tetryl	8330	mg/kg	NA	NA	NA	0.091 U
Hydrocarbons						
TPH as Diesel	8015B DRO	mg/kg	NA	NA	NA	7.4
TPH as Lube Oil	8015B DRO	mg/kg	NA	NA	NA	9.9 J
General Chemistry						
Perchlorate	6850	ug/kg	NA	NA	NA	2.9 J
pH	9045C	pH Units	NA	NA	NA	5.7
Metals						
Aluminum	6010C	mg/kg	NA	NA	NA	5220 J
Antimony	6010C	mg/kg	NA	NA	NA	0.44 U
Arsenic	6010C	mg/kg	NA	NA	NA	1.2
Barium	6010C	mg/kg	NA	NA	NA	33.4 J
Beryllium	6010C	mg/kg	NA	NA	NA	0.26
Cadmium	6010C	mg/kg	NA	NA	NA	0.029 U
Calcium	6010C	mg/kg	NA	NA	NA	2590 J

Table C-1. Analytical Results of Soil From Ammunition Cans

Analyte	Analytical Method	Units	01-SS-IDW11-S01 Discrete Sample LE636	01-SS-IDW11-S02 Discrete Sample LE637	01-SS-IDW11-S03 Discrete Sample LE638	01-SS-IDW11-S04 Composite Sample LE639
Chromium	6010C	mg/kg	NA	NA	NA	13.2
Cobalt	6010C	mg/kg	NA	NA	NA	1.3
Copper	6010C	mg/kg	NA	NA	NA	9.8 J
Iron	6010C	mg/kg	NA	NA	NA	10300 J
Lead	6010C	mg/kg	NA	NA	NA	13.1 J
Magnesium	6010C	mg/kg	NA	NA	NA	1090 J
Manganese	6010C	mg/kg	NA	NA	NA	89.2 J
Mercury	7471A	mg/kg	NA	NA	NA	1.3 J
Molybdenum	6010C	mg/kg	NA	NA	NA	0.61
Nickel	6010C	mg/kg	NA	NA	NA	3.9 J
Potassium	6010C	mg/kg	NA	NA	NA	603
Selenium	6010C	mg/kg	NA	NA	NA	0.50 J
Silver	6010C	mg/kg	NA	NA	NA	0.037 U
Sodium	6010C	mg/kg	NA	NA	NA	80.0 J
Thallium	6010C	mg/kg	NA	NA	NA	0.210 U
Vanadium	6010C	mg/kg	NA	NA	NA	6.0
Zinc	6010C	mg/kg	NA	NA	NA	67.2 J

Notes:

ug/kg = micrograms per kilogram

J = the level stated is an estimated value

mg/kg = milligrams per kilogram

NA = the sample was not analyzed for the particular analyte

pH = negative logarithm of hydrogen ion concentration

RDX = cyclotrimethylenetrinitramine

SVOCs = semivolatile organic compounds

TPH = total petroleum hydrocarbons

U = not detected at the threshold indicated

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Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
6	(FBI) used IRP Site 1 for training purposes	Section 2.1.1	Letter Report stating the FBI's Use of the MCAS El Toro EOD Range. Entire Document. March 2000.

U.S. Department of Justice

Federal Bureau of Investigation

In Reply, Please Refer to
File No.
197-LA-217220

Los Angeles, California 90024
March 14, 2000

Mr. Juan Gutierrez
Senior Staff Counsel
Office of Legal Counsel
Department of Toxic Substances Control
P.O. Box 806
Sacramento, California 95812-0806

Dear Mr. Gutierrez:

This letter addresses concerns of the Department of Toxic Substances Control (DTSC) regarding the FBI's use of the Explosives Device Detonation (EOD) range at the closed Marine Corps Air Station (MCAS), El Toro. According to conversations at our last meeting on December 10, 1999, DTSC appeared to be primarily concerned that the FBI would use the EOD range as a "disposal" site. This correspondence addresses this concern by outlining the FBI's intended use of the EOD range. This outline focuses on the manner and intended use of the range, and not the technical terms involved in actual detonation.

The FBI is not in the business of bomb disposal, or for that matter, the generation, treatment, or disposal of hazardous waste. The FBI's use of the range is strictly limited to those actions authorized by federal statute necessary to protect the United States and its people against crime. Areas of chief concern for the FBI include the investigation of violent crimes and domestic security/terrorism matters. The FBI is also authorized to provide other law enforcement agencies with cooperative services, such as fingerprint identification, laboratory examinations and police training. The EOD range at El Toro is a very important training asset for the FBI and its Laboratory Division.

The FBI's Laboratory Division is one of the largest and most comprehensive crime laboratories in the world. It provides leadership and service in the scientific solution and prosecution of crimes throughout the United States and is the only full-service federal forensic laboratory. The FBI Laboratory's scientific examinations include trace evidence, firearms, bomb detonation, and chemistry. State and local crime laboratory and law enforcement personnel receive training from FBI laboratory personnel. Much of this training is not available anywhere else in the United States, and, without it, state and local crime laboratories would find it difficult to improve and expand their capabilities.

The FBI's Evidence Response Teams (ERTs) depend on the training and services of the FBI Laboratory, including post-blast crime scene analysis. The ERTs specialize in the recovery of physical evidence. The ERTs are called out in cases requiring the most sophisticated

forensic analyses. For example, teams from 17 different field offices participated in the post-blast evidence recovery at the bombing of the Oklahoma City federal building.

The FBI's Bomb Data Center collects information on improvised explosive devices (IEDs) and terrorist activities encountered by civil law enforcement, public safety, and military agencies. For example, the Bomb Data Center played a crucial role in the investigation of the 1993 World Trade Center bombing and the 1988 Pan Am Flight 103 bombing. The FBI also evaluates, records and disseminates bomb data to authorized personnel and agencies participating in the program to aid in preparing contingency plans. The FBI's continual involvement in the emergency threats posed by the criminal use of explosives keep the Bomb Data Center up-to-date on the latest innovations in explosives and, in turn, allows the FBI to train its personnel with the best safety counter-measures.

In order for the FBI to safely and proficiently perform these responsibilities in a manner that is responsive to the needs of the public, it must provide continual and extensive training for its Special Agents. Training is crucial in every aspect of law enforcement, and in particular the collection of crime scene evidence. If our agents are not properly trained, then entire prosecutions can be lost and criminals set free. Even worse, particularly with bombs, Special Agents or the public could be injured or killed if proper procedures are not followed.

The FBI must be able to sustain the capability to disarm unexploded improvised explosive devices delivered or placed by criminals. In addition, the FBI must be able to "render safe" devices made dangerous by accident or other circumstances. FBI personnel are trained and equipped to protect people, resources, and the environment from the effects of hazardous devices. These personnel must be able to defeat criminal and terrorist explosive devices and locate, identify, disarm, and neutralize explosive dangers. They also must be able to train others on device recognition, dangers, and precautions.

With the consent of the Marines, the El Toro EOD range has for many years provided the FBI with the unique ability to provide effective explosive device training for its agents as well as for other federal agencies and local law enforcement agencies. The FBI's EOD training program aims to produce highly qualified, technically proficient EOD teams capable of safely and efficiently performing device operations. The FBI's EOD training can be divided into three basic areas: (1) Bomb Technician Training; (2) Post-Blast Investigation Training; and (3) Emergency Response Operations.

(1) <u>Bomb Technician Training</u>

Bomb technician training ensures that the FBI's EOD personnel receive the most up-to-date information and procedures for handling devices. Personnel are trained in the best methods and procedures for performing device detonation to maintain proficiency. Other procedures include safety testing, research and development testing, equipment testing and quality control, quality assurance testing, EOD management, technological development training, and EOD staff logistics support training.

Typically, bomb technician training consists of "hands on" explosive training one day per month. Each bomb technician must show a proficiency in firing both an electrical and non-electrical explosive charge. This training involves a maximum of nine shots with each shot containing approximately one-half pound of explosive material. Each shot is loaded with only

enough material to ensure a complete detonation. Excess propellant is considered a public safety (and agent safety) issue in real-world situations and, thus, any excess material is incorporated into the explosive exercise to render the device safe. Training also encompasses the testing of new explosive products to determine their applicability to EOD operations. Generally, this involves only a few ounces of the material and detonation is initiated off the ground on a hard target surface.

(2) Post-Blast Investigation Training

Post-blast investigation training plays a major role in the FBI's use of the EOD range. Since almost all bomb situations in which the FBI responds involve criminal violations, the ability of the FBI and local law enforcement to preserve evidence (including the crime scene) and to investigate becomes imperative. Without proper evidence, even the best investigation and the most qualified experts will have difficulty producing a prosecutable case.

Post-blast training emphasizes the identification, location, access, and recovery of explosive devices and any products surviving detonation. The FBI's forensic capabilities depend on the ability of its agents to identify, collect, test, and evaluate evidence recovered from a post-blast site. Each and every piece of material left over from an explosion is considered evidence and is used to formulate a perspective of the explosive device, its unique characteristics, and identification of its origin and/or maker.

Different types of devices create different types of evidence. Even two identical bombs can yield very different post-blast signatures depending on the type and location of the detonation. As such, training EOD personnel to recognize these differences requires extensive use of post-blast materials. EOD personnel must be able to not only determine what kind of bomb was detonated, but they must also be able to find and identify any unexploded device or materials capable of endangering the public in a real-world situation. After identifying or locating the evidence, the technicians must be able to process and collect the evidence in a manner that protects the chain of custody and preserves the evidence for further laboratory testing and/or evidentiary uses.

Post-blast investigative schools are held about four times a year and last about one week. The school is divided into range operations and classroom lecture. Range operations include training demonstrations. The training demonstrations consist of about six shots of different explosive products. Each shot is no more than eight ounces of explosive material. Each shot is suspended above the ground so the students can observe the shock wave and smoke without ground interference. Different types of gunpowders are also burned in small quantities on cardboard sheets to show the thermal tattooing of gunpowder. In addition, a blasting cap is detonated inside a metal coffee can to demonstrate pressure and fragmentation effects of explosions.

Training at the post-blast investigative schools also includes the detonation of up to five different improvised explosive devices (IEDs). An IED is a device placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals, designed to destroy, disfigure, distract or harass. EOD personnel are specifically trained on IEDs because many of the explosives encountered in real-world situations are considered IEDs. For training purposes, the IEDs are exploded on the ground with no more than eight ounces of explosive material in each device. The students are divided into groups and each

group is given a post-blast site to secure and locate, collect, and identify the fragmentation and componentry from the device for the purpose of reconstructing the device. Other exercises include the study of and training for car bombs. Four vehicles, which have been drained of all fluids and batteries by the towing company supplying the vehicles, are placed on the range. An IED is placed and detonated inside each vehicle. Each IED contains no more than 16 ounces of explosive material. The students then investigate the entire scene to recover primary and secondary fragmentation. The students are taught how to locate, identify, and collect the evidence, no matter how minuscule, in order to put together a court case using the evidence collected.

(3) Emergency Response Operations

The EOD range serves as a technical training area for the use and study of emergency explosive device responses. Because criminals and terrorists are constantly inventing and improvising explosive devices, the FBI and local law enforcement must be able to keep up with changing and developing technology. The most important aspect of such training is the continual development of render safe procedures (RSPs). An RSP provides for the interruption of functions or separation of essential components of explosive devices to prevent an unacceptable detonation. Before any type of evidence can be collected, the device must be rendered safe. A live device cannot be used for evidentiary purposes in a court of law due to the obvious safety issues. Thus, the device must be rendered safe either by a controlled detonation or by disassembly.

The FBI can and does manufacture IEDs in order to train EOD personnel regarding the different RSPs. However, in order for the FBI to safely execute RSPs, it must practice with real-world IEDs. Thus, the FBI, like the Marines, must exploit every opportunity to train when it encounters IEDs manufactured or improvised by members of the public. Explosives recovered from the public and rendered safe by the EOD personnel provide invaluable intelligence data and also aid in the development of suitable counter-measures to the device. It is absolutely crucial to the FBI's investigative and security purposes that its EOD personnel have the opportunity to study and train with the these IEDs in order to counter the threat posed by the development of new technological systems. The FBI uses every instance of an emergency situation to develop equipment and RSPs necessary to defeat new IEDs. IEDs also include devices that appear conventional, but are booby-trapped or rigged in a way to deliver an unexpected result.

The FBI considers all situations where a device is posing an immediate threat to the health or safety of the public, property, or the environment to be an emergency response -- where the response cannot be delayed without increasing the risk to human health, property or the environment.

The average IED encountered by public safety bomb units contain 16 ounces or less of explosive material. Generally, the only time an IED is counter-charged, or blown-up, is if it was assessed to contain an extremely sensitive fusing system. This being the case, the IED would be counter-charged where it was found. However, because there is always a chance that a certain movement could set an IED off while being disarmed, it is often the practice to move the IED to an EOD range rather than attempt to render safe the IED in a metropolitan area. It is the goal of the bomb technician to render the IED safe and preserve every possible component in good condition for forensic purposes.

At no time during any of the described EOD practices are materials discarded or disposed. The whole purpose of the EOD range is to train EOD personnel on how to render explosives safe and preserve whatever evidence remains for further study and/or prosecution. In fact, in emergency response situations, the FBI is legally required to use every reasonable effort to collect and preserve all evidence of criminal activity.

We hope this overview enlightens your perspective on the FBI's proposed use of the EOD range. This use is the same as that used by the FBI with the Marines while the MCAS, El Toro was open and operational. The FBI considers continued use of this inactive range extremely important not only to the FBI and local law enforcement in southern California, but also to the safety of all residents who benefit from the expertise developed by law enforcement at the El Toro EOD range. Without this EOD range, law enforcement within our area would be forced to detonate extremely dangerous devices in populated areas, which would endanger the safety of the people of the State of California.

If you have any questions, please contact Associate Division Counsel R. Stephen Kramer at (310) 996-3422.

Sincerely,

James V. Desarno, Jr.
Assistant Director in Charge

cc: Mr. John Scandura
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Ms. Triss Chesney
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, California 90630

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
7	suspected types of waste	Section 2.1.2	Draft Phase II Remedial Investigation Report, Operable Unit 2B – Site 2, Marine Corps Air Station, El Toro, California. Section 1.2.2.3. March 1996.

1.2.2.2 RECENT STATION OPERATIONS

MCAS El Toro continues to provide materials and support for aviation activities of the U.S. Marine Corps. The Station comprises runways; aircraft maintenance, training, housing, and shopping facilities; and other support facilities totaling 4,471 acres. The Station is currently undergoing the BRAC process. Some operations have closed, and various parts of the Station are no longer in use. Squadrons have been transferred to other Marine Corps and Naval Air Stations.

Currently, hazardous materials wastes are managed under Resource Conservation and Recovery Act (RCRA) requirements. Hazardous wastes are stored in containers at generator accumulation areas and are held for less than 90 days. The on-Station RCRA Interim-Status Storage Facility holds these wastes until they are released for disposal. MCAS El Toro contracts with waste transporters and treatment, storage, and disposal facilities to transport, recycle, treat, or dispose hazardous wastes.

1.2.2.3 HISTORY OF SITE 2 LANDFILL OPERATIONS

The Site 2 landfill is in an area that was used as a gravel borrow pit (Figure 1-5). The remains of the old borrow pit are still visible as a depression at the upper end of the landfill. Site 2 was used from the late 1950s until about 1980, although some unauthorized disposal may have occurred on an intermittent basis until recently. During the 1970s, all solid waste from MCAS El Toro and some waste from MCAS Tustin were disposed in this landfill. Previous reports estimate 800,000 to 1,000,000 cubic yards of waste were placed in the landfill during its operational life (Strata 1991). The suspected types of waste include construction debris, municipal waste, batteries, waste oils, hydraulic fluids, paint residues, transformers, and waste solvents. The configuration of landfill activities is apparent on Figure 1-5.

Interviews

On 26 May 1994, a meeting was held at MCAS El Toro to interview active and retired personnel from the Fuel Operations Division and Facility Management Department (FMD) (currently the Installations Department) regarding the operations and procedures of storage/disposal of hazardous materials and waste at the Station (Jacobs Engineering 1994a). Agency personnel, Navy and Station personnel, and personnel from the contractors for the Navy and the U.S. EPA participated as interviewers during the meeting. A synopsis of the Site 2 discussion follows.

- All panel members agreed that the boundaries of the site, as illustrated in the BRAC Cleanup Plan (BCP), encompass an area slightly larger than the actual disposal area.
- The boundaries northeast of the access road appear to be accurate. The area south of the access road was never used for disposal purposes. The panel agreed that the southwest boundary could be redrawn along the access road.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
8	remedial action for soil	Section 2.1.2	Final Remedial Action Completion Report, Installation Restoration Program Sites 2 and 17, Marine Corps Air Station, El Toro, California. Section 4. March 2009.

4. REMEDIAL ACTION ACTIVITIES

The selected remedy for vadose zones of IRP Sites 2 and 17 as documented in the Final Interim ROD (DON 2000) included below-mentioned components. Each component below applies to both IRP Sites 2 and 17 unless otherwise noted.

- A single-layer, minimum 4-foot-thick monolithic soil cap to prevent contact with landfill materials and to reduce infiltration into landfill contents.
- On-site waste consolidation prior to capping.
- Erosion control features to control surface water flow and protect the integrity of the cap.
- Fencing, signs, and gates with locks to restrict access to the sites.
- Land use restrictions to protect the integrity of the landfill cap, restrict irrigation, prevent use of groundwater at IRP Site 2, assure that contact with landfill materials does not occur, and allow DON, Federal Facility Agreement signatories, and California Integrated Waste Management Board (CIWMB) and/or its Local Enforcement Agency (LEA) access to the sites for the purpose of conducting or overseeing monitoring and maintenance;
- Natural resource/habitat mitigation measures will be coordinated with the United States Fish and Wildlife Service;
- Monitoring of soil gas and soil moisture to detect any migration of contaminants from the landfills;
- Groundwater monitoring to detect any releases of contaminants from the landfills. Monitoring wells will be secured to prevent damage.
- The cap, drainage features, settlement monuments, and security features will be inspected and maintenance will be performed as necessary to assure the integrity of the landfill cap and prevent unauthorized access.
- Periodic reviews (every 5 years) to evaluate the monitoring results and verify that the action remains protective of human health and the environment.

The above remedial action components may be divided into two parts: landfill cover construction and implementation of ICs. The implementation of each of these components is discussed in detail in Sections 4.1 and 4.2. Section 4.1 provides a step-by-step summary of the pre-construction and construction activities performed as part of landfill cap construction at IRP Sites 2 and 17. Section 4.2 discusses implementation of ICs.

A summary of major events associated with the IRP Sites 2 and 17 cover construction, starting with ROD signature, is presented in Table 4-1.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
9	The geology in the vicinity of IRP Site 1	Section 2.3.1.1	Final Phase II Remedial Investigation Report, IRP Site 1, Explosive Ordnance Disposal Range, Former Marine Corps Air Station, El Toro, California. Sections 3.1 and 3.2. December 2006.

3.1 LAND USE AND NATURAL RESOURCES

A great portion of the land immediately surrounding Former MCAS El Toro, including areas adjacent to IRP Site 1 has been used for nursery and agricultural activities. Continued urbanization, however, has brought housing developments about 0.5-mile to the northeast of IRP Site 1. The land located further north and northeast of the site near the foothills of the Santa Ana Mountains remains essentially undeveloped. Areas located to the south, southeast, and southwest have been developed for commercial, light industrial, and residential uses.

According to the Santa Ana Region Basin Plan (CRWQCB 1995), the beneficial uses for groundwater beneath Former MCAS El Toro include municipal water supply, agricultural and industrial supplies, and industrial process supply. Groundwater in the vicinity of Former MCAS El Toro is mostly used for irrigation of agricultural and greenbelt areas (i.e., parkways and parks). Potable water in the area is imported from various sources, and the remainder comes from local resources, including groundwater. The nearest municipal wells used as drinking water sources are associated with the recently installed Irvine Desalter project and are located within approximately 5 miles of IRP Site 1, near the intersection of Irvine Center Drive and Culver Drive. It is anticipated that the new wells will be operational by October 2006.

3.2 GEOLOGY

3.2.1 Lithology and Structure

The study area represents a portion of shelf and tidal deposits eroded from the Santa Ana Mountains and deposited offshore since the late Cretaceous (approximately 60 million years ago [mya]). Figures 2-4 and 3-1 provide a site map, which details the topography, surface geology, and all assessment locations at IRP Site 1 through IRP Site 2 during the various investigations. Figures 3-2 and 3-3 present the generalized Orange County structural and stratigraphic relationships. Highlighted in Figure 3-2 are the six stratigraphic units represented in the study area, which encompasses IRP Site 1 to IRP Site 2, and the intervening western reach of Borrego Canyon Wash. The six units represent deposition from approximately 20 mya to the present time, although, due to structural and erosion events, which have affected the area, not all of the intervening units are preserved within the study area.

The local stratigraphy within the IRP Site 1 boundary is mapped by Morton, et al, (1999) as late Miocene/early Pliocene Capistrano Formation overlain in the southern portion by recent Quaternary (or Holocene) alluvium. Also present near the southern IRP Site 1 boundary is the projected trace of an unnamed fault passing beneath the alluvium and possibly between groundwater Monitoring Wells 01-MW207 and 01-DGMW58 (Figure 3-1). For purposes of this report this fault is referred to as unnamed fault #1 (UF#1). South of UF#1, Morton, et al, (1999) have mapped the middle to late Miocene Monterey Formation and early Pliocene Niguel Formation. The Capistrano Formation at this location is missing, although it is mapped at other locations in the general vicinity. Approximately 2,700 feet southwest and downgradient of UF#1 is another unnamed fault, referred to in this report as UF#2. Monitoring Well 01-MW211 is sited approximately 500 feet southwest and downgradient of UF#2 in alluvium, which in this area overlies the lower-Miocene Vaqueros and middle-Miocene Topanga Formation. Approximately 2500 feet southwest and downgradient of UF#2 are two discontinuous faults UF #3 and UF#4 trending northwest, possibly across IRP Site 2. IRP Site 2 overlies alluvium and dipping structural blocks of Topanga Formation and Vaqueros Formations.

Figure 3-2 shows the stratigraphic interval from the time of deposition of the Vaqueros Formation, the oldest exposed bedrock in the study area, to Holocene aged alluvium, the youngest material present. The oldest unit, the Vaqueros Formation, records deposition, which occurred during the earliest structural events associated with inception of the Los Angeles Basin (LA Basin). Nearly continuous structural downwarping since the late Miocene accompanied deposition of clastics derived from the rising highlands of the Santa Ana, San Bernardino and San Gabriel mountains.

Although no specific structural interpretations of the study area are known to exist, it is clear from the sedimentary record (Figures 3-2 and 3-3) that the southernmost block (beneath IRP Site 2) received the greatest uplift juxtaposing the oldest bedrock stratigraphic unit (Vaqueros Formation) next to the youngest (Niguel Formation). Loss or absence of the intervening strata is interpreted to represent a period of post-depositional erosion, which preceded the final Basin Filling and Disruption phase.

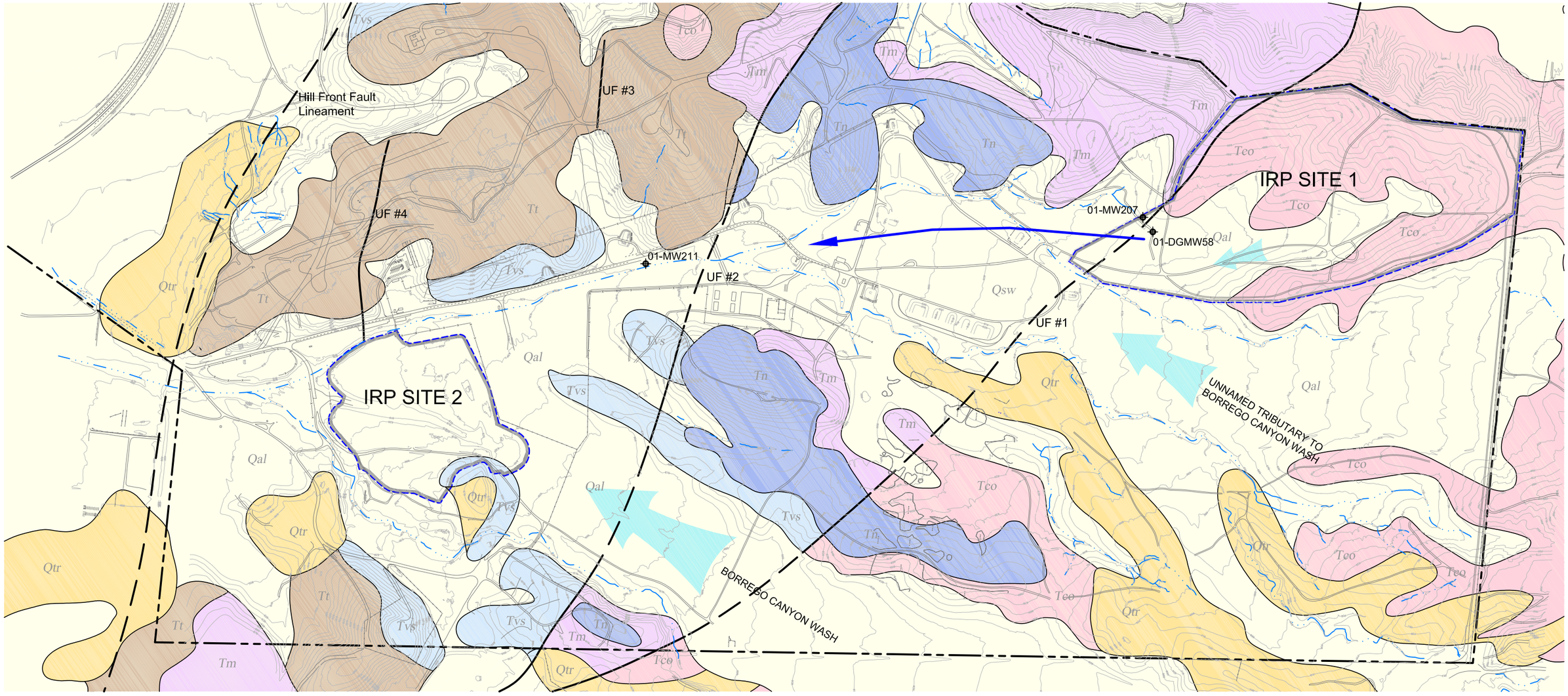
Stratigraphically, the reported maximum thickness of strata above the Vaqueros Formation includes 500 feet for the Topanga Formation, 8,500 feet for the Monterey Formation, 1,500 feet for the Capistrano Formation, and 350 feet for the Niguel Formation. Although these are maximum thicknesses, and may not be representative of thicknesses of these units deposited in this area, it underscores the fact that the IRP Site 2 bedrock block could have experienced the loss of approximately 10,000 feet of stratigraphic section (sediment thickness) from erosion that the nearby intermediate and IRP Site 1 blocks still retain. Given that the horizontal distance between IRP Site 1 and IRP Site 2 is on the order of 7,000 to 8,000 feet, the structural displacement on the fault separating IRP Site 2 from the intermediate block could be quite significant. By the same inference, given that the Niguel Formation is exposed in the intermediate block and the Capistrano Formation in the IRP Site 1 block, the stratigraphic offset across the fault separating these blocks would be substantially less.

These structural and stratigraphic relationships suggest the loss of considerable sediments from the IRP Site 2 block which are still present beneath the surfaces of the intermediate and IRP Site 1 blocks. As the IRP Site 2 block is topographically lower and downgradient from the intermediate and IRP Site 1 blocks, this would tend to suggest that the majority of this structural uplift and erosion had transpired long before the present day topography evolved. This event was likely related to the late stage structural evolution of the LA Basin, which dropped the Irvine sub-basin and raised the Santa Ana's once again.

3.2.2 Holocene Erosion and Deposition

The IRP Site 1 area is surrounded by ridges of feldspathic sandstone of the Capistrano Formation and is its own watershed, meaning that all of the water that falls as precipitation within this enclosed valley drains from it, is lost due to evaporation and evapotranspiration, or is absorbed by its soil or bedrock. IRP Site 1 drains into a larger western reach of Borrego Canyon Wash, which in turn drains into the even larger Borrego Canyon Wash, which drains into the much larger catchment areas of the Santa Ana foothills in the Irvine Groundwater Management Zone. Analysis of Figure 3-1 suggests that these washes are filled with varying widths of gently sloped (virtually flat) alluvium deposited as these drainages matured to their present state.

However, these washes were also cut into the bedrock by these same drainages before conditions evolved to the point where deposition, rather than erosion, dominated. Therefore, both the Borrego Canyon Wash, and its tributary wash that IRP Site 1 drains into, most likely have one or more "V-cut" channels carved into the underlying bedrock, just like the eroded bedrock surface of IRP Site 1 has today.



LEGEND:

- MCAS EL TORO BOUNDARY
- IRP SITE BOUNDARY (1 AND 2)
- STREAM OR WASH (INTERPOLATED FROM TOPOGRAPHIC DATA)
- GEOLOGIC FAULT, DASHED WHERE INFERRED
- UF #1 — UNNAMED FAULT #1
- 01-MW224 — 4-INCH GROUNDWATER MONITORING WELL
- GENERAL GROUNDWATER GRADIENT DIRECTION

- Qal — FLOOD PLAIN AND STREAM CHANNEL DEPOSITS (HOLOCENE AND LATE PLEISTOCENE)
- Qsw — SHEETWASH DEPOSITS (HOLOCENE TO MIDDLE PLEISTOCENE)
- Qtr — TRAIL RIDGE SANDS (PLEISTOCENE)
- Tn — NIGUEL FORMATION
- Tco — OSO MEMBER
- Tm — MONTEREY FORMATION (MIOCENE)
- Tt — TOPANGA FORMATION (MIDDLE MIOCENE)
- Tvs — SESPE AND VAQUEROS FORMATIONS

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION

NORTH

0 350 700 FEET

SCALE: 1"= 700'

Phase II Remedial Investigation — Final

Site Geology

IRP Site 1 - EOD Training Range

Former MCAS El Toro

Date: 12-06

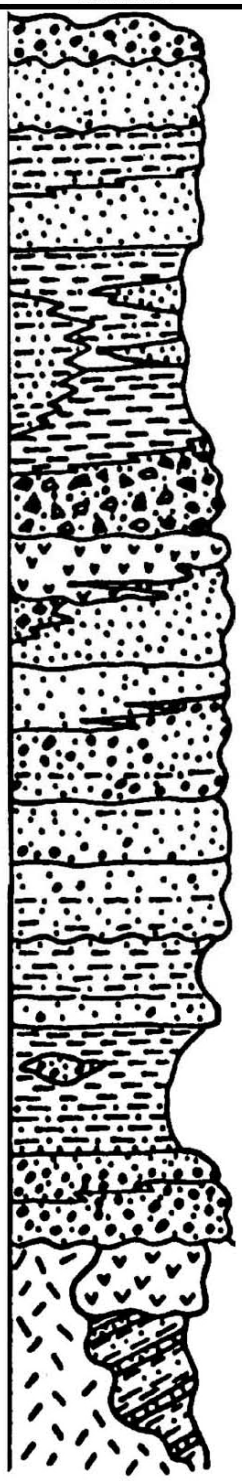
Project No. 36097

EarthTech
A Tyco International Ltd. Company

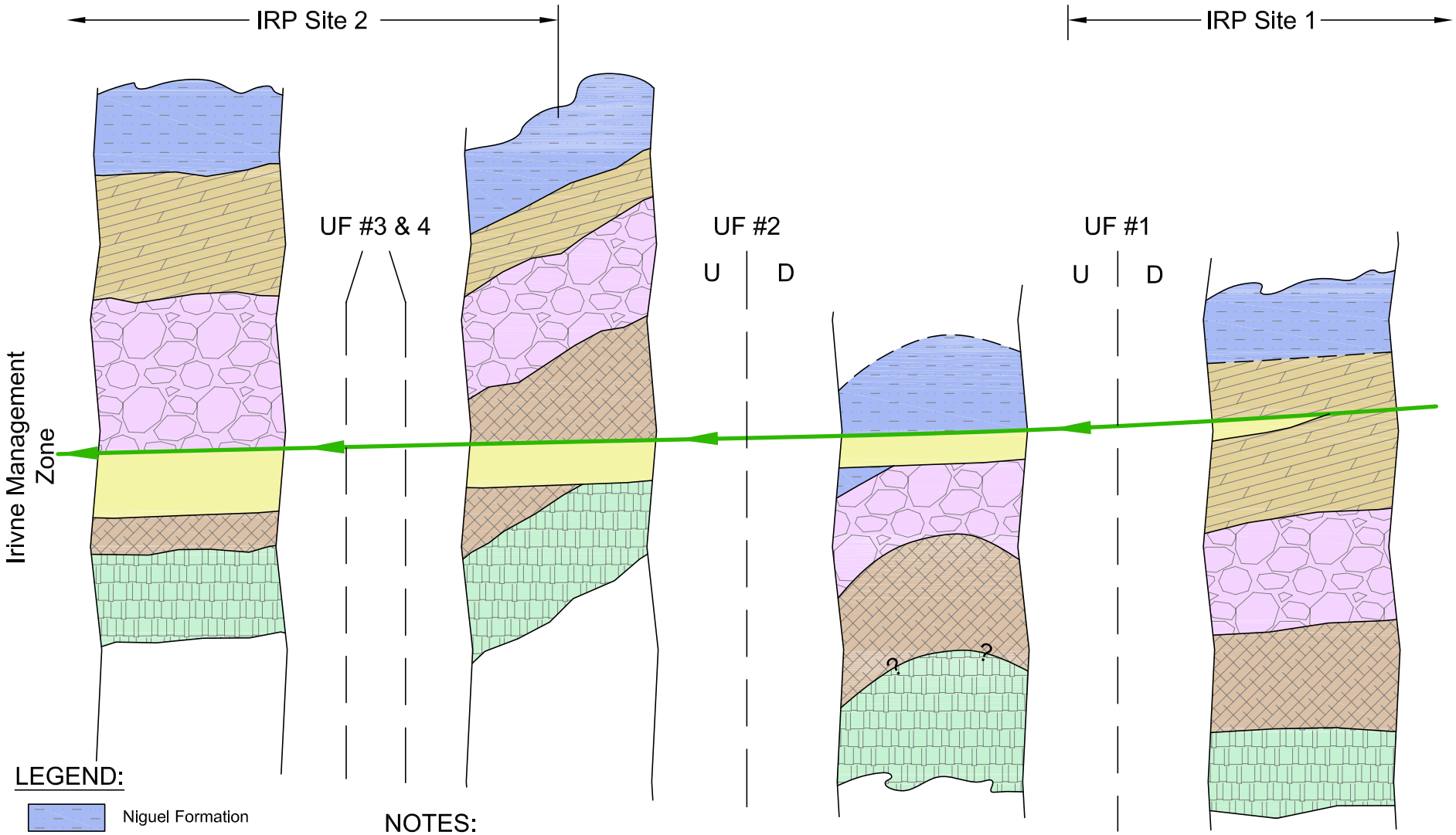
Figure 3-1

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-1.dwg Time: Dec 20, 2006 – 3:07pm

Figure 3-2: LA Basin Structural and Stratigraphic Relationships

L.A. Basin History	Geologic Age	Lithostratigraphic Unit	Stratigraphic Column	Remarks
Basin Filling and Disruption Phase	Holocene	Holocene Alluvium		Sands and gravels
	Pleistocene	San Pedro Fm. and Palos Verdes Sand		Marine terrace deposits
Basin Deposition Phase	Pliocene	Fernando Formation		Marine to terrestrial
	Late Miocene	Niguel Formation		Poorly consolidated deep marine sandstones and siltstones. Known to contain gypsum cement on fractures and joints.
		Capistrano Formation		
	Middle to late Miocene	Monterey Formation		Deep marine diatomite mudstones w/chert.
Basin Inception Phase	Mid. Miocene	San Onofre Breccia		Chaotic debris
	Mid. Miocene	El Modeno Volcanics		Basaltic to andesitic
	Mid. Miocene	Topanga Formation		Shallow marine sandstones
	Lwr. Miocene	Vaqueros Formation		Shallow marine sandstones
Pre-Basin Depositional Phase	Oligocene	Sespe Formation		Nonmarine redbeds fluvial
	Eocene	Santiago Formation		Marine and nonmarine sandstone/conglomerate
	Paleocene	Silverado Formation		Marine and nonmarine sandstone/claystone
	Late Cretaceous (Campanian)	Williams Formation		Sandstones, siltstones and conglomerates
	Late Cretaceous (Turonian - Campanian)	Ladd Formation		Nonmarine to marine conglomerates to shales
	Late Cretaceous (Turonian)	Trabuco Formation		Reddish conglomerates alluvial fan fluvial
Pre-Basin Tectonic Phase	E. Cretaceous	Peninsular Ranges Batholith		Granites and related extrusives
	Late Jurassic E. Cretaceous	Santiago Peak Volcanics		Andesitic breccias and shallow intrusives
	Mid. to Late Jurassic	Bedford Canyon Formation		Turbidites, sandstones, shales - deep marine
	Trassic?			

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-3.dwg Time: Dec 22, 2006 - 1:44pm



LEGEND:

- Niguel Formation
- Capistrano Formation
- Monterey Formation
- Topanga Formation
- Vaqueros Formation
- Quaternary Alluvium
- Current Ground Surface

NOTES:

D	Downthrown
EOD	Explosive Ordnance Disposal
IRP	Installation Restoration Program
MCAS	Marine Corps Air Station
U	Upthrown
UF #1	Unamed Fault #1

Phase II Remedial Investigation — Final

IRP Site 1 to IRP Site 2 Structural and Stratigraphic Relationships

IRP Site 1 - EOD Training Range

Date: 12-06	Former MCAS El Toro	Figure 3-3
Project No. 36097	EarthTech — A Tyco International Ltd. Company	

The alluvium, which fills these washes, is derived from the exposed materials within their catchment areas.

3.2.3 Hydrogeology

The EOD Training Range is within a tributary canyon to Borrego Canyon Wash. The site lies within the watershed of the Irvine Groundwater Management Zone, which is located southeast and adjacent to the Main Orange County Groundwater Basin. The Irvine Groundwater Management Zone has been divided into a forebay area and a pressure area. The forebay area lies along the margin of the basin where relatively shallow and coarse-grained sediments overlie semiconsolidated rock. The forebay area encompasses most of Former MCAS El Toro (Brown and Caldwell 1986). Recharge to the regional system takes place in the forebay area, primarily along washes such as the Borrego Canyon Wash that exit the Santa Ana Foothills and Mountains. The pressure area lies in the central portion of the basin where productive aquifers are present mainly in deeper zones (BNI 1995). The IRP Site 1 area is predominantly composed of poorly consolidated massive marine sandstone (bedrock) of the Oso Member of the Capistrano Formation. In the Tier III-C investigation, the siltstone facies of the Capistrano was also encountered.

Groundwater within this bedrock matrix averaged about 48 feet bgs during the September and November 2004 monitoring well gauging (Table 3-1). In general, groundwater reflects a south-southwest flow with a gradient averaging 0.05-feet-per-foot within the saturated bedrock portion of IRP Site 1. Figure 3-4 shows the groundwater equipotential map for the September 2004 gauging event. Within the saturated bedrock area of IRP Site 1, the gradient was 0.05, as was the case with the March 2005 (Figure 3-5) gauging event. Groundwater levels went up by approximately 10 feet between these two events in response to the second highest rainfall amounts recorded in Los Angeles history. As is observed on both Figures 3-4 and 3-5, the gradient reduced to the 0.01 to 0.02 range as flow transitions from the sandstone bedrock to the alluvial channel connecting IRP Site 1 and IRP Site 2.

The Tier III-C investigation involved installation of 12 additional groundwater monitoring wells both within the IRP Site 1 boundaries and south along the watershed between IRP Sites 1 and 2. These 12 wells were drilled and installed with continuous coring methods. These wells penetrated both feldspathic sandstone bedrock as well as locally generated alluvium (south of IRP Site 1), with wells screened in both.

As continuous cores were removed from each borehole during the Tier III-C investigation, they were immediately logged by the attending geologist, and such properties as reactivity to hydrochloric acid (HCl), degree of moisture saturation, as well as color and grain size features were noted in the logs. Initial examination of the logs indicated that there were other properties which might better aid the interpretive efforts; therefore, the entire core from each borehole was further examined within a week of collection for characteristics such as geologic unit (e.g., alluvium versus bedrock), degree of weathering of the bedrock, and the presence or absence of moisture and degree of saturation.

Groundwater levels found in the feldspathic sandstone tend to reflect a regionally gradual potentiometric surface, generally reflecting the surface topography, throughout IRP Site 1. This surface does not necessarily correspond to where saturations were initially identified in the sandstone during drilling, but often rise above these levels to the site-wide potentiometric surface. This would tend to suggest some mechanism of confinement. This hydrogeologic environment appears to be complicated by the development of secondary porosity within the feldspathic sandstone, which is suspected of being responsible for the variable water saturations found there. Secondary porosity refers to development of a subsequent or separate system of openings (porosity) that are not part of

the native matrix, such as dissolution or leaching. In this case, the secondary porosity may be related to a lack of HCl-reactive mineralization.

The borehole for Well 01-MW222 was intended to explore the possibility of lower water-bearing units within the bedrock, and was to be screened in the second water-bearing unit if one was identified. The borehole for this well was advanced to 190 feet bgs. The first 25 feet of this borehole were composed of dry, highly weathered feldspathic sandstone that did not react with HCl. The remaining 165 feet of core (from 25 feet bgs to 190 feet bgs) were composed of 150 feet of visually similar feldspathic sandstone with only minor variations, and 15 feet of the siltstone facies in two beds. However, this same section of core contained 10 zones of sandstone which reacted with HCl, 4 short zones interpreted as "wet" or relatively saturated with water, 11 zones interpreted as "moist" (or less saturated with water), and nine zones that were dry but did not react with HCl. These zones are more or less randomly distributed through the core. The well screen was set between 115 and 130 feet bgs, which included a 1-foot saturated (wet) zone and one 2-foot "moist" zone. Water was subsequently gauged at approximately 75 feet above the screen in this well (encompassing some nine dry zones of core). The groundwater sample collected from this well was found not to contain perchlorate above the reporting limit indicating that perchlorate had not penetrated to this depth in the aquifer. The subsurface of IRP Site 1, though composed predominately of ostensibly massive feldspathic sandstone, is a complex hydraulic environment that appears to be composed of zones of randomly oriented secondary solution porosity, which comprises the "aquifer" in this area.

These features probably relate to the degree of weathering of the sandstone, presence or absence of moisture as noted in detail as the core was retrieved, and the relationship that appears to exist regarding HCl reactivity. In only one instance (01-MW219 between 45 and 50 feet bgs) moisture was observed to be associated with the sandstone where reactions with HCl were observed. In all other cases, where the sandstone reacted with HCl, visible evidence of moisture was absent. The moisture or water-bearing zones range from less than 1-foot to nearly 30 feet in thickness; however, they do not appear to correlate between the wells. This suggests that secondary porosity, possibly manifested by the absence of HCl reactivity, may be a factor in the hydrodynamics of the feldspathic sandstone aquifer. The best example of this may be found in the interpretive log for Well 01-MW222 (Figure 3-6). Additional examples may be observed on the interpretive logs for Wells 01-MW215, 01-MW-217, 01-MW218, 01-MW219, 01-MW220, 01-MW221 and 01-MW222. Interpretive logs have also been prepared for Wells 01-MW211, 01-MW212, 01-MW213, 01-MW215 and 01-MW216; however, these wells are predominantly installed in alluvium. Interpretive logs for all Tier III-C wells may be found immediately behind the relevant standard well log in Appendix B.

Wells screened within the bedrock (probably across several secondary porosity zones) typically yield little water, with slow recharge times during purging and sampling. This is consistent with the slug test data collected in the central portion of IRP Site 1 as a component of the Tier III-C investigation in June 2004. The slug test data indicates that hydraulic conductivities range from 4.8×10^{-3} feet per day (feet/day) to 2.2×10^{-4} feet/day. Using an average hydraulic conductivity of 1.9×10^{-3} feet/day (4.8×10^{-3}, 2.2×10^{-4} and 7.9×10^{-4} feet/day), an average hydraulic gradient of 0.05-feet-per-foot (from current groundwater elevations), and an assumed effective porosity of 0.1 (10 percent), the average linear groundwater velocity at IRP Site 1 is estimated to be 1×10^{-3} feet/day, or 0.4 feet per year. Using the most productive of the three wells (01-PZ07 with hydraulic conductivity of 4.8×10^{-3} feet/day) would give a result of about 0.9-foot-per-year. This suggests that hydraulic conductivities may be very low within the IRP Site 1 feldspathic sandstone.

Table 3-1. Groundwater Elevations

Well ID	2/12/2002		8/1/2002		1/29/2003		2/6/2003		2/13/2003		2/17/2003		6/5/2003		10/20/2003		3/11/2004	
	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)
01-MW101	64.02	688.59	65.4	687.21	--	--	65.87	686.74	65.82	686.79	--	--	--	--	65.9	686.71	66.6	686.01
01-MW102	107.93	651.96	108.87	651.02	--	--	109.75	650.14	109.67	650.22	--	--	110.16	649.73	110.92	648.97	111.13	648.76
01-MW201	43.23	624.68	44.33	623.58	--	--	43.3	624.61	45.24	622.67	--	--	--	--	45.95	621.96	46.14	621.77
01-MW202	21.51	670.36	22.36	669.51	--	--	22.9	668.97	22.76	669.11	--	--	22.06	669.81	23.31	668.56	23.55	668.32
01-MW203	29.65	655.2	30.97	653.88	--	--	31.7	653.15	31.58	653.27	--	--	--	--	32.43	652.42	32.81	652.04
01-MW204	38.65	627.36	39.25	626.76	--	--	39.64	626.37	39.62	626.39	--	--	--	--	39.8	626.21	40	626.01
01-MW205	36.35	611.75	36.97	611.13	--	--	37.36	610.74	37.36	610.74	--	--	--	--	37.59	610.51	37.81	610.29
01-MW206	35.37	603.98	35.9	603.45	--	--	36.3	603.05	36.23	603.12	--	--	--	--	36.8	602.55	36.91	602.44
01-MW207	48.13	575.59	49.19	574.53	--	--	50.55	573.17	50.66	573.06	--	--	50.96	572.76	51.48	572.24	51.96	571.76
01-MW208	--	--	42.32	621.31	--	--	43.05	620.58	43.03	620.6	--	--	43.4	620.23	44.01	619.62	44.26	619.37
01-MW209	--	--	36.94	620.28	--	--	37.52	619.7	37.51	619.71	--	--	--	--	37.87	619.35	38.13	619.09
01-MW210	--	--	42.95	652.58	--	--	44.07	651.46	44.00	651.53	--	--	44.3	651.23	45.11	650.42	45.58	649.95
01-MW211	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW212	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW213	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW214	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW215	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW216	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW217	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW218	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW219	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW221	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW222	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW223	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-MW224	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01-DGMW57	56.65	576.53	57.67	575.51	--	--	58.92	574.26	59.00	574.18	--	--	--	--	--	--	60	573.18
01-DGMW58	49.09	575.71	50.19	574.61	--	--	51.59	573.21	51.69	573.11	--	--	--	--	--	--	52.97	571.83
18-DGMW24	42.44	575.69	43.49	574.64	--	--	44.85	573.28	44.95	573.18	--	--	--	--	--	--	45.09	573.04
01-PZ01	--	--	--	--	66.92	688.97	66.66	689.23	66.55	689.34	66.83	689.06	66.9	688.99	67.26	688.63	67.26	688.63
01-PZ02	--	--	--	--	73.32	659.84	70.98	662.18	68.87	664.29	68.49	664.67	67.76	665.4	68.7	664.46	69.44	663.72
01-PZ03	--	--	--	--	40.11	680.94	40.02	681.03	39.90	681.15	40.17	680.88	40.52	680.53	40.98	680.07	41.44	679.61
01-PZ04	--	--	--	--	36.02	657.94	35.84	658.12	35.78	658.18	36.03	657.93	36.04	657.92	36.7	657.26	37.6	656.36
01-PZ05	--	--	--	--	64.41	675.95	64.75	675.61	64.61	675.75	64.91	675.45	65.46	674.9	66.2	674.16	66.7	673.66
01-PZ06	--	--	--	--	66.89	665.78	66.9	665.77	66.77	665.9	67.04	665.63	67.39	665.28	68.12	664.55	68.54	664.13
01-PZ07	--	--	--	--	37.57	625.6	37.46	625.71	37.39	625.78	37.6	625.57	37.72	625.45	38.22	624.95	38.57	624.6
01-PZ08	--	--	--	--	73.91	648.43	74.16	648.18	73.78	648.56	74.04	648.3	74.42	647.92	75.2	647.14	75.6	646.74
01-PZ09	--	--	--	--	33.86	624.19	33.81	624.24	33.72	624.33	33.99	624.06	34.42	623.63	34.9	623.15	35.22	622.83
01-PZ10	--	--	--	--	39.77	612.89	39.73	612.93	39.80	612.86	39.81	612.85	39.57	613.09	39.98	612.68	40.38	612.28
01-PZ11	--	--	--	--	43.03	621.8	42.95	621.88	42.81	622.02	43.01	621.82	43.04	621.79	43.58	621.25	43.79	621.04
01-PZ12	--	--	--	--	85.79	629.58	85.82	629.55	85.68	629.69	85.93	629.44	86.04	629.33	86.63	628.74	86.90	628.47
01-PZ13	--	--	--	--	46.95	572.86	46.96	572.85	--	--	47.07	572.74	47.68	572.13	48.02	571.79	48.53	571.28
01-PZ14	--	--	--	--	41.95	571.47	41.96	571.46	--	--	42.08	571.34	42.54	570.88	42.98	570.44	43.4	570.02
01-PZ15	--	--	--	--	23.78	558.04	23.71	558.11	23.86	557.96	23.87	557.95	23.9	557.92	24.72	557.1	25.05	556.77
01-PZ16	--	--	--	--	20.84	543.4	20.82	543.42	--	--	20.5	543.74	20.45	543.79	21.35	542.89	20.84	543.4

Notes:

TOC = top of casing

msl = mean sea level

-- = No measurement was taken

Table 3-1. Groundwater Elevations

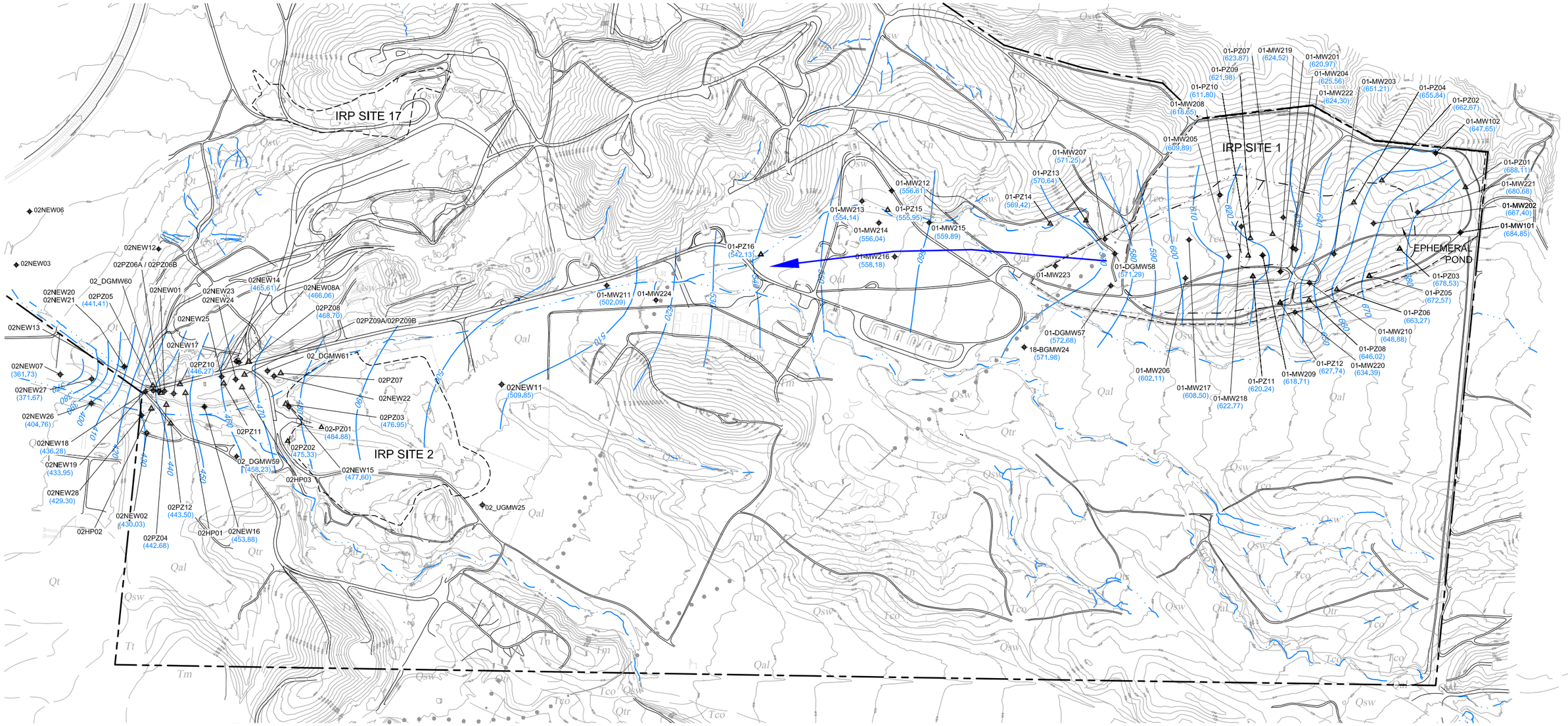
Well ID	7/16/2004		9/8/2004		11/5/2004		3/9/2005		6/2/2005		6/8/2005		7/7/2005		8/3/2005		8/23/2005	
	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)	Depth to Water (feet below TOC)	Elevation (feet above MSL)
01-MW101	67.35	685.26	67.76	684.85	67.77	684.84	66.12	686.49	63.26	689.35	68.29	684.32	62.98	689.63	62.94	689.67	62.94	689.67
01-MW102	111.9	647.99	112.24	647.65	112.5	647.39	112.6	647.29	110.93	648.96	111.05	648.84	110.65	649.24	110.47	649.42	110.2	649.69
01-MW201	46.66	621.25	46.94	620.97	46.91	621	42.4	625.51	37.75	630.16	37.66	630.25	37.73	630.18	37.22	630.69	37.89	630.02
01-MW202	24.21	667.66	24.47	667.4	24.3	667.57	14.08	677.79	17.08	674.79	17.31	674.56	17.97	673.90	18.55	673.32	18.76	673.11
01-MW203	33.57	651.28	33.64	651.21	33.81	651.04	30.22	654.63	24.77	660.08	24.85	660	24.93	659.92	25.22	659.63	25.4	659.45
01-MW204	40.29	625.72	40.45	625.56	40.42	625.59	17.62	648.39	21.37	644.64	21.77	644.24	24.31	641.70	26.67	639.34	28.35	637.66
01-MW205	38.07	610.03	38.21	609.89	38.21	609.89	18.93	629.17	23.15	624.95	23.05	625.05	24.88	623.22	26.47	621.63	27.35	620.75
01-MW206	37.1	602.25	37.24	602.11	37.21	602.14	21.65	617.7	25.82	613.53	26.04	613.31	27.25	612.10	28.32	611.03	29.15	610.20
01-MW207	52.2	571.52	52.47	571.25	52.55	571.17	45.62	578.1	43.91	579.81	43.96	579.76	43.56	580.16	43.43	580.29	43.12	580.60
01-MW208	44.72	618.91	44.98	618.65	44.98	618.65	17.4	646.23	22.17	641.46	22.78	640.85	25.05	638.58	26.6	637.03	27.67	635.96
01-MW209	38.36	618.86	38.51	618.71	38.44	618.78	18.8	638.42	20.86	636.36	20.95	636.27	23.1	634.12	24.88	632.34	26.08	631.14
01-MW210	46.36	649.17	46.65	648.88	47.07	648.46	46.51	649.02	44.72	650.81	44.68	650.85	44.31	651.22	43.97	651.56	43.6	651.93
01-MW211	--	--	45.48	502.09	45.13	502.44	28.18	519.39	--	--	26.33	521.24	--	--	--	--	--	--
01-MW212	--	--	32.3	556.61	32.35	556.56	25.13	563.78	--	--	24.92	563.99	--	--	--	--	--	--
01-MW213	--	--	28.82	554.14	28.44	554.52	12.08	570.88	--	--	21.86	561.1	--	--	--	--	--	--
01-MW214	--	--	34.76	556.04	34.61	556.19	24.69	566.11	--	--	27.86	562.94	--	--	--	--	--	--
01-MW215	--	--	35.47	559.89	35.48	559.88	32.46	562.9	--	--	29.88	565.48	--	--	--	--	--	--
01-MW216	--	--	35.16	558.18	35.01	558.33	30.7	562.64	--	--	28.68	564.66	--	--	--	--	--	--
01-MW217	--	--	33.55	608.5	33.55	608.5	25.79	616.26	21.29	620.76	21.45	620.6	22.58	619.47	23.65	618.40	24.36	617.69
01-MW218	--	--	48.8	622.77	48.99	622.58	43.2	628.37	33.72	637.85	33.7	637.87	33.88	637.69	34.19	637.38	34.38	637.19
01-MW219	--	--	53.61	624.52	47.42	630.71	45.09	633.04	33.41	644.72	36.84	641.29	33.18	644.95	33.16	644.97	33.15	644.98
01-MW220	--	--	78.38	634.39	78.68	634.09	78.06	634.71	--	--	75.66	637.11	--	--	74.96	637.81	-	-
01-MW221	--	--	31.76	680.68	32.1	680.34	31.44	681	29.78	682.66	29.54	682.9	29.33	683.11	29.22	683.22	28.96	683.48
01-MW222	--	--	41.96	624.3	41.98	624.28	35.13	631.13	30.43	635.83	30.43	635.83	30.96	635.30	31.42	634.84	31.79	634.47
01-MW223	--	--	--	--	--	--	--	--	42.58	577.31	42.49	577.4	42.01	577.88	41.71	578.18	41.55	578.34
01-MW224	--	--	--	--	--	--	--	--	--	--	30.39	525.1	--	--	--	--	--	--
01-DGMW57	60.25	572.93	60.5	572.68	60.49	572.69	51.06	582.12	50.92	582.26	50.89	582.29	50.76	582.42	50.87	582.31	50.85	582.33
01-DGMW58	53.25	571.55	53.51	571.29	53.47	571.33	45.87	578.93	44.47	580.33	44.52	580.28	44.14	580.66	44.12	580.68	43.98	580.82
18-DGMW24	45.81	572.32	46.15	571.98	45.71	572.42	39.04	579.09	--	--	37.91	580.22	--	--	--	--	--	--
01-PZ01	67.61	688.28	67.78	688.11	68.01	687.88	68.13	687.76	67.46	688.43	67.43	688.46	67.38	688.51	67.25	688.64	67.05	688.84
01-PZ02	70.12	663.04	70.49	662.67	70.93	662.23	71.38	661.78	70.29	662.87	71.11	662.05	69.89	663.27	69.49	663.67	69.19	663.97
01-PZ03	42.25	678.8	42.52	678.53	42.79	678.26	47.2	673.85	38.04	683.01	38.02	683.03	37.1	683.95	36.59	684.46	36.27	684.78
01-PZ04	37.86	656.1	38.12	655.84	38.44	655.52	34.33	659.63	29.46	664.50	29.52	664.44	29.7	664.26	29.95	664.01	30.07	663.89
01-PZ05	67.48	672.88	67.79	672.57	68.23	672.13	68.41	671.95	67.48	672.88	67.48	672.88	67.35	673.01	67.14	673.22	66.93	673.43
01-PZ06	69.16	663.51	69.4	663.27	69.8	662.87	70.28	662.39	69.62	663.05	69.6	663.07	69.48	663.19	69.31	663.36	69.11	663.56
01-PZ07	39.06	624.11	39.3	623.87	39.33	623.84	31.55	631.62	26.07	637.10	26.05	637.12	26.68	636.49	27.23	635.94	27.69	635.48
01-PZ08	76.65	645.69	76.32	646.02	76.7	645.64	77.12	645.22	76.18	646.16	76.15	646.19	76.25	646.09	76.41	645.93	75.6	646.74
01-PZ09	35.85	622.2	36.07	621.98	36.2	621.85	32.64	625.41	25.91	632.14	26.05	632	25.48	632.57	25.18	632.87	25	633.05
01-PZ10	40.6	612.06	40.86	611.8	40.86	611.8	18.38	634.28	21.93	630.73	22.23	630.43	24.03	628.63	25.68	626.98	27.1	625.56
01-PZ11	44.37	620.46	44.59	620.24	44.64	620.19	39.95	624.88	34.74	630.09	34.56	630.27	34.68	630.15	34.75	630.08	34.89	629.94
01-PZ12	87.38	627.99	87.63	627.74	87.90	627.47	87.03	628.34	83.93	631.44	83.81	631.56	83.41	631.96	82.92	632.45	82.64	632.73
01-PZ13	48.89	570.92	49.17	570.64	49.34	570.47	47.85	571.96	--	--	45.85	573.96	--	--	--	--	--	--
01-PZ14	43.74	569.68	44	569.42	44.08	569.34	42.78	570.64	--	--	39.82	573.6	--	--	--	--	--	--
01-PZ15	25.61	556.21	25.87	555.95	25.27	556.55	12.77	569.05	--	--	18.39	563.43	--	--	--	--	--	--
01-PZ16	21.88	542.36	22.11	542.13	21.22	543.02	11.41	552.83	--	--	14.42	549.82	--	--	--	--	--	--

Notes:

TOC = top of casing

msl = mean sea level

-- = No measurement was taken



LEGEND:

- MCAS EL TORO BOUNDARY
- EOD TRAINING RANGE BOUNDARY
- OPERABLE UNIT (IRP SITES 1, 2 AND 17) COVER BOUNDARIES
- STREAM OR WASH (INTERPOLATED FROM TOPOGRAPHIC DATA)
- EXISTING FENCE
- 550 — GROUNDWATER CONTOUR ELEVATION, DASHED WHERE INFERRED (GROUNDWATER ELEVATIONS COLLECTED ON SEPTEMBER 8, 2004)
- GENERAL GROUNDWATER GRADIENT DIRECTION
- 01-MW209 (624.52) — 4-INCH GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION
- 01-PZ11 (620.24) — 2-INCH PIEZOMETER WITH GROUNDWATER ELEVATION
- GEOLOGIC FAULT, DOTTED WHERE INFERRED

DESCRIPTION OF MAP UNITS:

Qal	Flood Plain and Stream Channel Deposits (Holocene and Late Pleistocene)
Qsw	Sheetwash Deposits (Holocene to Middle Pleistocene)
Qtr	Trail Ridge Sands (Pleistocene)
Tn	Niguel Formation
Tco	Oso Member
Tm	Monterey Formation (Miocene)
Tt	Topanga Foundation (middle Miocene)
Tvs	Sespe and Vaqueros Formations

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION

NORTH

0 350 700 FEET

SCALE: 1"= 700'

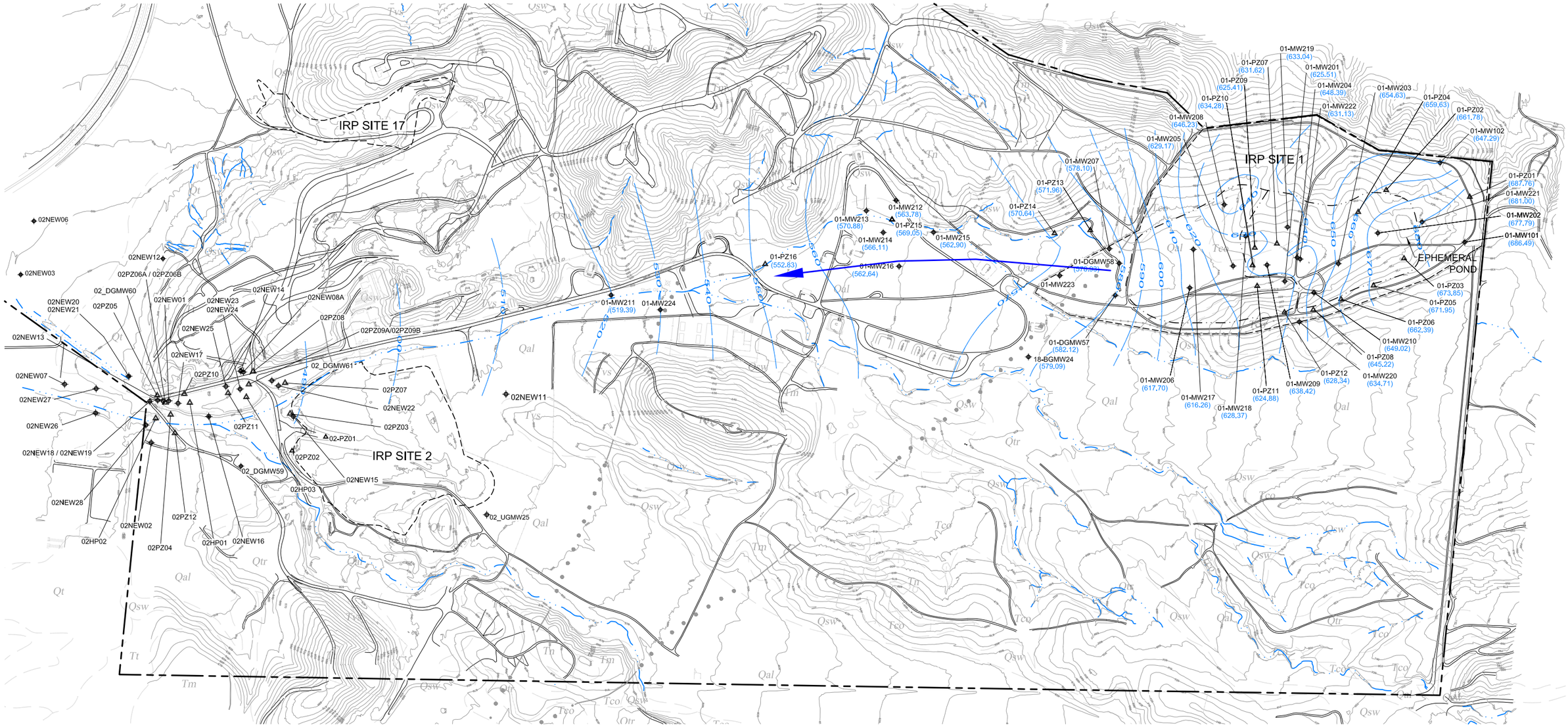
Phase II Remedial Investigation — Final

Groundwater Equipotential Map (September 2004)

IRP Site 1 - EOD Training Range

Date: 12-06	Former MCAS El Toro	Figure 3-4
Project No. 36097	EarthTech — A Tyco International Ltd. Company	

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-4.dwg Time: Dec 20, 2006 - 3:12pm



LEGEND:

- MCAS EL TORO BOUNDARY
- EOD TRAINING RANGE BOUNDARY
- OPERABLE UNIT (IRP SITES 1, 2 AND 17) COVER BOUNDARIES
- STREAM OR WASH (INTERPOLATED FROM TOPOGRAPHIC DATA)
- EXISTING FENCE
- 530 — GROUNDWATER CONTOUR ELEVATION, DASHED WHERE INFERRED (GROUNDWATER ELEVATIONS COLLECTED ON MARCH 9, 2005)
- GENERAL GROUNDWATER GRADIENT DIRECTION
- 01-MW209 (638.42) — 4-INCH GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION
- 01-PZ11 (624.88) — 2-INCH PIEZOMETER WITH GROUNDWATER ELEVATION
- GEOLOGIC FAULT, DOTTED WHERE INFERRED

DESCRIPTION OF MAP UNITS:

Qal	Flood Plain and Stream Channel Deposits (Holocene and Late Pleistocene)
Qsw	Sheetwash Deposits (Holocene to Middle Pleistocene)
Qtr	Trail Ridge Sands (Pleistocene)
Tn	Niguel Formation
Tco	Oso Member
Tm	Monterey Formation (Miocene)
Tt	Topanga Foundation (middle Miocene)
Tvs	Sespe and Vaqueros Formations

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION

NORTH

0 350 700 FEET

SCALE: 1"= 700'

Phase II Remedial Investigation — Final

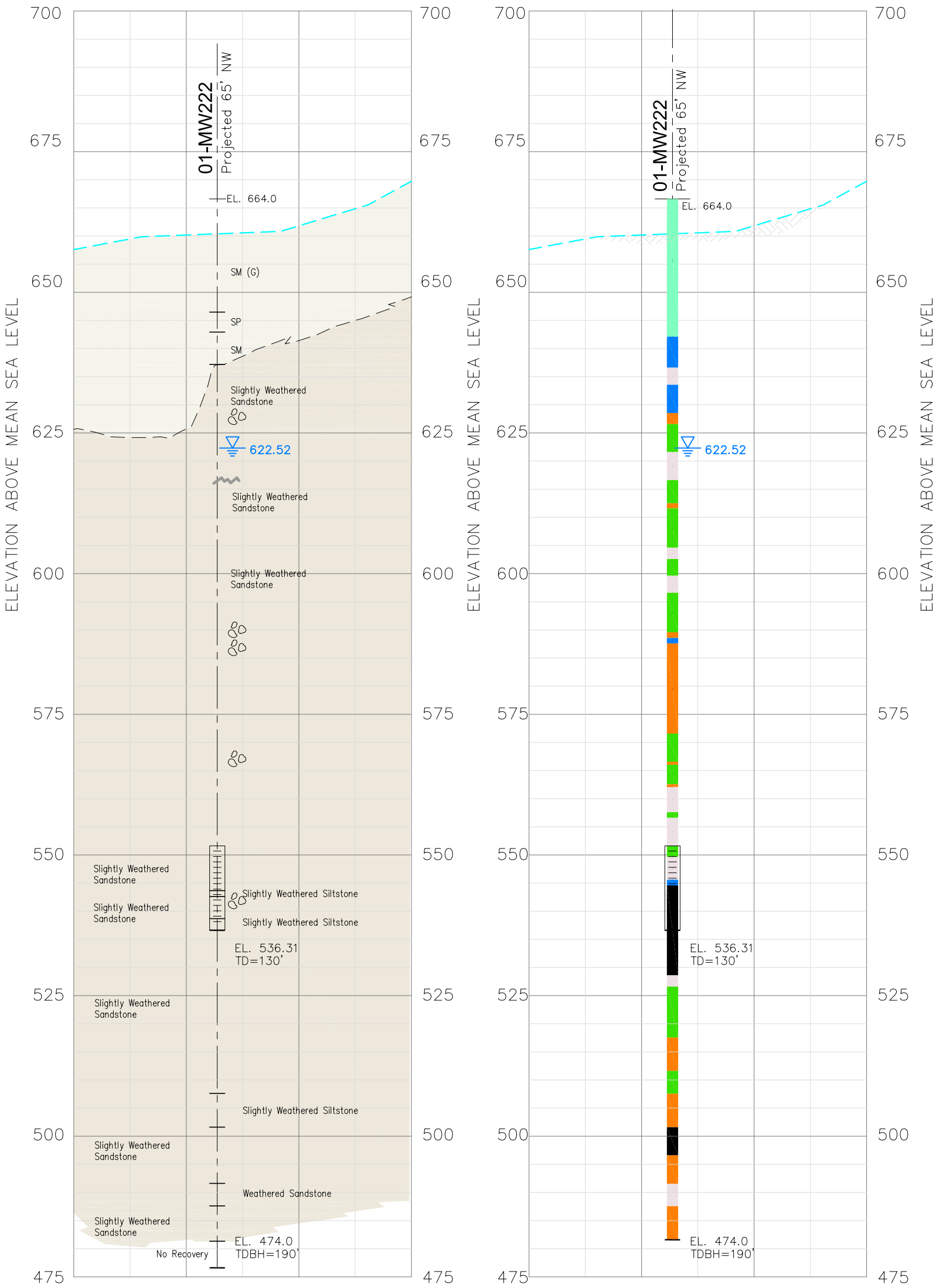
Groundwater Equipotential Map (March 2005)

IRP Site 1 - EOD Training Range

Date: 12-06	Former MCAS El Toro	Figure
Project No. 36097	EarthTech — A Tyco International Ltd. Company	3-5

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-5.dwg Time: Dec 20, 2006 - 3:14pm

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-6.dwg Time: Dec 20, 2006 - 3:57pm



LITHOLOGIC LEGEND:

- WEATHERED BEDROCK (INCLUDES MODERATELY AND HIGHLY WEATHERED BEDROCK OF THE CAPISTRANO AND NIGUEL FORMATIONS)
- SLIGHTLY WEATHERED BEDROCK (CAPISTRANO AND NIGUEL FORMATIONS)
- FRACTURE
- CALICHE NODULES OR CALCIUM CARBONATE CONCRETIONS

LEGEND:

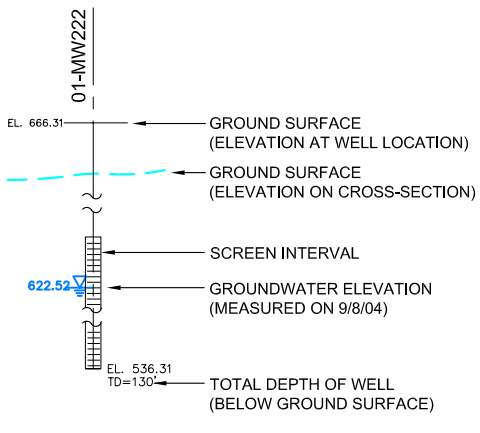
- ALLUVIUM
- FELDSPATHIC SANSTONE-A ("A" HORIZON, DECOMPOSITION ZONE; DRY, NON-REACTIVE WITH HCL)
- FELDSPATHIC SANSTONE-B ("B" HORIZON, ACCUMULATION ZONE; DRY, NON-REACTIVE WITH HCL)
- FELDSPATHIC SANSTONE-B-HCL ("B" HORIZON; DRY, REACTS WITH HCL)
- FELDSPATHIC SANSTONE-B-M ("B" HORIZON, MOIST, NON-REACTIVE WITH HCL)
- FELDSPATHIC SANSTONE-B-W ("B" HORIZON, WET, NON-REACTIVE WITH HCL)
- SILTSTONE (NIGUEL FORMATION OR CAPISTRANO FORMATION, NON-REACTIVE WITH HCL)

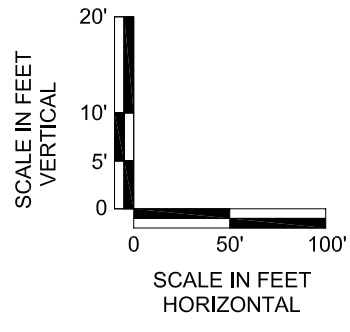
NOTES:

UNIFIED SOIL CLASSIFICATION SYSTEM, (USCS) USED TO DESCRIBE TEXTURE AND IS NOT INTENDED TO INTERPRET EARTH MATERIAL AS SOIL, WITHIN THE BEDROCK UNITS.

EOD	EXPLOSIVE ORDNANCE DISPOSAL
'	FEET
HCL	HYDROCHLORIC ACID
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
NW	NORTH WEST
SM	SILTY SAND
SM (G)	SILTY SAND WITH GRAVEL
SP	POORLY GRADED SAND
TDBH	TOTAL DEPTH OF BOREHOLE

WELL LEGEND:





Phase II Remedial Investigation — Final

01-MW222 INTERPRETIVE LOG

IRP Site 1 - EOD Training Range

Date: 12-06	Former MCAS El Toro	Figure 3-6
Project No. 36097	EarthTech — A Tyco International Ltd. Company	

Alluvium/Bedrock Contact Exposed in Western Reach of Borrego Canyon Wash.
This illustrates the contact and illustrates an odd form of sandstone block cementation (possibly cementation along desiccation cracks). These cemented features clearly resist erosion better than the sandstone bedrock matrix, but they do not appear to be fractures.

These observations suggest the following:

- Water is being transported through the feldspathic sandstone primarily in zones of secondary porosity that do not react with HCl. It is not known with certainty what HCl-reactive mineral is missing, but this would appear to be the result of differential weathering, as bedding surfaces within the feldspathic sandstone have not been noted. Several references report that the Capistrano contains gypsum, which may be functioning as cement between the sandstone grains. Many workers report that the Capistrano and Niguel Formations are immature sandstones, having undergone only partial diagenesis and were therefore never fully cemented.
- As local recharge occurs, more of these non HCl-reactive zones may be activated, changing the local "aquifer" hydrodynamics.
- The flow regime in the sandstone bedrock appears to be quite complex, possibly not amenable to conventional methods of access.

The degree of weathering is thought likely to influence how groundwater moves within this matrix. As bedrock weathers in place it develops soil horizons, which over time can extend quite deep into the original fabric of the rock. Bedrock, which has undergone such deep weathering, is referred to as saprolite (Figure 3-7). Porosity and permeability of saprolites is commonly higher than less weathered bedrock, and in sedimentary rock matrices, the materials that formed the cement (commonly lime, gypsum, etc.) typically weather out first; however, this is not always the case as can be seen in the photograph above. The features shown in the photograph are found in the near

proximity of location 01-HPA5 where feldspathic sandstone bedrock, cropping out near to the inferred fault in the south of IRP Site 1, evinces fracture or rock fabric structures filled with cement that is more resistant to erosion than the rock matrix itself.

In general, the local groundwater gradient within the feldspathic sandstone tends to promote drainage of the ridge slopes surrounding IRP Site 1, and then along the western reach of Borrego Canyon Wash toward IRP Site 2. Comparison of Figures 3-4 and 3-5 provides evidence of the variation of this environment to absorb water. The period between September 2004 and March 2005 occasioned the second largest amount of precipitation ever recorded in the Los Angeles Basin (over 36 inches). Figure 3-4 shows the IRP Site 1 area after a prolonged period without precipitation with a gradient at equilibrium. Figure 3-5 shows the IRP Site 1 area in gradient dis-equilibrium after this historic amount of precipitation and this is interpreted to reflect the variable degree of recharge afforded by the partially cemented and differentially weathered feldspathic sandstone matrix.

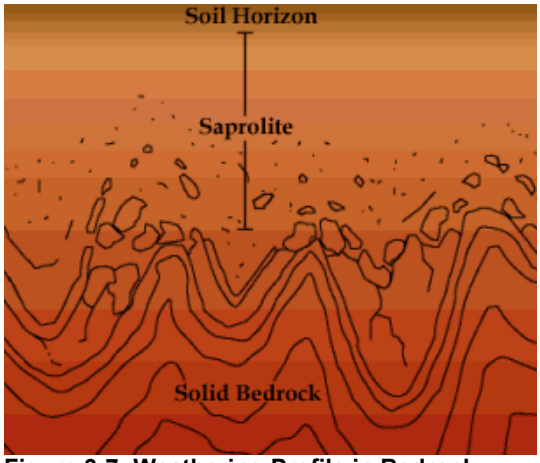


Figure 3-7: Weathering Profile in Bedrock

A long-term aquifer study conducted across IRP Site 2 found up to 8 separate hydraulic zones with the saturated bedrock of the Topanga Formation. These zones are believed to be distinct hydrogeologic entities, separated both vertically and horizontally, which respond poorly and with notable delays to precipitation events. The results of the long-term aquifer test at IRP Site 2 were a determining factor for the use of continuous coring during the Tier III-C investigation at IRP Site 1. The randomly variable secondary porosity observed in the cores at IRP Site 1 may be the mechanism for localized (or compartmentalized) hydrogeologic zones viewed on the scale of the aquifer test conducted at IRP Site 2.

The Tier III-C investigation found weathered bedrock to depths that ranged from 4 to 25 feet within the IRP Site 1 area. Most of these locations were around the periphery of the IRP Site 1 plume.

Information collected during the Tier III-C field investigation confirmed that saturated alluvium overlies the feldspathic sandstone bedrock south of IRP Site 1. Monitoring Well 01-PZ15, installed during the Tier III-B investigation, was screened entirely in alluvium and evinced perchlorate detections. Tier III-C Monitoring Wells 01-MW215, 01-MW213, 01-MW214 and 01-MW211 were placed upgradient and downgradient from Well 01-PZ15.

Examination of the core from Well 01-MW215 indicated that this well was actually installed in weathered bedrock. It was installed approximately 300 feet upgradient of 01-PZ15, and it also yielded perchlorate detections. Well 01-MW213, installed approximately 190 feet downgradient of Well 01-PZ15 was also found to have perchlorate detections.

These findings suggested that perchlorate was present in both saturated bedrock as well as saturated alluvium, which had been deposited over a paleochannel cut into the bedrock surface.

The Tier III-D investigation was designed to develop a better understanding of the paleochannel hydraulic environment. A total of 31 continuously cored borings were drilled across the western reach of Borrego Canyon Wash with Hydropunch™ groundwater samples collected soon after penetrating the aquifer surface. Each boring was completed to bedrock to define the geometry of the paleochannel with essentially 5 lines (Lines A through E from IRP Site 1 to near IRP Site 2). Bedrock, where encountered beneath the alluvium, was typically less weathered than that encountered within IRP Site 1. This is interpreted to have resulted from the fluvial erosion, which

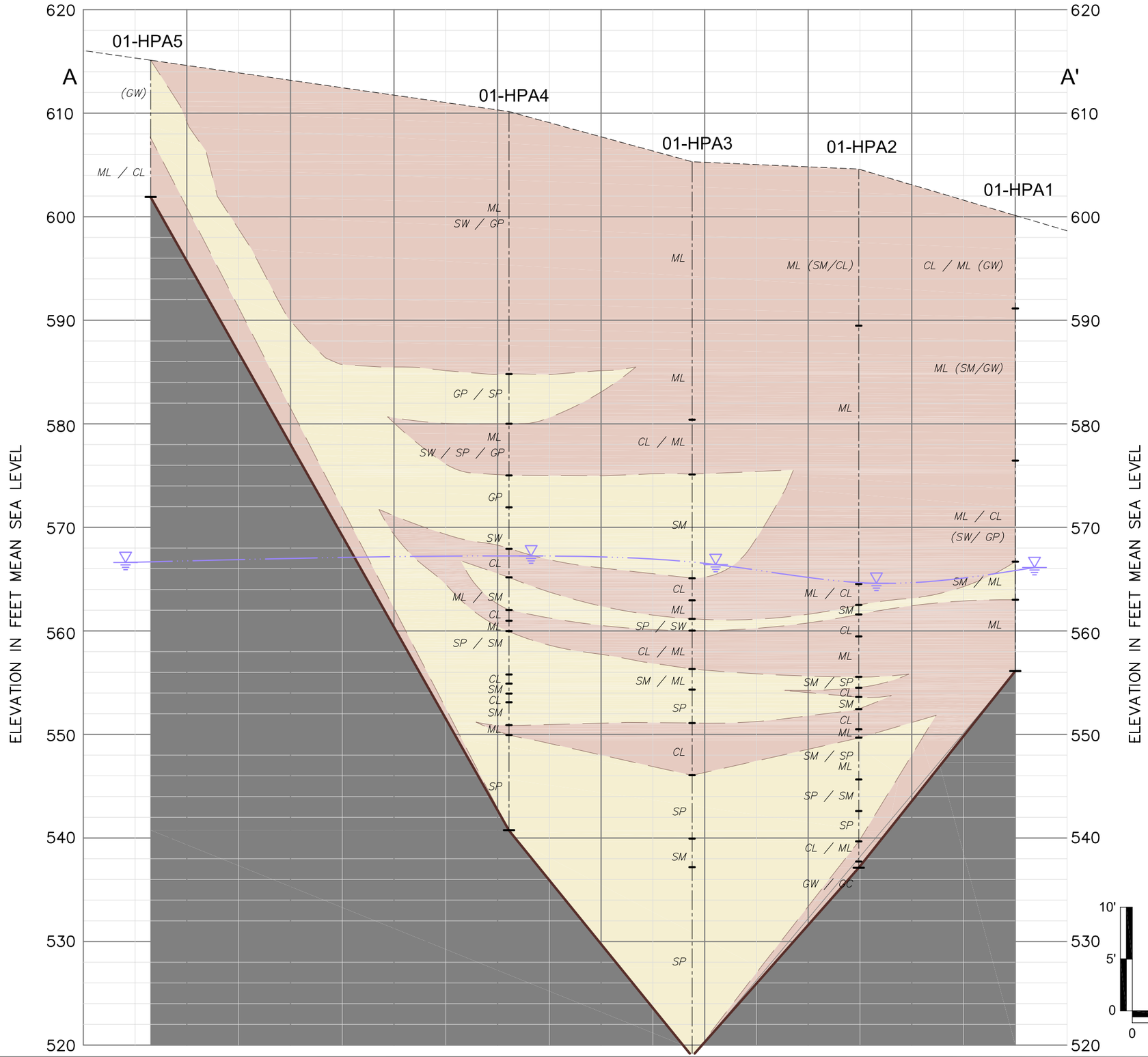
probably cut, or removed, the softer weathered bedrock and continued to cut a classic "V" shaped channel into the resultant bedrock surface. The relatively narrow "V-cut" paleochannel retains a fairly consistent depth below the alluvial fill surface from the southernmost location near 01-HPE3 (91 feet bgs) to 01-HPA3 (86.5 feet bgs) over a distance of some 3,700 feet. The location of the V-cut channel and occurrence of the highest concentrations of perchlorate closely follow the western side of the western reach of Borrego Canyon Wash. This implies the historic tributary stream channel (paleochannel) had a westerly flow component directing flow along a relatively narrow section on the western margin of the western reach of Borrego Canyon Wash. Similarly, the primary occurrence of perchlorate after the confluence of the Borrego Canyon Wash with the unnamed tributary is along the western boundary of IRP Site 2 bedrock (Topanga Formation) and alluvial wash.

The coarse gravels and sands found at the bottom of the channel during the Tier III-D investigation attest to the cutting capacity of this drainage. As the final pulse of glaciation (the Wisconsin Stage) drew to a close approximately 15,000 years ago, sea levels worldwide rose nearly 300 feet for the last of four times, one time each for the four major glaciations. As the climate warmed, the Wisconsin Stage ice sheet, and locally alpine glaciers, melted. Many of the present day drainages were either deepened or initiated during this long, wet interval. Erosion in this wash gradually attenuated, probably due to lower rainfalls as the climate eventually stabilized to its present-day activity. Gradually lower stream velocities allowed for deposition, first of the coarser loads, and later the finer materials seen in the upper part of the wash stratigraphy.

Figure 2-4 presents locations of the Tier III-D Hydropunch™ and cross-section locations, and Figures 3-8 through 3-13 present cross-sections along lines A through E, south, down the length of the western reach of Borrego Canyon Wash between IRP Sites 1 and 2. As may be gleaned from these cross-sections, not only does the alluvium generally fine upward from the channel depths to the surface, but it also becomes progressively coarser from north to south such that at Line E (Figure 3-13), almost all of the material in the phreatic (saturated) zone is fine to coarse sands mixed with gravels. Average depth to groundwater during the Tier III-D program was approximately 37 feet bgs. The alluvial aquifer thickness along the channel axis is about 40-50 feet. During the Hydropunch™ program, coarse, heaving, unconsolidated sands were commonly encountered while trying to core the alluvium in the channel depths. This suggests clean saturated sands and gravels with relatively high groundwater flow velocities.

Due to the similarity in topography, stratigraphy, infiltration rate, surface runoff, and evapotranspiration in the general study area, the volume of groundwater flowing through the study area is likely proportional to the size of the upgradient watershed area. As discussed above, IRP Site 1 is a small isolated valley, and has an approximate surface drainage area of 0.14 square miles. Groundwater from IRP Site 1 converges and mixes with groundwater from the larger unnamed tributary (UT1) near the southern end of IRP Site 1. The unnamed tributary has a surface drainage area of approximately 0.45 square miles. From that location, groundwater flows southwest until it merges with groundwater from a second, larger unnamed tributary (UT2) and Borrego Canyon Wash, in the vicinity of IRP Site 2. The entire Borrego Canyon Wash upgradient from IRP Site 2, including IRP Site 1 and the unnamed tributary, has a surface drainage area of approximately 4.91 square miles. After the convergence of groundwater at IRP Site 2, groundwater flows into the Irvine Management Zone which includes numerous additional drainages areas coming off of the Santa Ana Mountains, which expand the additional watershed area even further.

Based on the approximate surface drainage areas described above, IRP Site 1 constitutes approximately 2.9 percent of the Borrego Canyon Wash surface drainage area to IRP Site 2. Therefore, it is reasonable to assume that IRP Site 1 contributes a similar amount of the total groundwater flow leaving Borrego Canyon Wash downgradient from IRP Site 2.



LEGEND:

01-HPA5 BOREHOLE DESIGNATION

EXISTING GROUND SURFACE

CONTACT

ELEVATION OF STATIC GROUNDWATER (HYDROPUNCH)

GEOLOGIC LEGEND:

COARSE TO FINE SANDS (CHANNELS)

SILTS AND CLAYS

WEATHERED BEDROCK

SAND/SILT CONTACT

ALLUVIUM / BEDROCK CONTACT

CL USCS CLAYS

ML USCS SILTS

SM USCS FINE SANDS, WELL GRADED

SP USCS COARSE, POORLY SORTED SANDS

GP USCS GRAVELS, POORLY SORTED

NOTES:

EOD EXPLOSIVE ORDNANCE DISPOSAL

IRP INSTALLATION RESTORATION PROGRAM

MCAS MARINE CORPS AIR STATION

USCS UNIFIED SOIL CLASSIFICATION SYSTEM

Phase II Remedial Investigation — Final

Cross-Section A-A'

IRP Site 1 - EOD Training Range

Date: 12-06

Former MCAS El Toro

Project No. 36097

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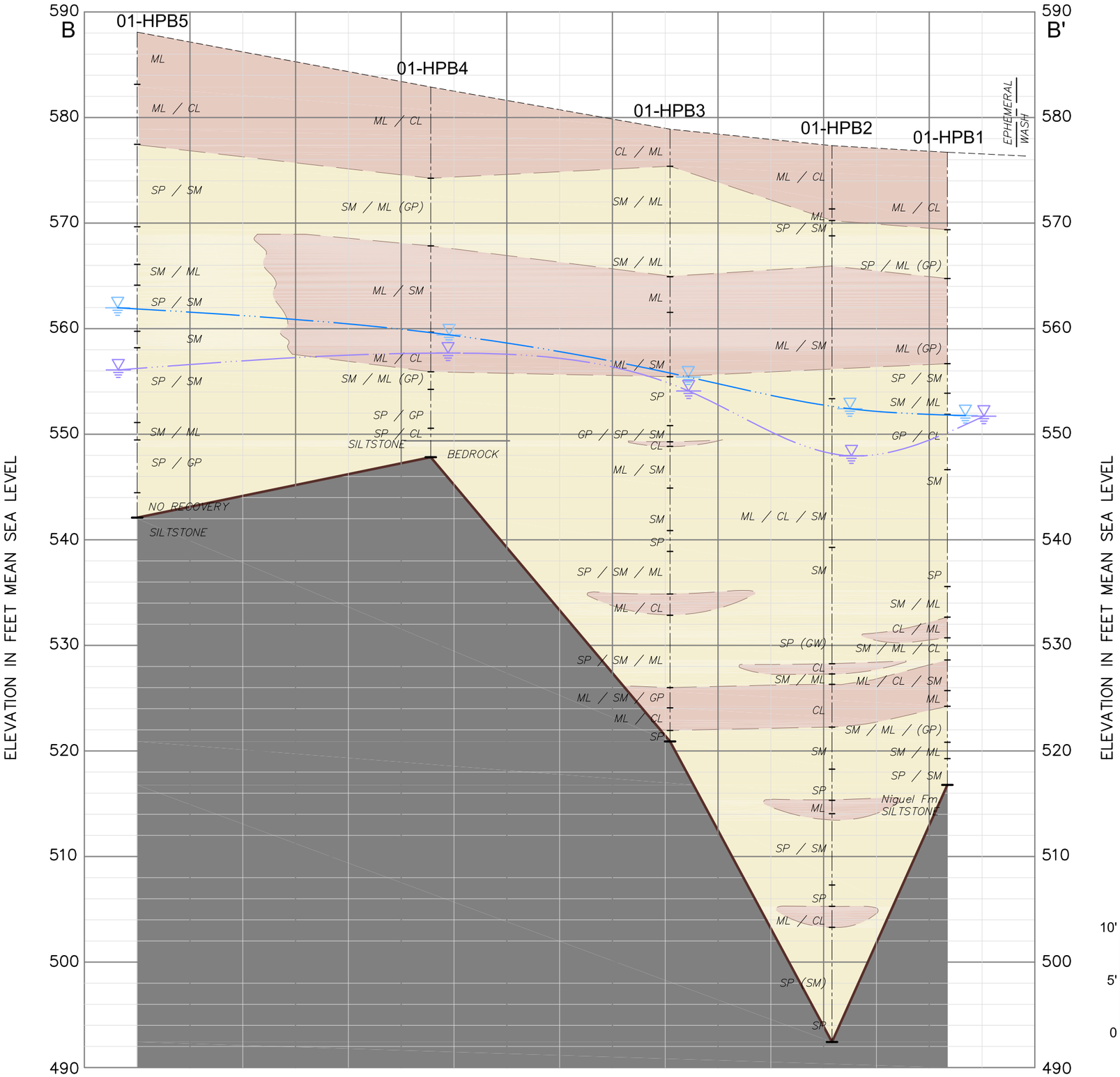
Figure 3-8

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-8.dwg Time: Dec 19, 2006 - 10:43am



LEGEND:

01-HPB5	BOREHOLE DESIGNATION
	EXISTING GROUND SURFACE
	CONTACT
	ELEVATION OF FIRST GROUNDWATER (HYDROPUNCH)
	ELEVATION OF STATIC GROUNDWATER (HYDROPUNCH)

GEOLOGIC LEGEND:

	COARSE TO FINE SANDS (CHANNELS)
	SILTS AND CLAYS
	WEATHERED BEDROCK
	SAND/SILT CONTACT
	ALLUVIUM / BEDROCK CONTACT
CL	USCS CLAYS
ML	USCS SILTS
SM	USCS FINE SANDS, WELL GRADED
SP	USCS COARSE, POORLY SORTED SANDS
GP	USCS GRAVELS, POORLY SORTED

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
USCS	UNIFIED SOIL CLASSIFICATION SYSTEM

10'
5'
0
0 50' 100'

Phase II Remedial Investigation — Final

Cross-Section B-B'

IRP Site 1 - EOD Training Range

Date: 12-06

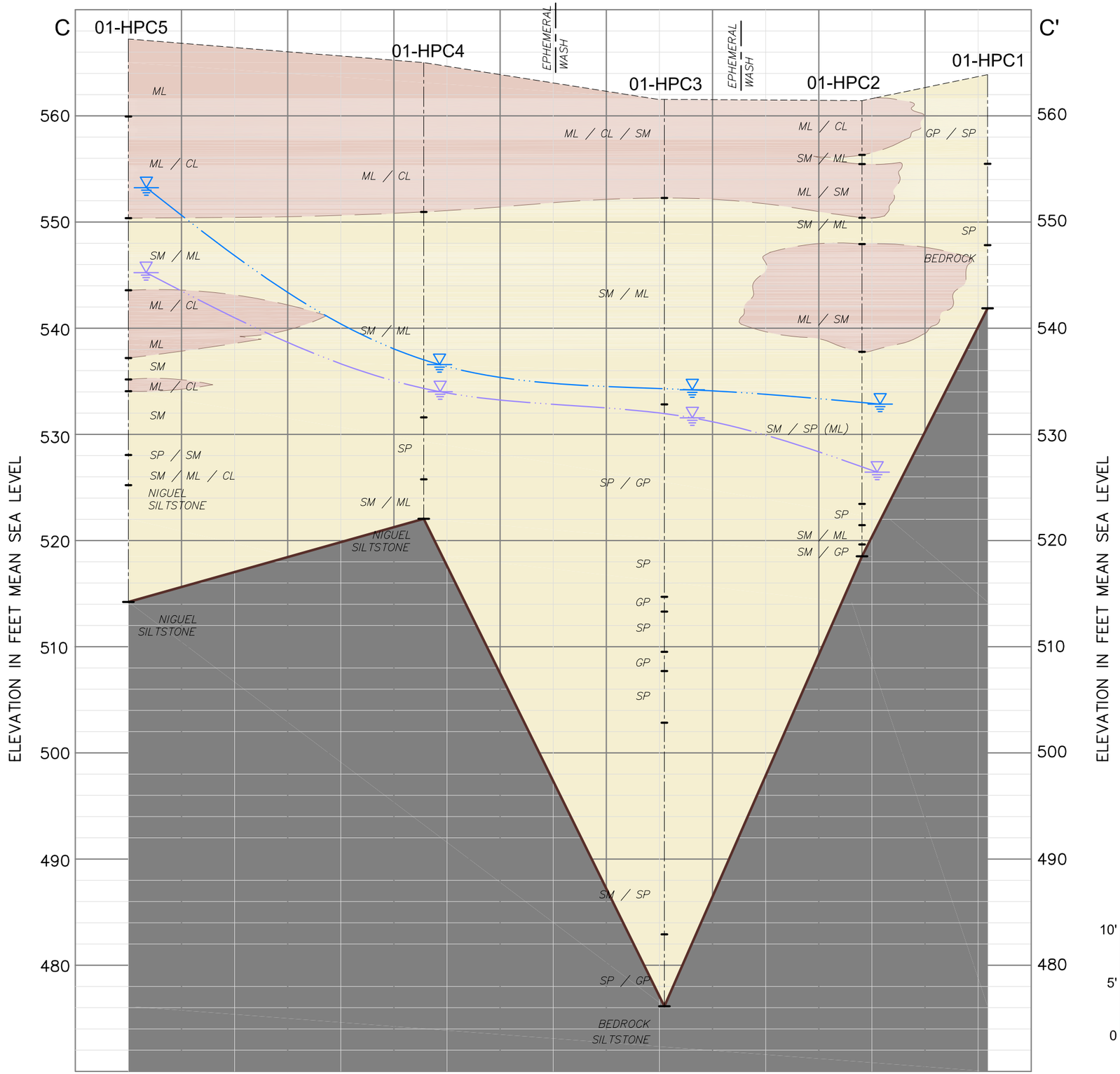
Former MCAS El Toro

Project No. 36097

EarthTech
A Tyco International Ltd. Company

Figure 3-9

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-9.dwg Time: Dec 19, 2006 - 10:46am



LEGEND:

01-HPC5	BOREHOLE DESIGNATION
	EXISTING GROUND SURFACE
	CONTACT
	ELEVATION OF FIRST GROUNDWATER (HYDROPUNCH)
	ELEVATION OF STATIC GROUNDWATER (HYDROPUNCH)

GEOLOGIC LEGEND:

	COARSE TO FINE SANDS (CHANNELS)
	SILTS AND CLAYS
	WEATHERED BEDROCK
	SAND/SILT CONTACT
	ALLUVIUM / BEDROCK CONTACT
CL	USCS CLAYS
ML	USCS SILTS
SM	USCS FINE SANDS, WELL GRADED
SP	USCS COARSE, POORLY SORTED SANDS
GP	USCS GRAVELS, POORLY SORTED

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
USCS	UNIFIED SOIL CLASSIFICATION SYSTEM

10' 5' 0 0 50' 100'

Phase II Remedial Investigation — Final

Cross-Section C-C'

IRP Site 1 - EOD Training Range

Former MCAS El Toro

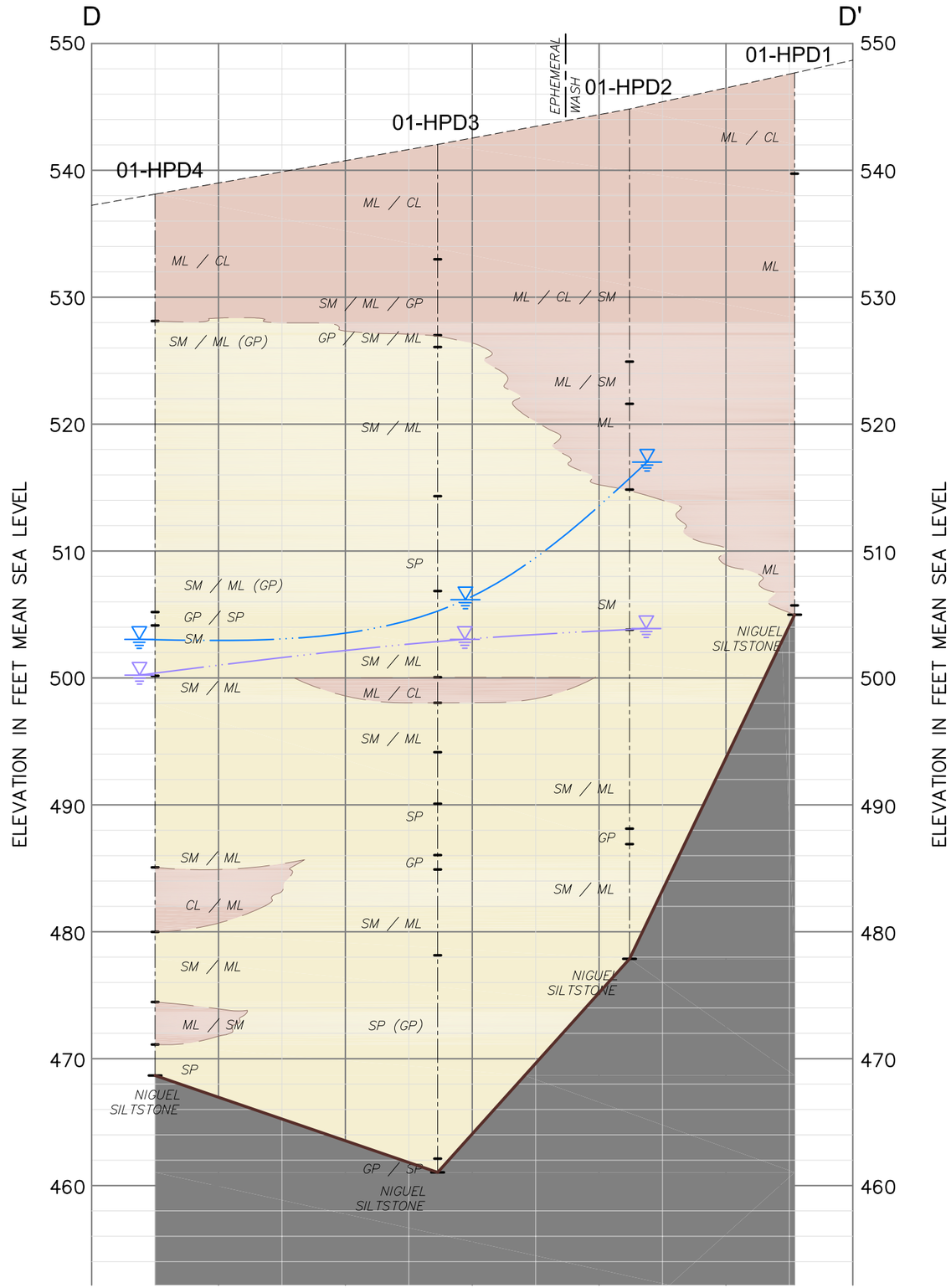
Date: 12-06

Project No. 36097

EarthTech — A Tyco International Ltd. Company

Figure 3-10

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-10.dwg Time: Dec 19, 2006 – 10:50am



LEGEND:

01-HPD4	BOREHOLE DESIGNATION
	EXISTING GROUND SURFACE
	CONTACT
	ELEVATION OF FIRST GROUNDWATER (HYDROPUNCH)
	ELEVATION OF STATIC GROUNDWATER (HYDROPUNCH)

GEOLOGIC LEGEND:

	COARSE TO FINE SANDS (CHANNELS)
	SILTS AND CLAYS
	WEATHERED BEDROCK
	SAND/SILT CONTACT
	ALLUVIUM / BEDROCK CONTACT
CL	USCS CLAYS
ML	USCS SILTS
SM	USCS FINE SANDS, WELL GRADED
SP	USCS COARSE, POORLY SORTED SANDS
GP	USCS GRAVELS, POORLY SORTED

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
USCS	UNIFIED SOIL CLASSIFICATION SYSTEM

10' 5' 0 0 50' 100'

Phase II Remedial Investigation — Final

Cross-Section D-D'

IRP Site 1 - EOD Training Range

Former MCAS El Toro

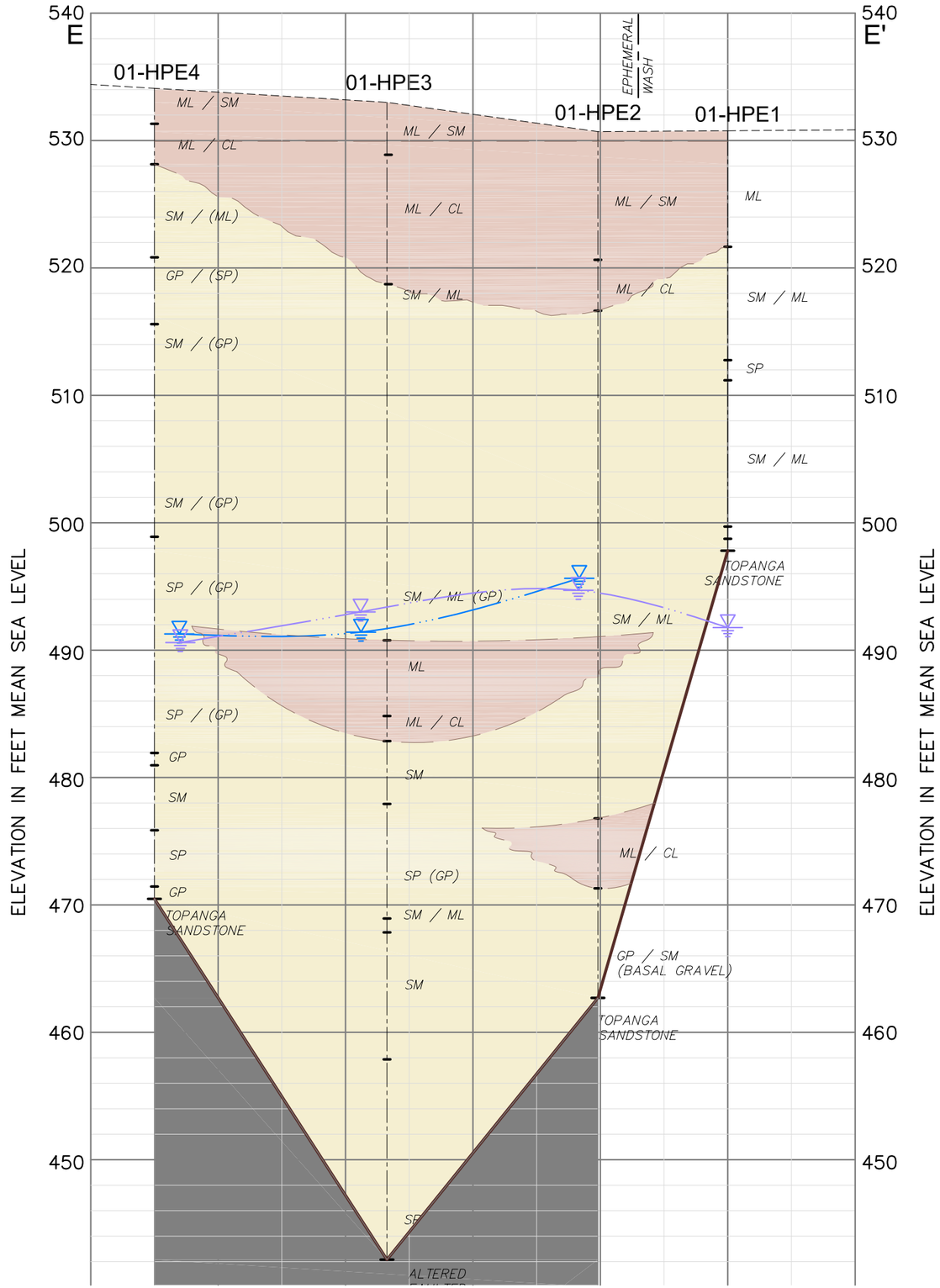
Date: 12-06

Project No. 36097

EarthTech — A Tyco International Ltd. Company

Figure 3-11

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-11.dwg Time: Dec 19, 2006 – 11:00am



LEGEND:

01-HPE4	BOREHOLE DESIGNATION
	EXISTING GROUND SURFACE
	CONTACT
	ELEVATION OF FIRST GROUNDWATER (HYDROPUNCH)
	ELEVATION OF STATIC GROUNDWATER (HYDROPUNCH)

GEOLOGIC LEGEND:

	COARSE TO FINE SANDS (CHANNELS)
	SILTS AND CLAYS
	WEATHERED BEDROCK
	SAND/SILT CONTACT
	ALLUVIUM / BEDROCK CONTACT
CL	USCS CLAYS
ML	USCS SILTS
SM	USCS FINE SANDS, WELL GRADED
SP	USCS COARSE, POORLY SORTED SANDS
GP	USCS GRAVELS, POORLY SORTED

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
USCS	UNIFIED SOIL CLASSIFICATION SYSTEM

10'
5'
0
0 50' 100'

Phase II Remedial Investigation — Final

Cross-Section E-E'

IRP Site 1 - EOD Training Range

Date: 12-06

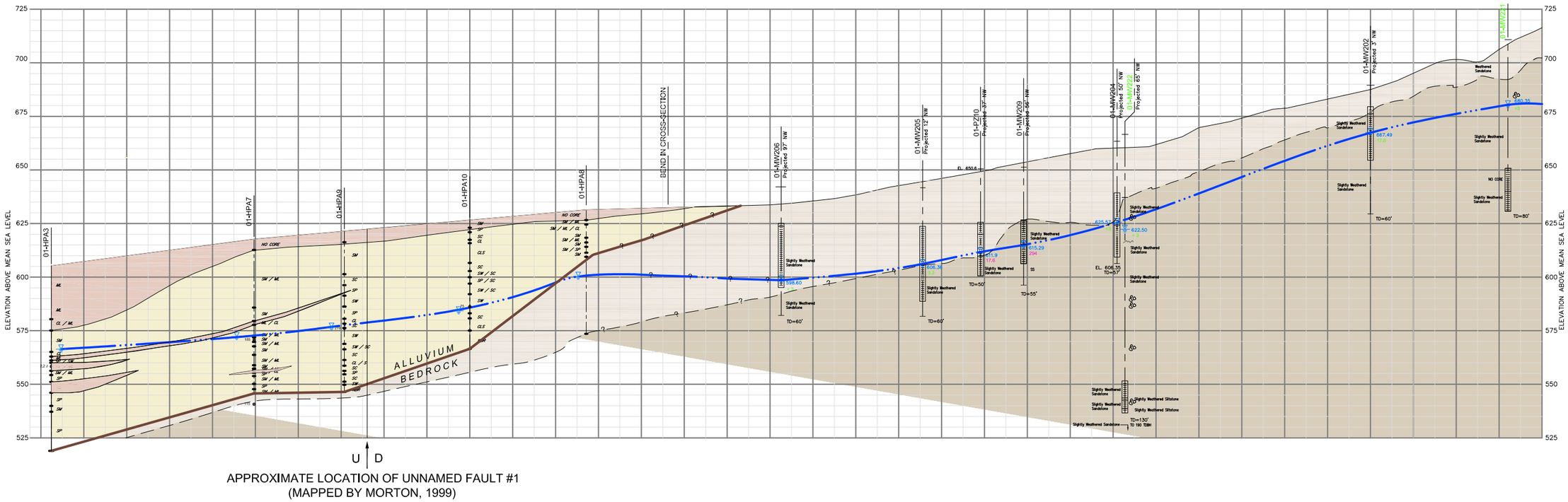
Former MCAS El Toro

Project No. 36097

EarthTech
A Tyco International Ltd. Company

Figure 3-12

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-12.dwg Time: Dec 19, 2006 - 11:03am



APPROXIMATE LOCATION OF UNNAMED FAULT #1
(MAPPED BY MORTON, 1999)

BOREHOLE LEGEND:

01-HPA7 — BOREHOLE DESIGNATION

CONTACT

ELEVATION OF FIRST GROUNDWATER (HYDROPUNCH) (SEE NOTE 1)

2.2 J — PERCHLORATE CONCENTRATION BELOW REPORTING LIMIT

185 — PERCHLORATE CONCENTRATION ABOVE REPORTING LIMIT

NOTE:

1. GROUNDWATER LEVELS COLLECTED FROM MONITORIN WELLS WERE GAUGED ON 3/9/05. GROUNDWATER LEVELS COLLECTED FROM BOREHOLES 01-HPA1, 01-HPA7, AND 01-HPA8 WERE GAUGED DURING BOREHOLE DRILLING IN FEBURARY 2005.

NOTES:

EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION

MONITORING WELL LEGEND:

01-MW218 Projected 3.5' S — GROUNDWATER MONITORING WELL (PROJECTED DISTANCE FROM CROSS-SECTION) GREEN INDICATES NEWLY INSTALLED WELL

GROUND SURFACE (ELEVATION ON CROSS-SECTION)

GEOLOGIC CONTACT

SM — LITHOLOGY (SEE LEGEND AT RIGHT)

CONTACT CORRELATION INTERPRETATION

SCREEN INTERVAL

622.61 / 14.1 — GROUNDWATER ELEVATION (MEASURED ON 11/5/04, SEE NOTE 1)

PERCHLORATE CONCENTRATION (MEASURED IN JULY-NOVEMBER 2004)

TD=60' — TOTAL DEPTH OF WELL (BELOW GROUND SURFACE)

LITHOLOGIC LEGEND:

SAND (INCLUDES SILTY AND CLAYEY SANDS)

SILT AND OR CLAY

ALLUVIUM / BEDROCK CONTACT

WEATHERED BEDROCK (INCLUDES MODERATELY AND HIGHLY WEATHERED BEDROCK OF THE CAPISTRANO AND NIGUEL FORMATIONS), DECOMPOSED BEDROCK AND ALLUVIUM

SLIGHTLY WEATHERED BEDROCK (CAPISTRANO AND NIGUEL FORMATIONS)

FRACTURE

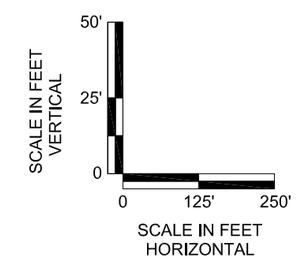
CALICHE NODULES OR CALCIUM CARBONATE CONCRETIONS

NOTE:

UNIFIED SOIL CLASSIFICATION SYSTEM, (USCS) USED TO DESCRIBE TEXTURE AND IS NOT INTENDED TO INTERPRET EARTH MATERIAL AS SOIL, WITHIN THE BEDROCK UNITS.

ML	CLAYEY SILT
SC	SANDY CLAY
SM	SILTY SAND
SM (G)	SILTY SAND WITH GRAVEL
SP	POORLY GRADED SAND
TO 190 TDBH	TOTAL DEPTH OF BOREHOLE
U	UPTHROWN
D	DOWNTHROWN

CROSS-SECTION L-L'



Phase II Remedial Investigation		Final
IRP Site 1 Cross-Section L-L' IRP Site 1 - EOD Training Range		
Date: 12-06	Former MCAS El Toro	Figure
Project No. 36097	EarthTech A Tyco International Ltd. Company	3-13

File: L:\work\36097\cad\Site 1 RI\Final\FIGURE 3-13.dwg Time: Dec 21, 2006 - 12:42pm

An aquifer test has been conducted at IRP Site 1 to assess the hydraulic properties of the aquifer. The results of that aquifer test will be addressed in the Feasibility Study.

3.3 ECOLOGY

The habitat assessment was conducted at IRP Site 1 on 20 December 2000. The preliminary results were used to characterize habitat, and identify potentially impacted species, including any considered sensitive.

3.3.1 Vegetation

The dominant vegetation types at IRP Site 1 consist of non-native grassland coastal sage scrub (CSS), and toyon-sumac chapparral. Plants found on the site are listed in Table 3-2.

- **CSS.** CSS occurs in patches on the slopes in the northern part of the property. It is typically dominated by California sagebrush (*Artemisia californica*), California encelia (*Encelia californica*), and California buckwheat (*Eriogonum fasciculatum*). Other common elements of this habitat type are prickly pear (*Opuntia littoralis*), black sage (*Salvia mellifera*), and goldenbush (*Isocoma menziesii*). The structure and composition of this habitat also appears to be a function of how long since it was disturbed. In some locations such as the west-facing slope above the main valley, the valley contains more succulents (e.g., prickly pear) than the other stands of sage scrub. The number and cover of annual species observed were limited, however, partly because of the dense canopy in some stands and partly due to the timing of the survey. There are approximately 9.74 acres of sage scrub on IRP Site 1.
- **Toyon-sumac chapparral.** Toyon-sumac chaparral occurs primarily on the east-facing slopes above the main valley. Onsite, it is dominated by lemonadeberry. Subdominant elements of this vegetation type include toyon (*Heteromeles arbutifolia*) and laural sumac (*Malosma laurina*), and other CSS elements. It is a relatively tall (up to 8 feet) and dense vegetation type and does not appear to have been disturbed or burned in recent times. There are approximately 2.63 acres of chaparral on IRP Site 1.

There are also small areas of mulefat scrub, southern willow scrub, disturbed wetland, and ornamental plantings. Mulefat scrub is dominated by its namesake (*Baccharis salicifolia*) and occurs in two locations. One is in the vicinity of the Ephemeral Pond in the northern portion of the site. The other is along a flat graded section of a hillside, north of the main valley. This latter stand also supports an understory of exotic grasses. Mulefat scrub on IRP Site 1 ranges up to 8 feet tall and covers an area of approximately 0.03-acre.

Southern willow scrub stands consist of a few individuals of black willow (*Salix gooddingii*) up to 25 feet tall. There is approximately 0.01-acre of southern willow scrub on IRP Site 1.

Potential wetland occurs in the bottom of the Ephemeral Pond (perhaps a previous stockpond). It consists of a sparse cover of a variety of weedy and wetland species including mulefat, black willow, mustard, tocalote (*Centauria melitensis*), and soft chess (*Bromus hordeaceus*). There is approximately 0.29-acre of disturbed wetland on IRP Site 1.

The berm, which is partly responsible for the creation of the above basin, is planted with fan palms (*Washingtonia robusta*) and pines (*Pinus* sp.). These are mature specimens with an understory of CSS and annual grassland species. There is approximately 0.18-acre of ornamental plantings on IRP Site 1.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
10	pump tests conducted in 2005 and 2006	Section 2.3.1.1	Final Aquifer Characterization and Bench-Scale Treatability Testing, Installation Restoration Program Site 1, Former Marine Corps Air Station El Toro, Irvine, California. Section 8.1.2, and Tables 8 and 11. Enviro Compliance Solutions, Inc. November 2006.

By July 2005, deeper groundwater levels within the center of Zone 1 (01-PZ-17A) rose to within approximately 0.5 to one foot of levels measured in alluvium and shallow bedrock, suggesting that there is good vertical hydraulic communication between shallow (01-PZ-17B) and deeper (01-PZ-17A) portions of the aquifer near the center of Zone 1 (see Appendix P). Deeper groundwater levels at the upgradient boundary of Zone 1 (01-MW-222) appeared to rise, but remained up to approximately 10 feet below groundwater levels measured in the nearby shallow well (01-MW-204) until March 2005, when groundwater levels in alluvium and shallow bedrock began to decline. By March 2006, the potentiometric surface of the deeper bedrock aquifer (01-MW-222) at the upgradient boundary of Zone 1 was 2.4 feet above groundwater levels measured in the shallow bedrock and alluvium (see Appendix P). These persistent differences in groundwater levels suggest that there is poorer vertical hydraulic communication between shallow and deeper portions of the aquifer at the upgradient boundary of Zone 1.

The potentiometric surface in competent bedrock within the paleochannel downgradient of Zone 1 (01-PZ-21A) has been higher than the groundwater levels measured in alluvium and weathered bedrock (01-PZ-21B) since piezometers 01-PZ-21A and B were installed in October 2005. This finding indicates that groundwater has been flowing from competent bedrock into the paleochannel from at least October 2005 through March 2006 downgradient of Zone 1.

8.1.2 Hydraulics

As discussed previously, hydraulic conductivity (k), Storativity (S) and the radius of influence (ROI) of pumping were computed from aquifer test data. These parameters are discussed below.

8.1.2.1 Hydraulic Conductivity and Storativity

Based on aquifer testing, hydraulic conductivity in bedrock ranges from approximately 1.4 E-05 cm/s (Table 11) for shallow bedrock in the upland area within and near Zone 2, to 3.2 E-04 cm/s[17] (Table 8) in the lowland area near the center of Zone 1. Storativity (3.8E-03), computed from aquifer tests within Zone 1 (Table 8), suggests that the effective porosity for shallow bedrock within lowland areas of Zone 1 is approximately 0.4%.

8.1.2.2 Radius of Influence

During Aquifer Tests 1, 2 and 4, the ROI was elongated perpendicular to the downgradient direction of groundwater flow (Figures 13 and 19). These results suggest that a preferential secondary porosity and permeability occurs within Zone 1. Groundwater recovery in observation wells completed in bedrock was slow and incomplete within Zone 1 (see hydrographs in Appendix D) because groundwater flows were restricted to these preferential pathways (secondary porosity). In contrast, groundwater recovery for wells open to Alluvium, where flow is not restricted to preferential pathways, was rapid and complete (see hydrographs in Appendix D). As discussed below, these aquifer properties are important controls for downgradient perchlorate migration from Zone 1.

[17] This result is consistent with laboratory the triaxial testing result of 2.2E-04 cm/s (see Table 6)

TABLE 8
ZONE 1 AQUIFER TEST RESULTS

Installation Restoration Program - Site 1
Former Marine Corps Air Station - El Toro

WELL			METHOD OF ANALYSIS							
			Jacob					Recovery		
ID	Dist. from pumping well (r) (ft)	Corr. Drawdown at test end (ft)	S(logcycle) ft/log of time	to (min)	T gpd/ft	k cm/s	S Unitless	S'(logcycle) ft/log of time	T gpd/ft	k cm/s
AQUIFER TEST 1 -Pumping Well: 01-EW-02B								Constant Discharge (Q) (gpm) =		0.70
Shallow Bedrock										
01-EW-01	5	3.75	1.00	0.80	185	2.9E-04	1.2E-03	0.6	308	4.9E-04
01-EW-02B	0.4	9.71	2.20	-	84	1.3E-04	-	0.8	231	3.6E-04
01-MW-201	171	0.25	0.42	1100.00	438	6.9E-04	3.4E-03	-	-	-
01-MW-204	206	0.01	*	*	*	*	*	*	*	*
01-MW-209	15	0.65	0.60	195.00	308	4.8E-04	5.6E-02	-	-	-
01-MW-222	225	0.95	0.93	440.00	199	3.1E-04	3.6E-04	-	-	-
01-PZ-07	151	1.06	0.74	160.00	251	4.0E-04	3.7E-04	-	-	-
01-PZ-09	146	0.00	*	*	*	*	*	*	*	*
01-PZ-10	113	0.03	*	*	*	*	*	*	*	*
01-PZ-11	178	0.23	0.31	900.00	594	9.3E-04	3.5E-03	-	-	-
01-PZ-17A	7	3.09	0.90	1.00	205	3.2E-04	8.7E-04	0.7	264	4.2E-04
01-PZ-17B	7	4.00	1.00	0.60	185	2.9E-04	4.7E-04	0.8	231	3.6E-04
01-PZ-18	18	3.42	0.80	0.30	231	3.6E-04	4.5E-05	0.8	231	3.6E-04
01-PZ-19B	5	9.54	1.10	0.05	168	2.6E-04	7.6E-05	0.90	205	3.2E-04
MEAN					266	4.2E-04	7.2E-03		205	3.2E-04
30 Aquifer Thickness (b) (ft)										
AQUIFER TEST 2 - Pumping Well: 01-EW-01								Constant Discharge (Q) (gpm) =		1.05
Alluvium and Shallow Bedrock										
01-EW-01	0.4	11.55	3.2	-	87	1.0E-04	-	1.20	231	2.7E-04
01-EW-02B	5	8.10	2.4	2.6	116	1.4E-04	2.5E-03	0.70	396	4.7E-04
01-MW-201	170	0.41	0.55	850.00	504	5.9E-04	3.1E-03	-	-	-
01-MW-204	210	0.04	*	*	*	*	*	*	*	*
01-MW-209	10	1.68	1.46	220	190	2.2E-04	8.9E-02	-	-	-
01-MW-222	228	1.32	1.60	580	173	2.0E-04	4.0E-04	-	-	-
01-PZ-07	156	1.57	0.62	260	447	5.3E-04	1.0E-03	-	-	-
01-PZ-09	146	0.14	*	*	*	*	*	*	*	*
01-PZ-10	109	0.05	*	*	*	*	*	*	*	*
01-PZ-11	173	0.37	0.20	410	1386	1.6E-03	4.0E-03	-	-	-
01-PZ-17A	5	4.80	2.0	18.0	139	1.6E-04	2.1E-02	1	396	4.7E-04
01-PZ-17B	5	6.66	2.60	3.00	107	1.3E-04	2.7E-03	1.30	213	2.5E-04
01-PZ-18	10	5.76	2.25	6.70	123	1.5E-04	1.7E-03	2.28	122	1.4E-04
01-PZ-19B	7	8.08	2.40	2.70	327	3.9E-04	1.4E-02	7.0E-01	272	3.2E-04
MEAN					327	3.9E-04	1.4E-02		272	3.2E-04
40 Aquifer Thickness (b) (ft)										
AQUIFER TEST 4 - Pumping Well: 01-EW-04 (first 10-days)								Constant Discharge (Q) (gpm) =		0.35
Shallow Bedrock										
01-EW-04	1	6.68	0.9	-	103	1.2E-04	-	-	-	-
01-MW204	188	-0.01	*	*	*	*	*	*	*	*
01-MW218	207	-0.09	*	*	*	*	*	*	*	*
01-MW219	153	0.05	*	*	*	*	*	*	*	*
01-MW222	212	0.84	0.59	310	157	1.8E-04	2.3E-04	-	-	-
01-PZ07	21	2.85	0.9	8	103	1.2E-04	4.0E-04	-	-	-
01-PZ09	138	0.04	*	*	*	*	*	*	*	*
01-PZ-17A	148	1.01	0.38	110	243	2.9E-04	2.5E-04	-	-	-
01-PZ-17B	148	0.02	0.38	180	243	2.9E-04	4.2E-04	-	-	-
MEAN					170	2.0E-04	3.2E-04		-	-
40 Aquifer Thickness (b) (ft)										
ALLUVIAL/BEDROCK MEAN (TEST 2)					327	3.9E-04	1.4E-02		272	3.2E-04
BEDROCK MEAN (TEST 1 & 4)					218	3.1E-04	3.8E-03		205	3.2E-04

BEDROCK MEAN (All Methods)

Transmissivity (T)(gpd/ft)	212
Hydraulic Conductivity (k) (cm/s)	3.2E-04
Storalivity (S) (unitless)	3.8E-03

Jacob Method Equations	Recovery Method Equations
T (gpf/ft)= $264Q/s_{(logcycle)}$	T (gpm) = $264Q/s'_{(logcycle)}$
k (cm/s) = (4.72E-05)T/b	k (cm/s) = (4.72E-05)T/b
$S=.3Tt_o/r^2$	where 4.72E-05 is conversion factor

Abbreviations

cm/s = centimeters per second
ft/log of time = feet per logcycle of time
gpd/ft = gallons per day per foot
k = hydraulic conductivity
min = minutes
S = Storativity
S(logcycle) = change in drawdown per logcycle of time
S'(logcycle) = change in residual drawdown per logcycle of time
T = Transmissivty
to = Intercept at zero drawdown for Jacob Method of data analysis (days)

Symbols

- Not applicable or available
* - Insufficient drawdown for analysis

TABLE 11
ZONE 2 AQUIFER TEST RESULTS
Installation Restoration Program - Site 1
Former Marine Corps Air Station - El Toro

ZONE 2*					Outside Zone 2
TEST WELL:	01-EW-03	01-MW-210	01-PZ-08	01-PZ-20	01-PZ-12
Date:	11/11/2005	11/11/2005	11/11/2005	11/11/2005	11/11/2005
Slug (Gal):	3.63	4.10	0.54	0.45	0.45
Initial Saturated Thickness (ft)	19.63	7.66	3.12	20.17	20.17
Match Point (see graphs in Appendix - Aquifer Test 3)					
H (ft)	1.50	1.00	1.00	3.50	1.00
1/t (min^{-1})	0.0043	0.0066	0.0296	0.0043	0.0412
Aquifer Hydraulics					
T (gpd/ft)	2.68	3.10	1.85	0.77	2.12
k (ft/day)	0.02	0.05	0.08	0.01	0.01
k (cm/sec)	6.4E-06	1.91E-05	2.79E-05	1.81E-06	4.96E-06

ZONE 2 MEAN

Transmissivity, T (gpm)	2.1
Hydraulic Conductivity, k (cm/sec)	1.4E-05

* = Wells do not yield suffcient water to sustain pumping

Abbreviations

cm = centimeters
ft = feet
Gal = Gallons
gpd = gallons per day

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
11	The geology in the vicinity of IRP Site 2	Section 2.3.1.2	Final Technical Memorandum, Aquifer Test, IRP Site 2, Magazine Road Landfill, Former Marine Corps Air Station, El Toro, California. Sections 5.3 and 5.4. February 2006.

Table 5-11: Calculated VOC and Perchlorate Mass Removed During Long-Term Aquifer Test

Well ID	Pumping Duration (hours)	Contaminant	Average Concentration (µg/L)	Gallons Pumped	Total VOC Mass Removed (lb)
02NEW08A	5376	TCE	0.32	1,935,360	0.0052
		PCE	3.83		0.062
		Perchlorate	5.12		0.083
02DGMW61	3528	PCE	2.58	163,296	0.0035
		Perchlorate	7.46		0.010
02DGMW60	5376	TCE	121.76	121,968	0.12
		PCE	4.74		0.0048
		1,2,3-TCP	5.42		0.0056
		Perchlorate	3.77		0.0038
02NEW13	2520	TCE	69.73	45,360	0.026
		PCE	3.15		0.0012
		1,2,3-TCP	4.32		0.0016
		Perchlorate	2.53		0.00096
02NEW02	960	Perchlorate	3.86	288,000	0.0093
Total		**TCE**			**0.16**
		PCE			**0.072**
		1,2,3-TCP			**0.0072**
		Perchlorate			**0.11**

Notes:
1,2,3-TCP 1,2,3-trichloropropane
µg/L micrograms per liter
ID Identification
lb pound
PCE tetrachloroethene
TCE trichloroethene
VOC volatile organic compound

5.3 GEOLOGY

5.3.1 Regional Geology

The Former MCAS El Toro lies on the southeastern edge of the Tustin Plain, a gently sloping surface of alluvial fan deposits derived from the Santa Ana Mountains. The main portion of the Former MCAS El Toro and the central portion of IRP Site 2 consist of Late Holocene alluvial fan deposits. These deposits consist of unconsolidated gravel, sand, and silt (Morton 1999). Directly to the east and northeast of the Former MCAS El Toro, at the foothills of the Santa Ana Mountains, are Early Holocene to Middle Pleistocene terrace deposits and outcroppings (Early Pliocene to Middle Miocene Formations) (Morton 1999). The Pleistocene terrace deposits consist of loosely consolidated sands and gravels. The Miocene Formations consist of the Soquel Member of the Puente Formation, Oso Member of the Capistrano Formation, Monterey Formation, and Topanga Formation. These Miocene formations are generally described as marine to non-marine fine sandstones and siltstones with localized lenses of finer and coarser material.

IRP Site 2 is located within a northeastern trending alluvial valley (Borrego Canyon Wash). The center of the Valley consists of Holocene alluvium, Pleistocene terrace deposits, and the Miocene Topanga Formation flank the Valley to the north and south. A geologic map showing the spatial distribution of geologic units is provided as Figure 5-15. Based on lithologic logs, the depth of the Holocene alluvium extends to approximately 20 to 40 feet below ground surface (bgs) on the western side of Borrego Canyon Wash, and to at least 90 feet bgs east of Borrego Canyon Wash near the Station boundary at well 02NEW02. Within IRP Site 2, the Miocene Topanga Formation is believed to exist beneath the Holocene alluvium.

Geologic maps indicate the presence of several faults in the Miocene outcroppings south and north of IRP Site 2 trending in a northwesterly direction. The faults are not mapped in the Holocene alluvial deposits in the center of IRP Site 2, suggesting that structural movement on the faults may be older than the recently deposited alluvial sands. The westernmost fault (Hill Front Fault Lineament, Morton 1999) is shown near the base of the Santa Ana Mountain foothills. The location across Borrego Canyon Wash is inferred. The presence of this Fault is hydraulically supported within the bedrock by significantly different water levels and depth to the alluvium-bedrock contact east of the Santa Ana Mountain Foothills, within IRP Site 2, along Magazine Road, versus the westerly gently sloping alluvial plain to the west, and the alluvial material within Borrego Canyon Wash. A second fault is shown southeast of IRP Site 2 in the Miocene Formations. This fault may extend beneath the alluvium into the PCE plume area and may be the source of the inferred hydraulic barrier at that location. One additional fault is mapped west of the IRP Site 2 landfill and north of the PCE plume area.

The geology and faults are shown in the geologic map provided on Figure 5-15.

5.3.2 Site Geology

Lithologic logs were used to create two cross sections (Plates 1 and 2) showing the inferred geology to the maximum depth drilled of 214 feet bgs. Three areas of artificial fill, two on the northern side of Borrego Canyon Wash (Area C-1 and C-2) and one on the southern side of Borrego Canyon Wash (Area D-2), have been identified and consist of between 10 and 30 feet of brown, dry, loose, fine to medium-grain-sized sand with minor coarse sand and other debris. Below the artificial fill is heterogeneous sand, gravel and silt (Holocene) alluvium. Beneath the alluvium is predominantly sandstone and siltstone bedrock. The upper portion of the bedrock is weathered, thus complicating the identification of the bedrock-alluvium contact.

The bedrock outcrops on the northwest side of Magazine Road and increases in depth toward the southeast. On the western side of Borrego Canyon Wash, the bedrock-alluvium contact ranges from depths of approximately 20 to 40 feet bgs (Plates 1 and 2). East of Borrego Canyon Wash, the depth of the bedrock alluvium contact was measured at approximately 90 feet bgs in well 02NEW02. Southeast of well 02NEW02, bedrock outcrops in the hills. Based on this information, a wedge of alluvium is present west of Magazine Road, increases in depth eastward, and thins out west of Borrego Canyon Wash.

Southwest of the inferred location of the Hill Front Fault Lineament, the depth of the alluvium-bedrock contact was detected in wells 02NEW26 and 02NEW27 at approximately 80 feet bgs. The alluvium-bedrock contact was not detected at a depth of 145 feet bgs in well 02NEW07.

As shown on cross section A-A' (Plate 1) the inferred alluvium-bedrock (along Magazine Road) contact rapidly increases in depth beginning at wells 02NEW18-02NEW19 (approximately 20 feet bgs) and 02NEW20-02NEW21 (approximately 45 feet bgs) to wells 02NEW26 and 02NEW27

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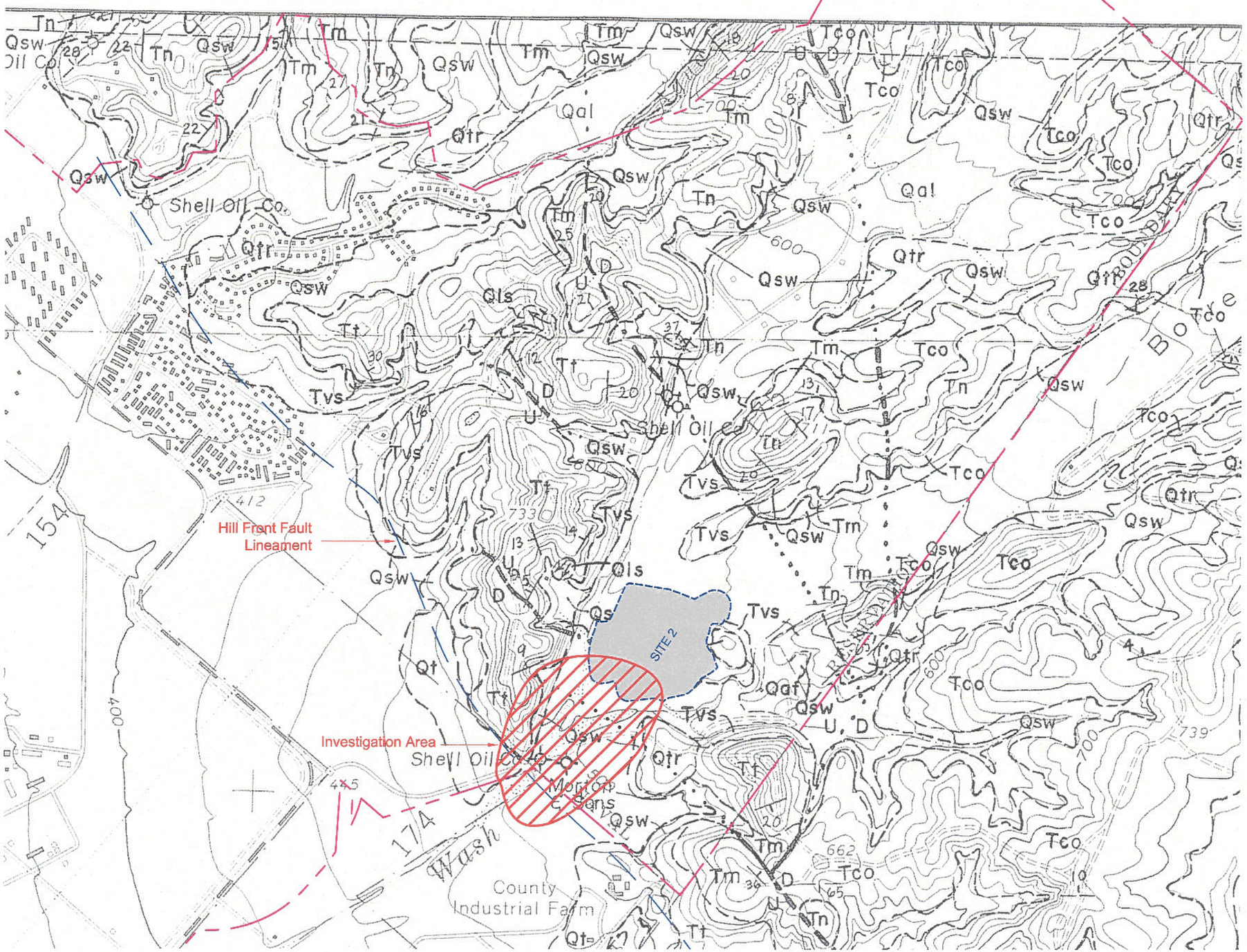
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION



LEGEND:

- STREAM OR WASH (INTERPOLATED FROM TOPOGRAPHIC DATA)
- GEOLOGIC FAULT, DOTTED WHERE INFERRED
- SITE BOUNDARY
- STATION BOUNDARY

DESCRIPTION OF MAP UNITS:

Qal	Flood Plain and Stream Channel Deposits (Holocene and Late Pleistocene)
Qsw	Sheetwash Deposits (Holocene to Middle Pleistocene)
Qtr	Trail Ridge Sands (Pleistocene)
Tn	Niguel Formation
Tco	Oso Member
Tm	Monterey Formation (Miocene)
Tt	Topanga Foundation (middle Miocene)
Tvs	Sespe and Vaqueros Formations

NORTH

0 500 1,000 FEET

SCALE: 1"= 1,000'

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Site Geology

Aquifer Test, IRP Site 2, Magazine Road Landfill

Date: 02-06	Former MCAS El Toro	Figure
Project No. 37380	EarthTech — A Tyco International Ltd. Company	5-15

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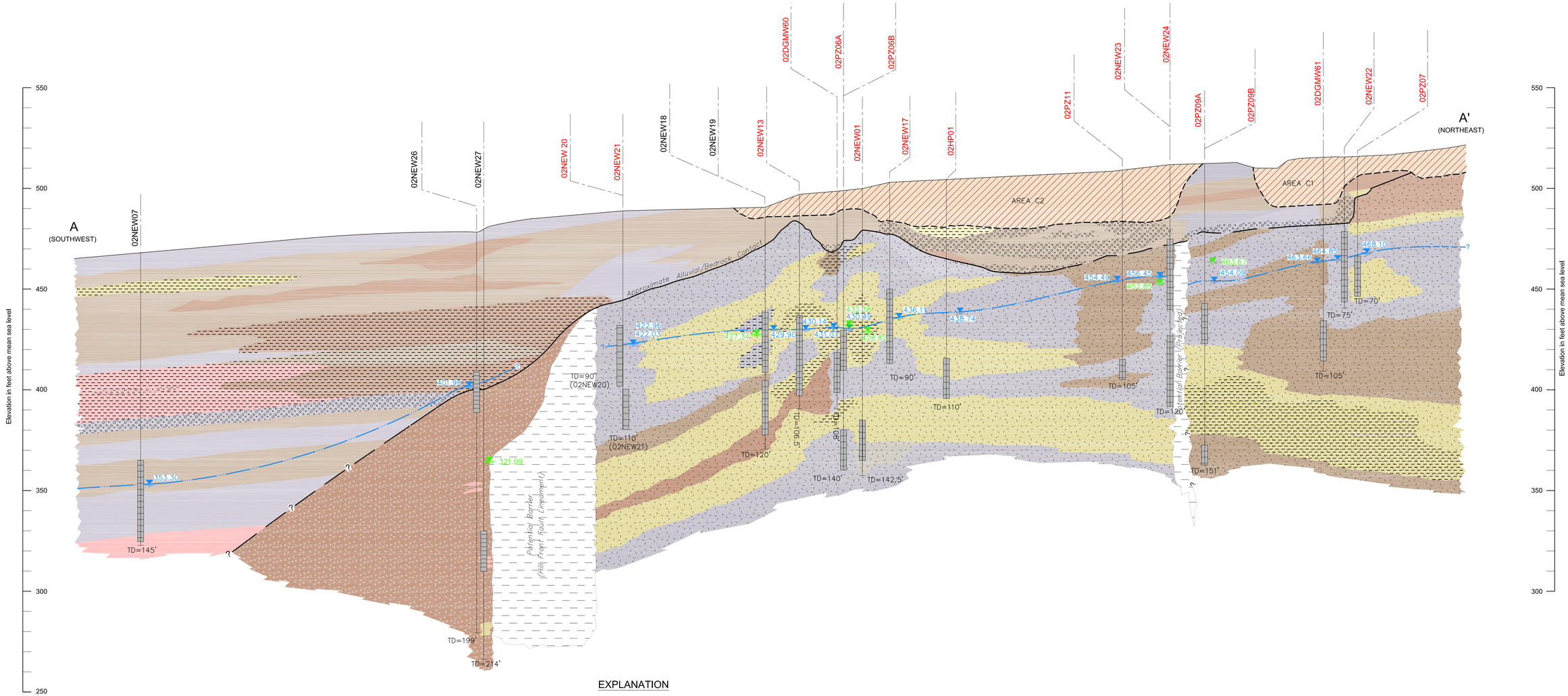

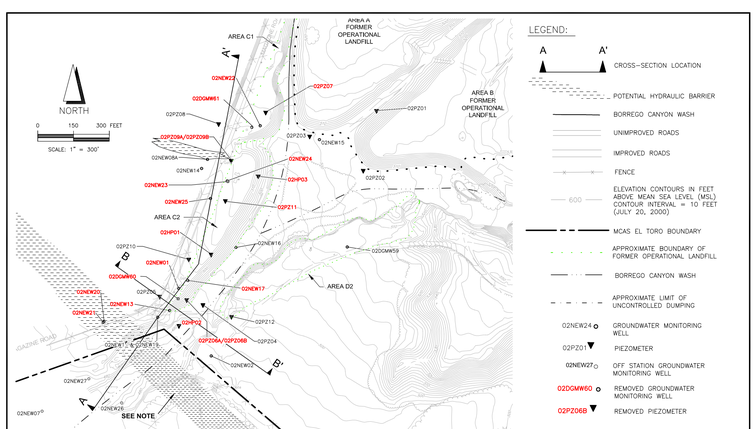

Cross-Section Location Map

EXPLANATION

ALLUVIAL LITHOLOGY:

- ARTIFICIAL FILL
- CLAY
- CL/ML
- GRAVEL
- ML
- SILT
- SC
- SM
- SP
- SW

BEDROCK LITHOLOGY:

- APPROXIMATE ALLUVIAL / BEDROCK CONTACT (DASHED WHERE INFERRED)
- ML (SILTSTONE)
- SM, SP, SW (SANDSTONE)
- BRECCIA
- INFERRED POTENTIAL HYDRAULIC BARRIER

- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)
- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE OF WELL IN PIEZOMETER NOT USED IN GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE MAP
- INFERRED GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)

02NEW21 — EXISTING MONITORING WELL
SCREENED INTERVAL
TD=142.5' — TOTAL DEPTH OF WELL BORING (FEET BELOW GROUND SURFACE)

02NEW23 — REMOVED MONITORING WELL
SCREENED INTERVAL
TD=142.5' — TOTAL DEPTH OF WELL BORING (FEET BELOW GROUND SURFACE)

Scale in Feet Vertical: 25, 12.5, 0
Scale in Feet Horizontal: 0, 40, 80

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Geologic Cross Section A-A'

Aquifer Test, IRP Site 2,
Magazine Road Landfill

Date: 02-06	Former MCAS El Toro	Plate
Project No. 37380	EarthTech, A Tyco International Ltd. Company	1

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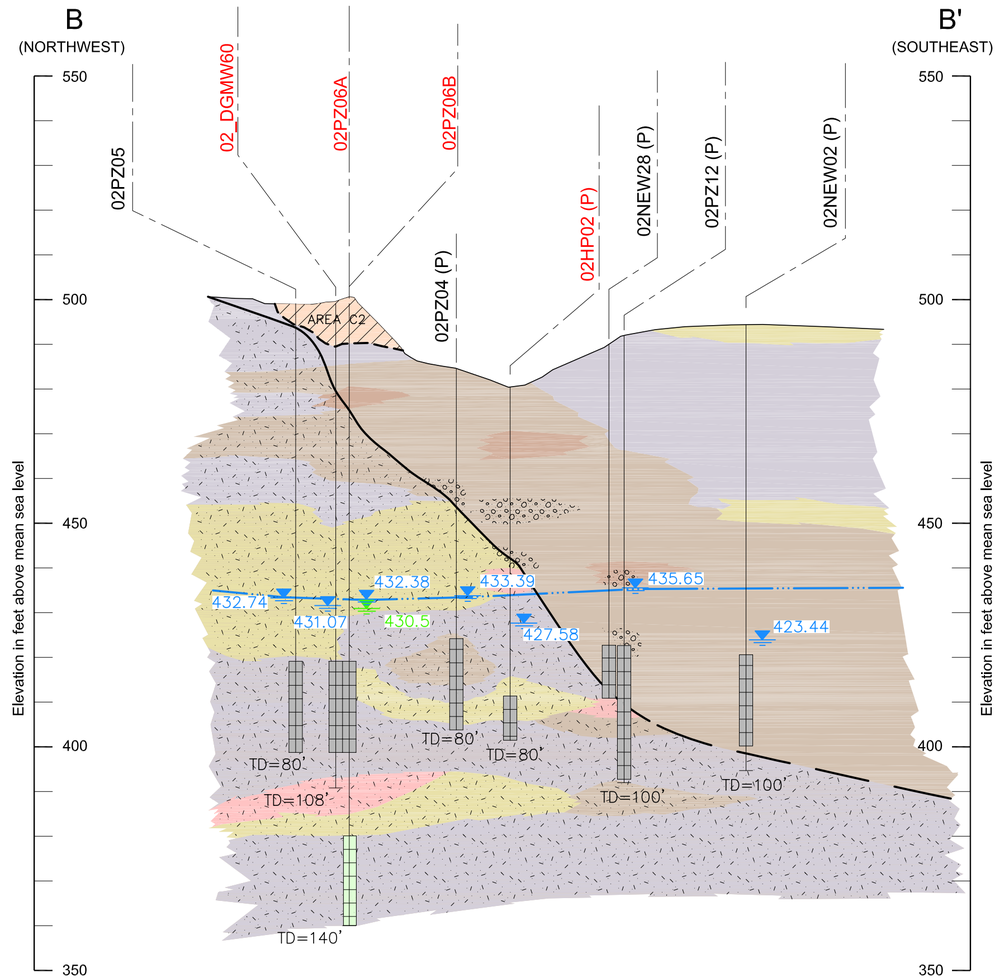


EXPLANATION

ALLUVIAL LITHOLOGY:

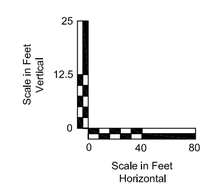
- ARTIFICIAL FILL
- CLAY
- CL/ML
- GRAVEL
- ML
- SILT
- SC
- SM
- SP
- SW

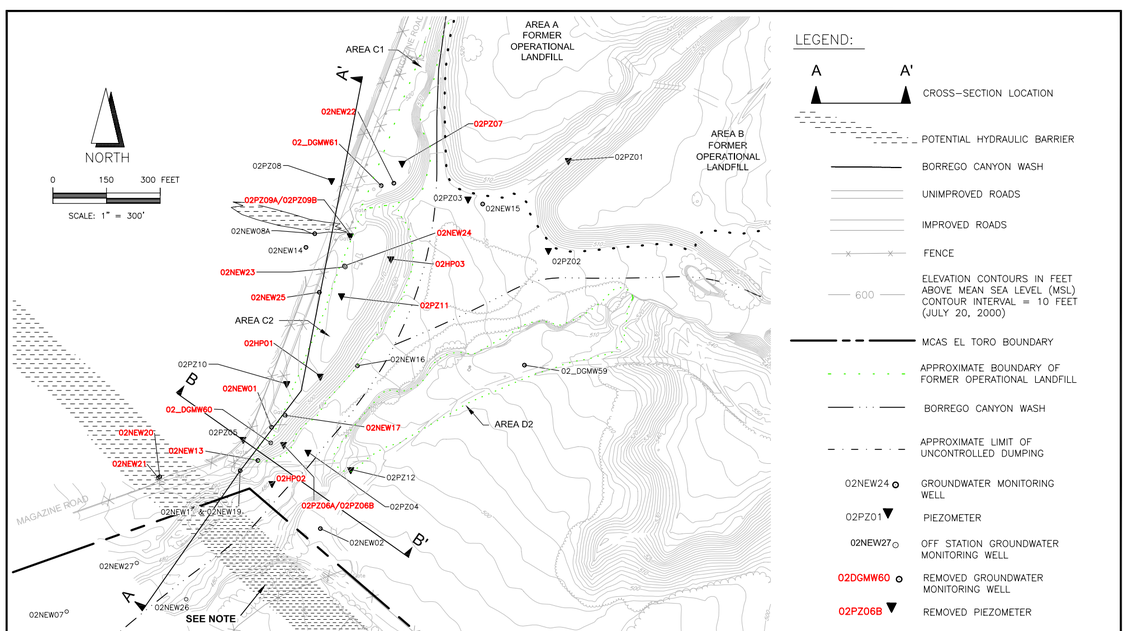
BEDROCK LITHOLOGY:

- APPROXIMATE ALLUVIAL / BEDROCK CONTACT (DASHED WHERE INFERRED)
- ML (SILTSTONE)
- SM, SP, SW (SANDSTONE)
- INFERRED POTENTIAL HYDRAULIC BARRIER
- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)
- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE OF WELL IN PIEZOMETER NOT USED IN GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE MAP
- INFERRED GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)

02PZ05 — EXISTING MONITORING WELL
SCREENED INTERVAL
TD=80' — TOTAL DEPTH OF WELL BORING (FEET BELOW GROUND SURFACE)

02DGMW60 — REMOVED MONITORING WELL
SCREENED INTERVAL
TD=108' — TOTAL DEPTH OF WELL BORING (FEET BELOW GROUND SURFACE)





Cross-Section Location Map

LEGEND:

- A — A' CROSS-SECTION LOCATION
- POTENTIAL HYDRAULIC BARRIER
- BORREGO CANYON WASH
- UNIMPROVED ROADS
- IMPROVED ROADS
- FENCE
- 600 — ELEVATION CONTOURS IN FEET ABOVE MEAN SEA LEVEL (MSL) CONTOUR INTERVAL = 10 FEET (JULY 20, 2000)
- MCAS EL TORO BOUNDARY
- APPROXIMATE BOUNDARY OF FORMER OPERATIONAL LANDFILL
- BORREGO CANYON WASH
- APPROXIMATE LIMIT OF UNCONTROLLED DUMPING
- 02NEW24 — GROUNDWATER MONITORING WELL
- 02PZ01 — PIEZOMETER
- 02NEW27 — OFF STATION GROUNDWATER MONITORING WELL
- 02DGMW60 — REMOVED GROUNDWATER MONITORING WELL
- 02PZ06B — REMOVED PIEZOMETER

NOTE: INFERRED DEPTH OF POTENTIAL HYDRAULIC BARRIER IS DEEPER THAN BORREGO CANYON WASH ALLUVIUM AND DOES NOT IMPEDE PRIMARY GROUNDWATER FLOW

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Geologic Cross Section B-B'

Aquifer Test, IRP Site 2,
Magazine Road Landfill

Date:02-06	Former MCAS El Toro	Plate
Project No. 37380	EarthTech — A Tyco International Ltd. Company	2

(approximately 80 feet bgs). The increase in alluvium-bedrock may be related to the Hill Front Fault Lineament, which is believed to be located near the Station boundary.

In contrast, the alluvium-bedrock contact in well 02NEW02 (located on the southern side of the current trace of Borrego Canyon Wash) is deeper than the alluvium-bedrock contact in wells 02NEW26 and 02NEW27. This indicates that the alluvial channel screened by well 02NEW02 has cut through bedrock and the Hill Front Fault, which supports the concept that structural movement along the Hill Front Fault and other faults in the local region the Hill Front Fault was pre-recent, Holocene time.

5.4 HYDROGEOLOGY

5.4.1 Regional Hydrogeology

The Former MCAS El Toro is located within the Irvine Groundwater Management Zone, which has been designated by the California Regional Water Quality Control Board (CRWQCB) as a public water supply source (CRWQCB 1995). The shallow aquifer directly below the Former MCAS El Toro is not currently used for municipal water supply; however, it is used for irrigation. General groundwater flow within IRP Site 2 and the predominant groundwater flow direction beneath the former operational landfill is toward the southwest at a depth of approximately 40 to 70 feet bgs. As the groundwater flows from IRP Site 2, the flow direction changes abruptly toward the northwest and the depth increases to approximately 130 feet bgs.

5.4.2 Site Hydrogeology

IRP Site 2 lies in a drainage basin consisting of recent alluvium and Miocene sandstones and siltstones (bedrock). The predominant groundwater gradient direction within IRP Site 2 and to the Station boundary is toward the southwest. The depth to groundwater ranges from approximately 40 to 70 feet bgs. As the groundwater flows from IRP Site 2, the flow direction changes abruptly toward the northwest and the depth to groundwater increases to approximately 130 feet bgs. The groundwater contour map for IRP Site 2 is shown on Figure 5-16.

The aquifer ranges from unconfined to confined and consists of numerous hydrogeologic zones. Groundwater occurs in the porous alluvial sediments and bedrock sandstones and siltstones. Due to the intermixed and interlayered heterogeneous lithology of the bedrock, bedrock water bearing units are laterally and vertically isolated to partially isolated. The alluvial water bearing zone is in direct physical contact with some of the bedrock water bearing zones (Plate 2), although, the degree of hydraulic connection between the alluvial water bearing zone and bedrock zones likely varies from bedrock zone to zone depending on the permeability and other factors including potential hydraulic barriers within the bedrock. The alluvial water bearing zone is unconfined with relatively high transmissivity (4,400 feet^2/day). The bedrock water bearing zones range from confined to unconfined with relatively low transmissivity (3.0 feet^2/day to 240 feet^2/day).

Groundwater within the alluvial aquifer is believed to flow downgradient within the alluvial sediments, passed the Station boundary into the Irvine Groundwater Management Zone, relatively unrestricted.

The rate of groundwater movement within the bedrock water bearing zones is low due to the presence of low permeability sediments within the bedrock. Based on this hydrogeologic model, groundwater within the bedrock slowly migrates downgradient until it either passes through the southern hydraulic barrier (zone of low permeability, which delays, restricts or alters groundwater movement) into the Irvine Groundwater Management Zone or mixes with the alluvial groundwater and then migrates downgradient into the Irvine Groundwater Management Zone.

VOCs are primarily detected in the shallow bedrock water bearing zones to the northwest of Borrego Canyon Wash adjacent to Magazine Road and within the center of Borrego Canyon Wash.

The primary recharge to groundwater is upgradient from Borrego Canyon Wash. Based on recharge observed in deeper portions of the aquifer in response to precipitation, the primary source of recharge is from subsurface flow in the alluvial water bearing zones and bedrock water bearing zones versus percolation from surface water. Surface water in Borrego Canyon Wash only flows for a short time (flash flood) during heavy precipitation.

Several potential bedrock hydraulic barriers were identified during the aquifer test. However, the exact location, lateral extent, and depth of the barriers can only be inferred. A hydraulic barrier exists near the southern end of IRP Site 2 and is believed to be related to the Hills Front Fault Lineament. This barrier is believed to affect groundwater within the bedrock along Magazine Road and under Borrego Canyon Wash. The barrier does not appear to affect the groundwater within the alluvial sediments. A second potential barrier was observed in bedrock between the PCE and TCE areas, just north of wells 02NEW23 and 02NEW24.

5.4.3 Hydrogeologic Zones

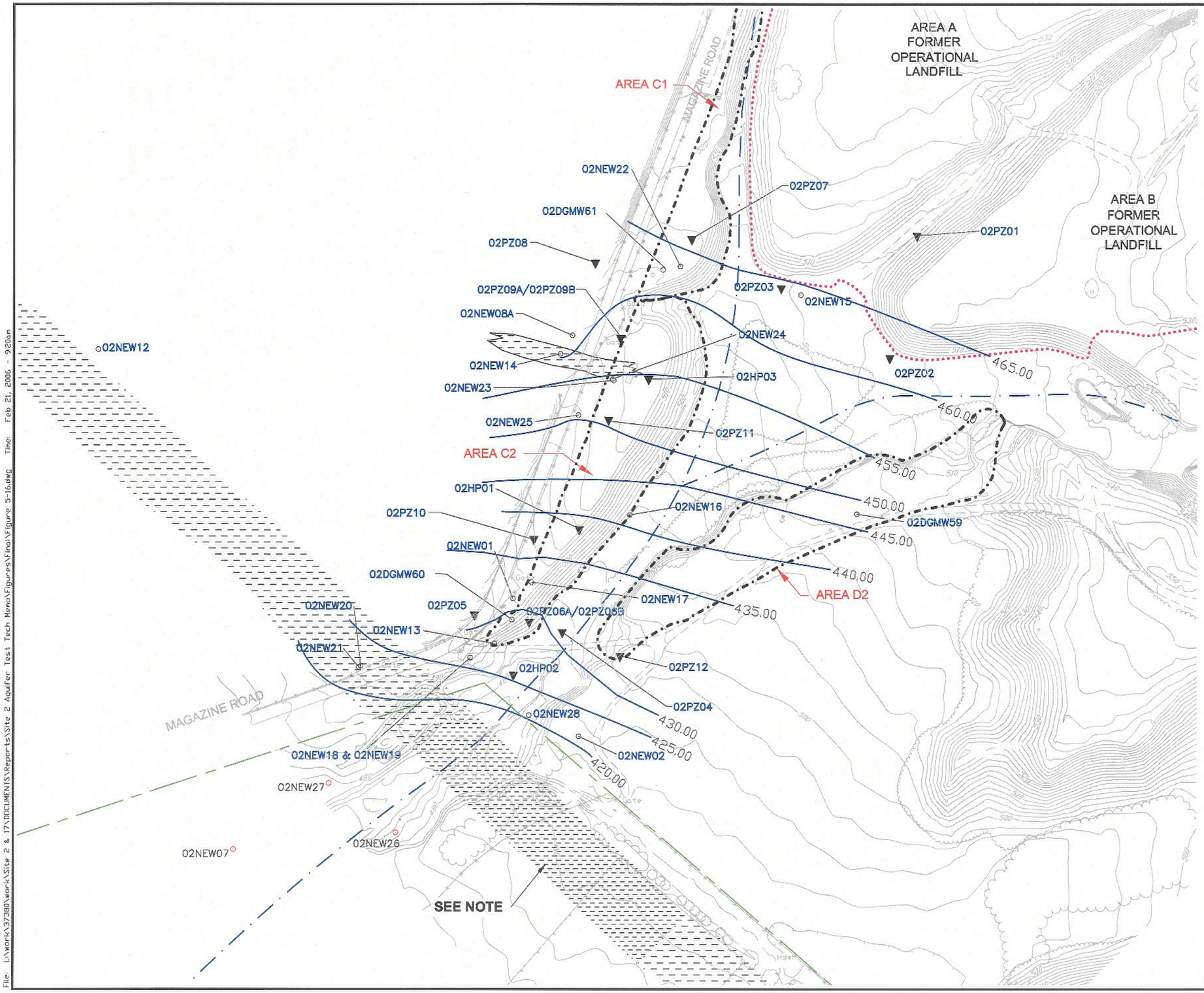
Based on hydrogeologic information collected during this aquifer test, twelve HZs were identified. Plates 3 and 4 show the HZs in cross section.

Hydrogeologic Zone 1 is defined as the deeper HZ beneath the PCE plume area. Well 02PZ09B is the only well screened in this zone. The primary rationale for identifying this zone is as follows:

1. A zone of silt and clayey silt separates piezometer 02PZ09B from shallower nested piezometer 02PZ09A.
2. Static water level in 02PZ09B is about 2 feet lower than in the shallower nested piezometer 02PZ09A.
3. In contrast to well 02PZ09A, well 02PZ09B (nested deeper well) did not respond to pumping from well 02NEW08A.
4. Piezometer 02PZ09B responded moderately to recharge induced from precipitation. The response was much more pronounced than shallower wells to the north and east. Minimal recharge was observed in piezometer 02PZ09A. However, the response to precipitation was similar to wells 02NEW24 and 02NEW25 and 02HP03 in HZ-5, screened at shallower depths and located to the south and southeast of the inferred hydraulic barrier.

PCE (0.8 μg/L and 1 μg/L) was not detected above reporting limits during post-aquifer sampling event in piezometers 02PZ09A and 02PZ09B, respectively. However, perchlorate was detected at a concentration of 11.5 μg/L in 02PZ09B, while the concentration in the shallower piezometer 02PZ09A was not above the reporting limit. Based on these data, it is inferred that HZ-1 is isolated from the shallower zone (HZ-4) screened by piezometer 02PZ09A. However, the presence of perchlorate in piezometer 02PZ09B and recharge from precipitation suggests that HZ-1 is connected to at least one upgradient hydrogeologic zone.

Since HZ-1 is isolated from the shallower HZ (where pumping occurred during the aquifer tests) there was no response during the aquifer testing, therefore aquifer parameters were not calculated. The overlying less permeable silts and clays and isolation from shallower water bearing units (HZ-3 and HZ-4) imply that HZ-1 is semi-confined to confined. The lower potentiometric surface than shallower HZ-3 implies a downward vertical gradient, which may have allowed trace levels of PCE to migrate downward. The difference in rate of recharge to shallower wells in HZ-3 to the north and



LEGEND:

- BORREGO CANYON WASH
- UNIMPROVED ROADS
- IMPROVED ROADS
- FENCE
- 600 — ELEVATION CONTOURS IN FEET ABOVE MEAN SEA LEVEL (MSL) CONTOUR INTERVAL = 10 FEET (JULY 20, 2000)
- MCAS EL TORO BOUNDARY
- APPROXIMATE BOUNDARY OF FORMER OPERATIONAL LANDFILL
- APPROXIMATE LIMIT OF UNCONTROLLED DUMPING
- 02NEW24 ○ GROUNDWATER MONITORING WELL
- 02PZ01 ▼ PIEZOMETER
- 02NEW27 ⊙ OFF STATION GROUNDWATER MONITORING WELL
- 454.85 GROUNDWATER ELEVATION ABOVE MEAN SEA LEVEL
- INFERRED POTENTIAL HYDRAULIC BARRIER

NOTE: INFERRED DEPTH OF POTENTIAL HYDRAULIC BARRIER IS DEEPER THAN BORREGO CANYON WASH ALLUVIUM AND DOES NOT IMPEDE PRIMARY GROUNDWATER FLOW

NORTH

0 100 200 FEET

SCALE: 1" = 200'

Technical Memorandum — Final

Groundwater Contour Map

Aquifer Test, IRP Site 2, Magazine Road Landfill

Date: 02-06	Former MCAS El Toro	Figure
Project No. 37380	EarthTech — A Tyco International Ltd. Company	5-16

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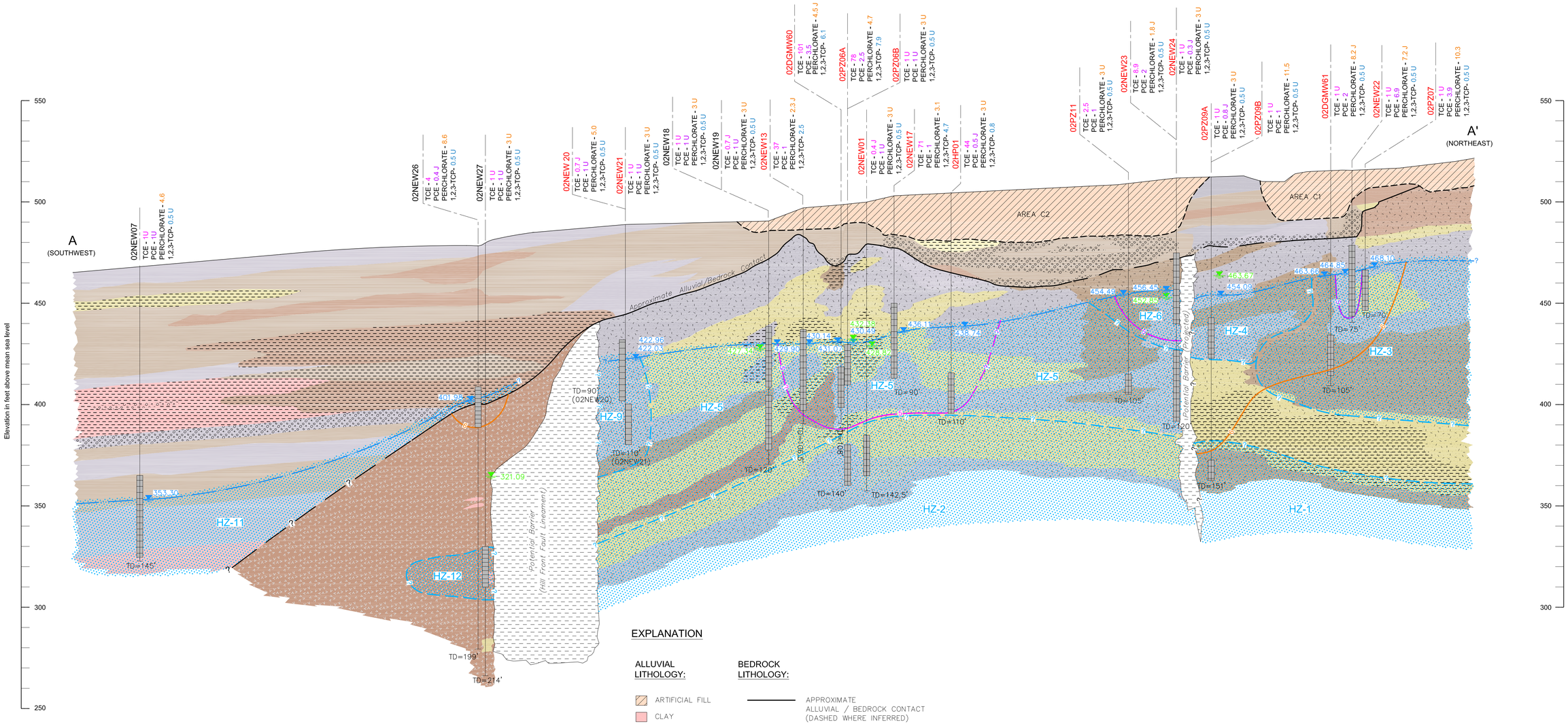

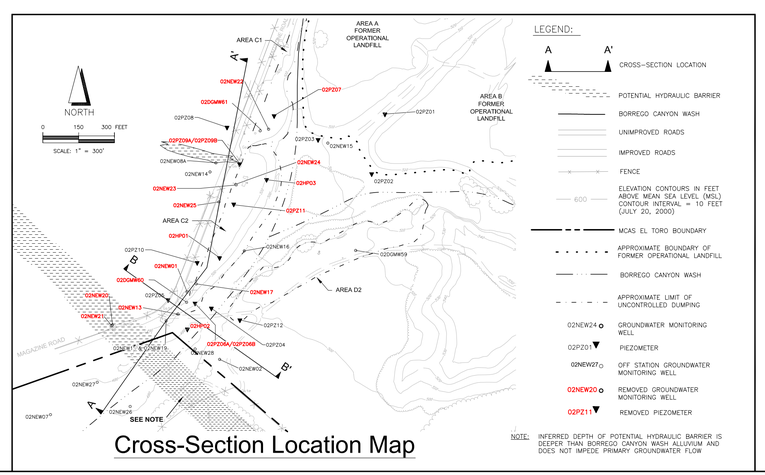

Cross-Section Location Map

EXPLANATION

ALLUVIAL LITHOLOGY:

- ARTIFICIAL FILL
- CLAY
- CL/ML
- GRAVEL
- ML
- SILT
- SC
- SM
- SP
- SW

BEDROCK LITHOLOGY:

- APPROXIMATE ALLUVIAL / BEDROCK CONTACT (DASHED WHERE INFERRED)
- ML (SILTSTONE)
- SM, SP, SW (SANDSTONE)
- BRECCIA
- INFERRED POTENTIAL HYDRAULIC BARRIER
- HZ-2 HYDROGEOLOGIC ZONE

- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)
- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE OF WELL IN PIEZOMETER NOT USED IN GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE MAP
- INFERRED GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)
- APPROXIMATE EXTENT OF TCE PLUME ABOVE 5 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)
- APPROXIMATE EXTENT OF PCE PLUME 5 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)
- APPROXIMATE EXTENT OF PERCHLORATE PLUME 6 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)
- APPROXIMATE EXTENT OF 1,2,3-TCP PLUME 0.5 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)

02NEW07
TCE - 1 U
PCE - 1 U
PERCHLORATE - 4.6
1,2,3-TCP- 0.5 U

- EXISTING MONITORING WELL (SHOWING WATER QUALITY RESULTS FROM AUG – DEC 2005)
- SCREENED INTERVAL
- TD=80' TOTAL DEPTH OF WELL BORING (FEET BELOW GROUND SURFACE)
- J ESTIMATED
- U NON DETECT
- (P) WELL PROJECTED

02NEW20
TCE - 0.7 J
PCE - 1 U
PERCHLORATE - 5.0
1,2,3-TCP- 0.5 U

- REMOVED MONITORING WELL (SHOWING WATER QUALITY RESULTS FROM JULY – AUG 2003)
- SCREENED INTERVAL
- TD=80' TOTAL DEPTH OF WELL BORING (FEET BELOW GROUND SURFACE)
- J ESTIMATED
- U NON DETECT
- (P) WELL PROJECTED

Scale in Feet Vertical: 25, 12.5, 0
Scale in Feet Horizontal: 0, 40, 80

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Hydrogeologic Zones And Contamination Extent - Cross Section A-A'

Aquifer Test, IRP Site 2, Magazine Road Landfill

Date: 02-06	Former MCAS El Toro	Plate
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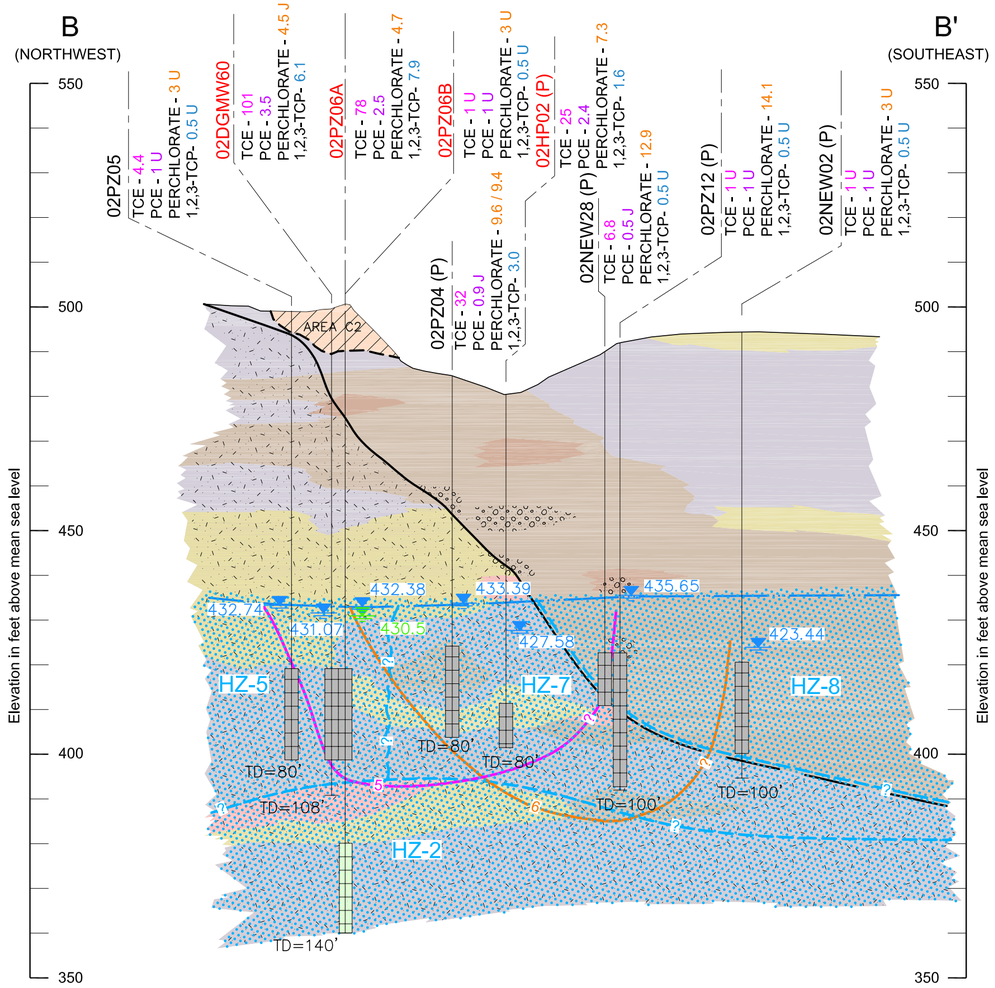
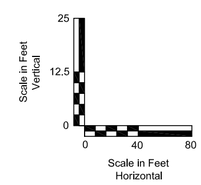




EXPLANATION

ALLUVIAL LITHOLOGY:

- ARTIFICIAL FILL
- CLAY
- CL/ML
- GRAVEL
- ML
- SILT
- SC
- SM
- SP
- SW

BEDROCK LITHOLOGY:

- APPROXIMATE ALLUVIAL / BEDROCK CONTACT (DASHED WHERE INFERRED)
- ML (SILTSTONE)
- SM, SP, SW (SANDSTONE)
- INFERRED POTENTIAL HYDRAULIC BARRIER
- HZ-2 HYDROGEOLOGIC ZONE
- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)
- GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE OF WELL IN PIEZOMETER NOT USED IN GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE MAP
- INFERRED GROUNDWATER ELEVATION/POTENTIOMETRIC SURFACE (MEASURED JULY 2004)
- APPROXIMATE EXTENT OF TCE PLUME ABOVE 5 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)
- APPROXIMATE EXTENT OF PCE PLUME 5 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)
- APPROXIMATE EXTENT OF PERCHLORATE PLUME 6 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)
- APPROXIMATE EXTENT OF 1,2,3-TCP PLUME 0.5 µg/L JULY / DECEMBER 2005 (DASHED WERE INFERRED)

02PZ05 — TCE - 1 U, PCE - 1 U, PERCHLORATE - 3 U, 1,2,3-TCP- 0.5 U — EXISTING MONITORING WELL (SHOWING WATER QUALITY RESULTS FROM AUG – DEC 2005)

02PZ06A — TCE - 78, PCE - 2.5, PERCHLORATE - 4.7, 1,2,3-TCP- 7.9 — REMOVED MONITORING WELL (SHOWING WATER QUALITY RESULTS FROM JULY – AUG 2003)

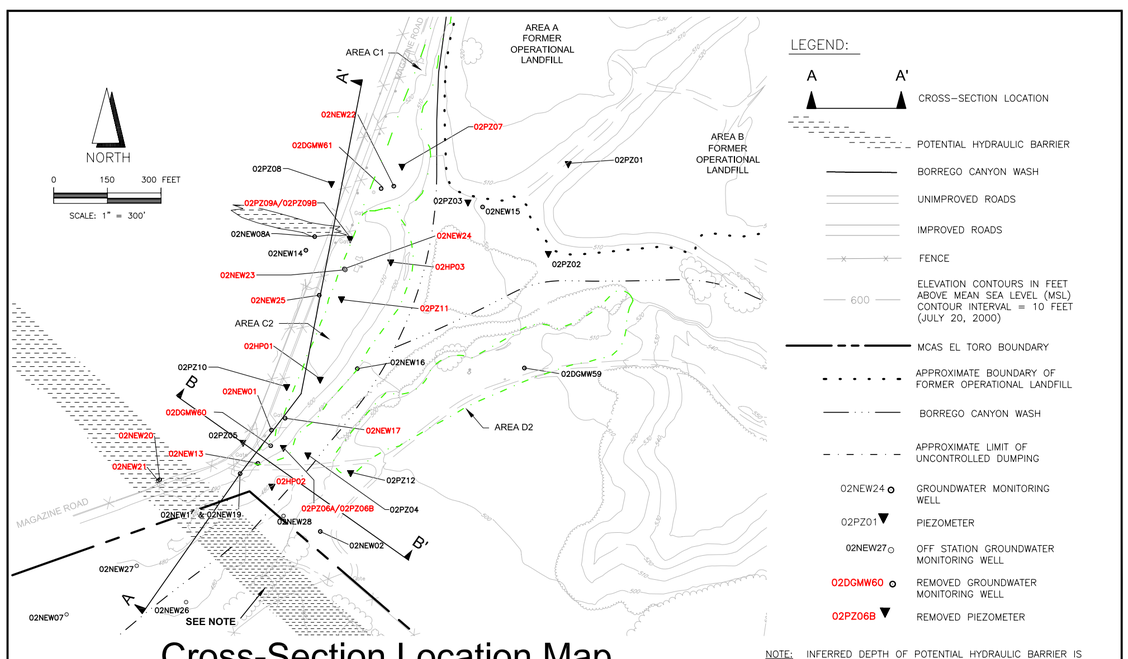
SCREENED INTERVAL

TD=80' — TOTAL DEPTH OF WELL BORING (FEET BELOW GROUND SURFACE)

J — ESTIMATED

U — NON DETECT

(P) — WELL PROJECTED



Cross-Section Location Map

NOTE: INFERRED DEPTH OF POTENTIAL HYDRAULIC BARRIER IS DEEPER THAN BORREGO CANYON WASH ALLUVIUM AND DOES NOT IMPEDE PRIMARY GROUNDWATER FLOW

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Hydrogeologic Zones and Contamination Extent - Cross Section B-B'

Aquifer Test, IRP Site 2, Magazine Road Landfill

Date: 02-06	Former MCAS El Toro	Plate
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northeast supports the presence of a different HZ. However, the similarities in rate of recharge to wells 02NEW24, 02NEW25 and 02HP03 in HZ-5, indicate a hydrogeologic connection, similar hydraulic conductivities, and/or similar upgradient recharge source areas, or a combination of all three.

Hydrogeologic Zone 2 is defined as the deeper HZ extending from the potential hydraulic barrier south of HZ-1 to the southern IRP Site 2 boundary and the Hill Front Fault hydraulic barrier. The primary rationale for assigning this as HZ-2 is as follows:

1. A lower silt and clayey silt layer was detected in piezometers 02HP01, 02PZ06B, and wells 02NEW13, 02DGMW60, and 02NEW01.
2. The potentiometric surface in piezometer 02PZ06B and well 02NEW01 is lower than the adjacent shallower wells/piezometers.
3. Neither piezometer 02PZ06B nor well 02NEW01 responded to pumping from wells 02DGMW60 and 02NEW13, as did shallower nested piezometer 02PZ06A and other adjacent and shallower wells/piezometers.
4. Both piezometer 02PZ06B and well 02NEW01 responded quickly and dramatically to recharge induced from precipitation. Both responded more quickly (several hours) to some of the shallower adjacent wells/piezometers.
5. Relatively high concentrations of TCE detected in shallow adjacent wells and piezometers were not detected in either piezometer 02PZ06B or well 02NEW01 (trace TCE of 0.4 μg/L was detected in well 02NEW01).
6. Perchlorate was not detected in either piezometer 02PZ06B or well 02NEW01. However, perchlorate was detected in the shallower well/piezometers.

Based on this information, it is inferred that HZ-2 is isolated from the shallower HZ-5 and defines the vertical extent of VOCs and perchlorate in the lower portion of Borrego Canyon Wash adjacent to Magazine Road. Since HZ-2 is isolated from the shallower HZ-5, where aquifer testing was conducted, aquifer parameters were not calculated. The overlying less permeable silts and clays and isolation from the shallower water bearing units imply that HZ-5 is semi-confined to confined. The lower static water level than the shallower HZ-5 implies a downward vertical gradient, which may have allowed trace TCE to migrate downward.

Hydrogeologic Zone 3 is defined as the northernmost, shallow HZ. It is screened by piezometers 02PZ07 and wells 02NEW22 and 02DGMW61. The rationale for describing HZ-3 is as follows (in addition to the HZ rationale described above):

1. All three wells are screened in similar lithology and at similar depths (well 02DGMW61 is screened a little deeper than the other two).
2. None of the wells respond to pumping from well 02NEW08A in HZ-4.
3. Drawdown from extraction well 02NEW08A was not observed in the HZ-4 wells/piezometers.

The response to precipitation induced recharge was relatively slow and gradual. The recharge was different than in wells to the south and deeper. Based on this information it is inferred that HZ-3 is unique from the adjacent HZ-4 and the lower HZ-1. Based on aquifer test analyses of pumping and observation wells, the transmissivity in HZ-3 was calculated to range from 9.9 feet^2/day to 170 feet^2/day. This is consistent with the mild recharge, induced from precipitation, seen in all three HZ-3 wells and piezometers.

Hydrogeologic Zone 4 is located just south of HZ-3 and north of HZ-5. It is screened by wells 02NEW08A and 02NEW14 and piezometers 02PZ08 and 02PZ09A. Characteristics, which distinguish HZ-4 from other HZs, include the following:

1. Response to pumping in well 02NEW08A was very high in the three monitoring wells and piezometers.
2. No response to pumping was observed in any of the wells or piezometers in HZ-5 or HZ-6. Although in some cases the distance to these wells was only slightly more than piezometer 02PZ08 and 02PZ09A, which showed almost immediate and significant response to pumping.
3. Response to precipitation in all four wells was minimal. Only a slight decrease in the drawdown slope was noticed. However, as discussed earlier this may have been related to a slight decrease in the pumping rate.

Based on this information it is inferred that HZ-4 is unique from the adjacent HZ-3, HZ-5, and HZ-6 and the lower HZ-1. Based on the aquifer test analyses of pumping and observation wells, the transmissivity in HZ-4 was calculated to range from 9 feet^2/day to 200 feet^2/day. The fact that wells in HZ-5 did not respond to pumping and piezometer 02PZ09A located a short distance away had considerable drawdown, indicates the presence of a hydraulic barrier between HZ-4 and HZ-5. This hydraulic barrier may be related to one of the faults, which is mapped in the bedrock to the southwest. HZ-4 may also represent a more permeable zone or preferential flow area which is flanked by less permeable lithology (i.e., HZ-3 and HZ-5). The lack of observed recharge, induced from precipitation, might be due to the high pumping rate in well 02NEW08A.

Hydrogeologic Zone 5 is located just south of HZ-3 and extends south to HZ-7 near the southern end of IRP Site 2. Numerous wells and piezometers are screened in HZ-5 and the majority of TCE impacted groundwater occurs in HZ-5. HZ-5 can be divided into the northern area and southern area. The northern area is screened by wells 02NEW24, 02NEW25, and piezometers 02HP03 and 02PZ11. The southern area includes piezometers 02HP01, 02PZ05, 02PZ06A, 02PZ10 and wells 02NEW01, 02NEW13, 02NEW19, and 02DGMW60. In addition, two hydrogeologic subzones are included in HZ-5. The subzones are identified by a slightly delayed response to pumping, difference in recharge from precipitation and different static water levels. The HZ-5 subzones are screened by wells 02NEW17and 02NEW18. HZ-5 characteristics include the following:

1. The northern wells and piezometers all have similar moderate recharge induced from precipitation, although the precipitation induced recharge is less than that in the southern HZ-5 wells and piezometers. However there are no other features present that would separate the northern HZ-5 wells/piezometers from the southern wells/piezometers.
2. The southern HZ-5 wells/piezometers all show rapid and dramatic response to precipitation.
3. All southern HZ-5 wells/piezometers show significant to moderate response to pumping from wells 02DGMW60 and 02NEW13.
4. The aquifer test data from pumping and observation wells/piezometers show the hydraulic conductivity in HZ-5 to be relatively low to moderate relative to other HZs.
5. A slight delay in response to pumping in well 02NEW17 is seen in relation to more distant piezometer 02PZ10. Thus, well 02NEW17 may be located in a subzone, although in general it responds similar to other southern HZ-5 wells/piezometers.
6. A second subzone is located on the southern end of HZ-5 where well 02NEW18 is screened. This subzone is marked due to the higher water level than the deeper nested well 02NEW19 and a delay in recharge from precipitation.

Although the lithology in HZ-5 is very heterogeneous and complex, the general hydrogeology is similar and therefore considered as one HZ. Based on aquifer test analyses of pumping and observation wells, the transmissivity in HZ-5 was calculated to range from 3.0 $feet^2$/day to 61 $feet^2$/day. A potential hydraulic barrier may be identified west of HZ-5 (see Section 5.4.4). The dramatic response to recharge is likely due to a mounding effect caused by this southern hydraulic barrier.

Hydrogeologic Zone 6 is a small isolated shallow groundwater area above the northern portion of HZ-5. HZ-6 is screened by well 02NEW23. Several primary factors describe HZ-6, they include:

1. Groundwater elevation in well 02NEW23 is several feet lower than the deeper nested well 02NEW24.
2. Recharge from precipitation is very slow and gradual compared to the surrounding HZ-5 wells/piezometers.
3. Well 02NEW23 did not respond to pumping in the HZ-4 well 02NEW08A.

Based on this information HZ-6 can be described as a small, shallow, and possibly unconfined groundwater zone (screen is across the water table). Since no response to pumping was observed in 02NEW23, transmissivity was not calculated.

Hydrogeologic Zone 7 is defined as the central Borrego Canyon Wash zone. It includes piezometers 02HP02, 02PZ04, and well 02NEW16. Characteristics of HZ-7 include the following:

1. Most dramatic and highest recharge in response to precipitation.
2. No measurable effect from pumping in the HZ-5 pumping wells 02DGMW60 or 02NEW13.
3. The highest concentrations of perchlorate are detected in wells and piezometers located in HZ-7.

The rapid and dramatic response to precipitation is most pronounced in HZ-7 wells/piezometer likely due to the presence of a downgradient hydraulic barrier. Based on three-dimensional visualization of water elevations (Appendix K), a mound can be seen starting from piezometer 02HP02 then moving north to piezometer 02PZ04 and well 02NEW16. The groundwater mound then moves to the northwest to HZ-5. Water elevations in HZ-5 are still increasing, while water levels in HZ-7 are decreasing.

Since no response to pumping was observed in any of the HZ-7 wells/piezometers, transmissivity was not calculated.

Hydrogeologic Zone 8 includes wells and piezometers on the east side of Borrego Canyon Wash. Hydrogeologic characteristics of HZ-8 include the following:

1. No influence to pumping in well 02NEW02; however, this is likely due to limited drawdown during pumping and distance.
2. A relatively high T as estimated based on pumping well 02NEW02.
3. A relatively moderate amount of recharge from precipitation. The amount of recharge was greatest in the upgradient wells versus the downgradient wells, which is opposite from the adjacent HZ-7.
4. Well 02NEW02 is screened in alluvium. All other HZs are screened in bedrock except HZ-11, located southwest of the inferred Front Hills Faults Lineament.

Based on this information, HZ-8 appears to be very different from the adjacent HZ-7 and is spatially located to the east of Borrego Canyon Wash. transmissivity was calculated at 4,400 feet^2/day from pumping well 02NEW02. HZ-8 represents the southern alluvial groundwater bearing zone upgradient of the Front Hills Fault Lineament.

Hydrogeologic Zone 9 is located to the south of HZ-5. It is screened by nested wells 02NEW20 and 02NEW21. Characteristics of HZ-9 include:

1. Wells 02NEW20 and 02NEW21 show relatively slight and gradual recharge from precipitation.
2. Drawdown from pumping in the HZ-5 wells 02DGMW60 and 02NEW13 was not observed in the two downgradient wells 02NEW20 and 02NEW21. This may be a function of distance to the pumping wells or related to a groundwater barrier between these wells and the pumping wells.

Recharge from precipitation observed in wells 02NEW20 and 02NEW21 likely represents a local regional groundwater level increase at IRP Site 2. Similar increases in groundwater elevation are seen upgradient in well 02UGMW25 located north of the former operational landfill.

Since no response to pumping was observed in 02NEW20 and 02NEW21, transmissivity was not calculated. HZ-9 may be located downgradient of the Front Hills Fault hydraulic barrier or in a zone of low permeability.

Hydrogeologic Zone 10 is defined as the area just south of the former operational landfill and is screened by piezometers 02PZ01, 02PZ02, and 02PZ03. Characteristics of HZ-10 include the following:

1. Response to precipitation in varying degrees. Piezometer 02PZ01, located in the channel between the former operational landfill, shows a steady increase in groundwater elevation/potentiometric surface of approximately 5 feet beginning after the first storm event. Piezometer 02PZ02, located adjacent to Borrego Canyon Wash, shows a stepped increase in groundwater elevation/potentiometric surface following each storm event and piezometer 02PZ03, located to the northwest of 02PZ02, further from Borrego Canyon Wash, shows stepped recharge following each storm event, although less vivid than in piezometer 02PZ02.

The differences in recharge of these three wells indicate the distance to Borrego Canyon Wash influences recharge rates. All three of these wells are screened much shallower (20 to 40 feet bgs) than most other IRP Site 2 wells. If surface percolation were the primary factor of recharge, it would be expected that rapid and significant recharge from precipitation would be seen in these three (shallow) wells. Since this is not the case, it is implied that the primary recharge to the wells is from subsurface flow; indicating water enters the groundwater units beneath IRP Site 2 from upgradient of IRP Site 2.

Since no response to pumping was observed in these three piezometers, T was not calculated.

Hydrogeologic Zone 11 is defined as the off-Station groundwater bearing zone above the alluvial bedrock contact. Groundwater was observed directly above the groundwater bedrock contact in wells 02NEW26 and 02NEW27. Lithology (as seen in cores) beneath the alluvial bedrock contact in both boreholes was dry. Groundwater is also present in the alluvium in well 02NEW07 approximately 250 and 320 feet southwest of wells 02NEW26 and 02NEW27, respectively. Low concentrations of VOC and perchlorate were detected in well 02NEW26. It is inferred that HZ-11 represents the off-Station uppermost alluvial water bearing zone southwest of the southern hydraulic barrier.

Hydrogeologic Zone 12 is defined as a localized groundwater zone, in bedrock, between approximately 159 and 165 feet bgs around off-Station well 02NEW27. The lithology in well 02NEW27 was dry between HZ-12 and HZ-11 (below HZ12) to the total depth drilled of 214 feet bgs. Groundwater was not observed below HZ-11 in well 02NEW26, located approximately 180 feet to the southeast. Therefore, the lateral extent of HZ-12 is limited in the southeast direction. The lateral extent is not defined to the north, east or west. The static water level rose approximately 36 feet above the wet zone after well 02NEW27 casing was installed. Neither VOCs nor perchlorate were detected in well 02NEW27 in HZ-12, indicating that HZ-12 is not impacted from upgradient sources.

5.4.4 Hydraulic Barriers

Several potential hydraulic barriers were identified during the aquifer test. However, the exact location, lateral extent, and depth, of the barriers can only be inferred.

A southern hydraulic barrier exists near the southern end of IRP Site 2 and is believed to be related to the Front Hills Fault Lineament. The existence of this barrier was initially identified due to significant water-level change between the southern IRP Site 2 wells (in the TCE area) and well 02NEW07 to the west. The water level in well 02NEW07 is approximately 50 to 70 feet lower than the southern IRP Site 2 wells. The effects of this barrier were observed during precipitation-induced recharge. As shown in the three-dimensional water elevation model (Appendix K), a mounding effect, beginning at the southern end of IRP Site 2 is seen in piezometers 02HP02 and 02PZ04. Analyses of recharge events show groundwater mounding beginning at the southernmost piezometer 02HP02; the mounding then moves northward, upgradient. The elevated water levels decline relatively rapidly indicating either the barrier is leaky or not laterally extensive, thus allowing water to flow either downgradient after brief mounding or from the barrier. This barrier is believed to affect groundwater within the bedrock along Magazine Road and under Borrego Canyon Wash. The barrier does not appear to affect the groundwater within the alluvial sediments.

A second potential barrier is observed between the PCE and TCE areas, just north of wells 02NEW23 and 02NEW24. As with the southern barrier, indication of a potential barrier was initially seen due to differences in water levels from wells 02NEW23 and 02NEW24 compared to nearby upgradient wells 02NEW08A and 02NEW14. In addition, a fault is mapped in bedrock to the east (Figure 5-15). Projecting this fault across Borrego Canyon Wash places it in the general area where it is shown on Plate 1. The aquifer test results show that either a barrier exists between HZ-5 on the south and HZ-4 to the north or the two HZs are separated by other discontinuous units. Further evidence of a barrier is observed from changes in the VOCs and perchlorate concentrations on either side of the barrier. Based on data collected to date, it appears the barrier may be more pronounced to the west and less pronounced to the east, where contaminants appear to have migrated around the barrier (see Section 5.5). Based on this information, enough evidence exists to place a potential groundwater barrier to the north of wells 02NEW23 and 02NEW24.

5.4.5 Hydrology

Surface drainage at the Former MCAS El Toro generally flows toward the southwest following the slope of the land. Several washes originate in the foothills northeast of the Former MCAS El Toro and flow through or adjacent to the Former MCAS El Toro boundary en route to San Diego Creek.

IRP Site 2 is located within the lower portion of Borrego Canyon drainage basin. Surface water flow only occurs during periods of high precipitation and only for short durations. Surface-water flow can generally be described as flash flooding. Surface water was observed to range from several inches to

several feet following the onset of precipitation. The duration lasted from about 10 minutes to 24 hours.

The former operational landfill area is upstream of the confluence of the main channel of Borrego Canyon Wash and a tributary.

5.5 EXTENT OF VOCS

5.5.1 PCE Plume

The baseline sampling results indicated that the extent of PCE above 5 μg/L was limited to one area, around wells 02NEW22 and 02PZ07, as shown on Figure 5-17 in plan view.

The post-aquifer test groundwater sampling results showed the extent of PCE above 5 μg/L was isolated to two small areas, around wells 02NEW22 and 02NEW14 (6.9 μg/L and 5.6 μg/L, respectively). In general, the concentrations of PCE have remained consistent with pre-aquifer test baseline sampling results. Sample results from pumping wells 02DGMW61 and 02NEW08A, collected during the aquifer test remained less than 6 μg/L and were typically between 3 to 4 μg/L. Based on the post-aquifer test groundwater sampling results, the lateral and vertical extent of PCE is defined, limited in size and only slightly exceeds the MCL of 5 μg/L. The trace detection of PCE in vertical delineation at well 02PZ09B is likely due to vertical migration of PCE through a leaky confining zone. The inferred extent of the PCE plume is shown on Figure 5-18.

Due to the removal of monitoring wells, only one well, 02NEW08A (6.2 μg/L) was detected with PCE above 5 μg/L during the sampling event in August 2005. The extent of PCE remained the same due to the lack of complete sample locations, and is shown in Figure 5-19 in plan view and Plate 3 and Plate 4 in cross-section views.

5.5.2 TCE Plume

The baseline sampling results indicated that the extent of TCE is limited to the north side of Borrego Canyon Wash between piezometer 02PZ11 and well 02NEW19, as shown on Figure 5-17 in plan view. The highest concentrations were in the southern area in wells 02DGMW60, 02NEW17, and piezometer 02PZ06A.

Post-aquifer test results indicated that the extent and concentrations of TCE decreased slightly as compared to pre-aquifer baseline sampling results. The relative concentrations between wells and spatial distribution were consistent with historic water quality data. The highest concentrations were detected in wells 02DGMW60 (101 μg/L), 02NEW17 (71 μg/L) and piezometer 02PZ06A (78 μg/L) along Magazine Road near the Station boundary. The concentration in the southern Station boundary well, 02NEW19, has decreased from 10 μg/L to 2.0 μg/L. The overall decrease in concentrations and reduction in plume extent to the south may indicate capture and reduction of TCE mass during aquifer test pumping.

Although the concentration of TCE in well 02HP02 decreased from 37 μg/L to 25 μg/L, the southern TCE boundary in the immediate vicinity of the Station boundary required delineation. Wells 02NEW26 and 02NEW27 were installed to help define the southern extent. Well 02NEW26 is screened in the first water bearing zone, located above the alluvium-bedrock contact. The TCE concentration was 3.5 μg/L, and PCE was estimated at 0.4 μg/L. This indicates the southern extent of VOCs do not extend much further downgradient than piezometer 02HP02 or the Station boundary.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
12	pump tests conducted in 2002 and 2003	Section 2.3.1.2	Final Technical Memorandum, Aquifer Test, IRP Site 2, Magazine Road Landfill, Former Marine Corps Air Station, El Toro, California. Section 5.2.4. February 2006.

Extraction from well 02NEW13 began on 25 March 2003 at approximately 0.3 gpm. The hydrograph for the TCE plume area is shown on Figure 5-7. The water level in well 02NEW13 dropped rapidly

after the commencement of pumping. Immediate response to pumping was also observed in wells 02DGMW60, 02PZ06A, and 02PZ05, and a slight response to pumping was observed in wells 02PZ10 and 02NEW17. A delayed response to pumping was also seen in well 02NEW19. Extraction was stopped on 7 July 2003 and the recovery test began. All observation wells in the TCE area showed response to extraction rate adjustment and recharge from precipitation. Limited drawdown from wells in the Wash was observed. Recovery was monitored for 12 days until the water level reached 95 percent of the static water level. The well efficiency was not estimated for well 02NEW13. However, based on the rapid and relatively large drawdown observed in the monitoring wells it is assumed the well efficiency was relatively high.

5.2.3.3 WELL 02NEW02

Based on the variation of recharge observed east of Borrego Canyon Wash (described in Section 5.2.2 above) it was suspected that a different hydrogeologic zone existed. Therefore, an additional aquifer test was conducted on well 02NEW02 to assess the hydrogeologic characteristics east of Borrego Canyon Wash. Extraction from well 02NEW02 began on 9 June 2003 at approximately 4.07 gpm. The hydrograph for 02NEW02 and observation wells 02PZ12 and 02HP02 are shown on Figure 5-14. The water level in well 02NEW02 dropped approximately 1.8 feet then declined at a steady rate to approximately 2.7 feet until the pumping test was terminated. There was no response to pumping in either observation well. However, local regional decline in water levels at IRP Site 2 was observed. The water level recovered within one day. The well efficiency was not estimated for well 02NEW02. However, based on the limited amount of drawdown and relatively high pumping rate it is assumed the well efficiency in well 02NEW02 is relatively high.

5.2.4 Aquifer Test Analysis

The drawdown data generated during the aquifer tests were used to estimate aquifer transmissivity and storativity. In order to minimize the recharge effect from rainfall, drawdown data were analyzed for the time periods with minimal or no recharge effects. The time periods selected for aquifer analyses are summarized in Table 5-4.

Drawdown versus time data in the observation wells were analyzed using the Neuman Method (Neuman 1975), Theis Method (Theis 1935), and Cooper & Jacob Distance-Drawdown Method (Copper & Jacob 1946), and the recovery data were analyzed using the Theis & Jacob Recovery Test Method (Theis 1935). In the pumping wells, only recovery data were analyzed and only transmissivity values were estimated. Storativity cannot be estimated from the pumping well recovery data.

The estimated transmissivity and storativity values calculated from the long-term aquifer test are presented in Table 5-5 through Table 5-9; the aquifer test analyses methods and data are presented in Appendix J. The curve fitting was performed using the "Aquifer Test Pro" computer program (WHI). The estimated transmissivity ranged from 3.0 square feet per day (feet^2/day) at 02PZ06A to 4,400 feet^2/day at 02NEW02. Storativity ranged from 3.5×10^{-5} at 02PZ06A to 0.09 at 02NEW22.

Groundwater levels in well 02NEW08A and its observation wells, were not significantly affected by precipitation; therefore, all data available were used for aquifer analysis. For comparison purposes, the first 72-hour groundwater level data were also used for analysis. The transmissivity values calculated from the first 72-hours are an order of magnitude higher than values calculated from all

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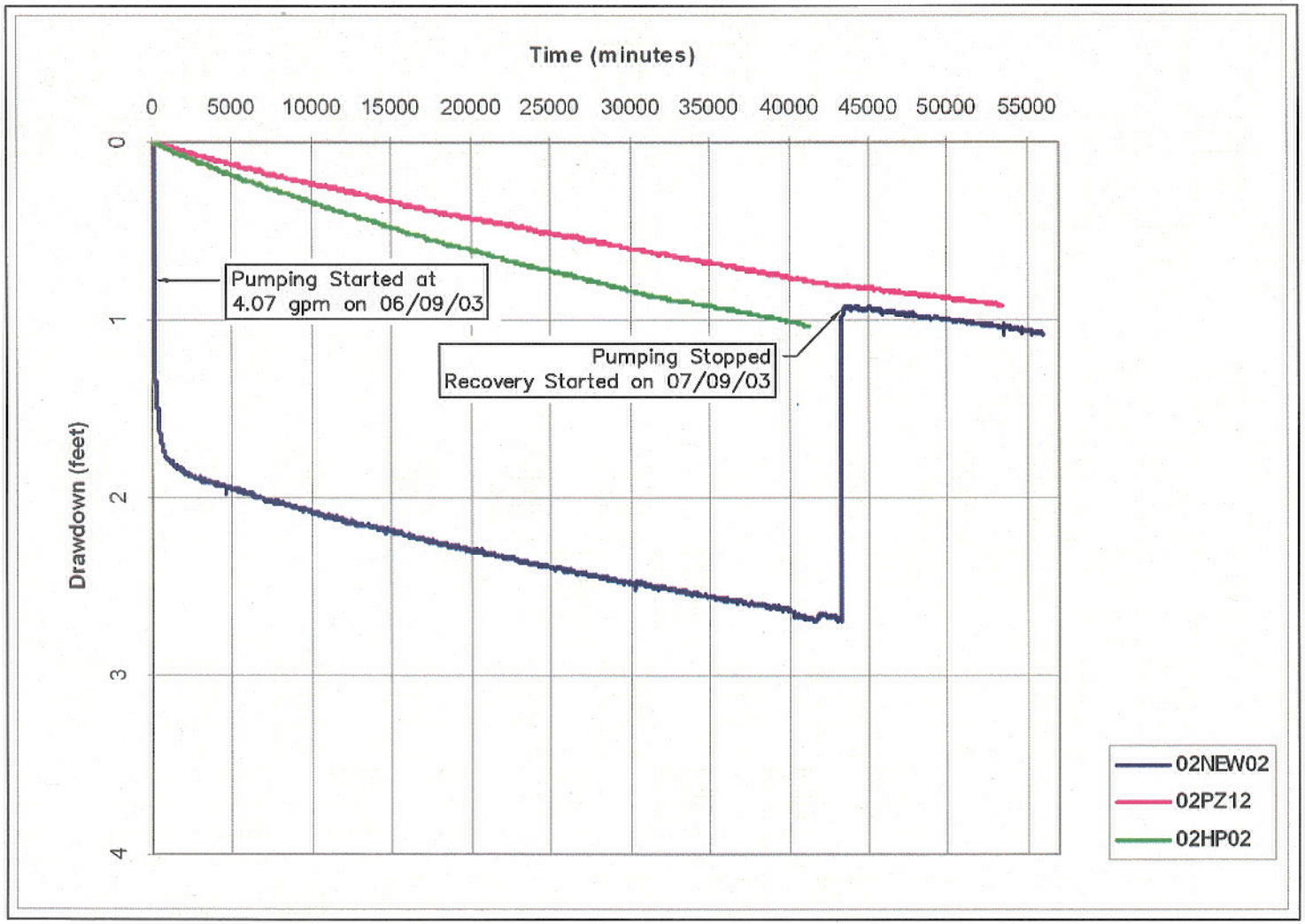


Technical Memorandum | Final

Constant Rate Test at Well 02NEW02

Aquifer Test, IRP Site 2, Magazine Road Landfill

Date: 02-06	Former MCAS El Toro	Figure
Project No. 37380	EarthTech A Tyco International Ltd. Company	5-14

the data and more consistent with values calculated from the step test analyses. The calculated values represent a possible range of transmissivity and storativity values from this area.

Table 5-4: Summary of Constant Rate Aquifer Test Analysis

Pumping Well	No. of Selected Period	Analyses Time Period		Time Duration (days)	Flow Rate (gpm)	Observation Well[a]
		Start	End			
02NEW08A	1	12/02/02, 12:20	07/10/03, 09:20	220	5.5	02NEW14 02PZ08 02PZ09A
	Recovery	07/10/03, 09:21	-	-	-	
02DGMW61	1	02/12/03, 10:50	02/17/03, 11:10	5	0.6	02PZ07 02NEW22
	2	05/29/03, 09:50	06/30/03, 07:50	32	1.15	
	3	06/30/03, 08:20	07/09/03, 10:20	9	1.42	
	Recovery	07/09/03, 13:10	-	-	-	
02DGMW60	1	12/02/02, 12:00	12/18/02, 03:20	16	0.24	02PZ06A/02NEW01 02NEW13/02NEW19 02PZ05
	2	01/22/03, 22:00	02/06/03, 20:20	15	0.38	
	Recovery	07/09/03, 11:50	-	-	-	
02NEW13	1	03/25/03, 08:50	04/03/03, 10:24	9	0.3	02DGMW60 02PZ05 02PZ06A
	2	04/19/03, 05:52	07/09/03, 11:40	81	0.3	
	Recovery	07/09/03, 11:50	-	-	-	
02NEW2	1	06/09/03, 09:10	06/09/03, 08:30	30	4.7	-
	Recovery			-	-	-

Notes:
[a] = wells with observable drawdown
gpm = gallon per minute

Table 5-5: Estimates of Transmissivity and Storativity Values at Well 02NEW08A

Well ID	Well Type	Data Type	Extraction Rate (gpm)	Analysis Method	8-Month Analysis		72-Hour Analysis	
					T (feet^2/day)	S	T (feet^2/day)	S
02NEW08A	Pumping Well	Pumping	5.5	Distance-Drawdown	92	-	-	-
		Recovery	-	Recovery Test	20	-	-	-
02NEW14	Observation Well	Pumping	-	Neuman	9.0	-	240	-
				Theis	-	-	240	4.9×10^{-5}
		Recovery	-	Recovery	19	-	-	-
02PZ09A	Observation Well	Pumping	-	Neuman	12	0.023	100	4.4×10^{-4}
		Pumping	-	Theis	-	-	200	1.4×10^{-3}
		Recovery	-	Recovery	16	-	-	-
02PZ08	Observation Well	Pumping	-	Neuman	10	0.058	98	-
		Pumping	-	Theis	12	0.052	98	9.2×10^{-3}

Notes:
feet^2/day square feet per day
gpm gallons per minute
ID Identification
S storativity

T transmissivity

Table 5-6: Estimates of Transmissivity and Storativity Values at Well 02DGMW61

Well ID	Well Type	Data Type		Extraction Rate (gpm)	Analysis Method	T (feet^2/day)	S
02DGMW61	Pumping Well	Pumping	1	0.60	Distance-Drawdown	16	4.3×10^{-3}
			2	1.15	Distance-Drawdown	17	5.8×10^{-2}
			3	1.42	Distance-Drawdown	18	2.6×10^{-2}
		Recovery		-	Recovery Test	62	-
02NEW22	Observation Well	Pumping	1	-	Neuman	39	2.7×10^{-3}
					Theis	39	2.2×10^{-3}
			2	-	Neuman	9.9	8.9×10^{-2}
					Theis	-	-
			3	-	Neuman	49	8.9×10^{-3}
					Theis	39	8.9×10^{-3}
		Recovery		-	Recovery Test	42	-
02PZ07	Observation Well	Pumping	1	-	Neuman	140	5.4×10^{-3}
					Theis	160	4.8×10^{-3}
			2	-	Neuman	41	5.5×10^{-2}
					Theis	-	-
			3	-	Neuman	150	2.4×10^{-2}
					Theis	120	2.1×10^{-2}
		Recovery		-	Recovery Test	170	-

Notes:
feet²/day square feet per day
gpm gallons per minute
ID Identification
S storativity
T transmissivity

Table 5-7: Estimates of Transmissivity and Storativity Values at Well 02DGMW60

Well ID	Well Type	Data Type		Extraction Rate (gpm)	Analysis Method	T (feet^2/day)	S
02DGMW60	Pumping Well	Pumping	1	0.26	Distance-Drawdown	3.9	4.0×10^{-3}
			2	0.38	Distance-Drawdown	4.1	8.5×10^{-3}
		Recovery		0.40	Recovery Test	6.8	-
02NEW13	Observation Well	Pumping	1	-	Neuman	6.4	2.0×10^{-4}
					Theis	7.2	2.0×10^{-4}
			2	-	Theis	14	2.5×10^{-3}
02PZ06A	Observation Well	Pumping	1	-	Neuman	3.0	1.3×10^{-4}
					Theis	5.3	3.5×10^{-5}
			2	-	Theis	6.7	7.3×10^{-4}

Table 5-7: Estimates of Transmissivity and Storativity Values at Well 02DGMW60

Well ID	Well Type	Data Type		Extraction Rate (gpm)	Analysis Method	T (feet^2/day)	S
02PZ05	Observation Well	Pumping	1	-	Neuman	4.7	2.3×10^{-4}
					Theis	5.3	2.3×10^{-4}
			2	-	Theis	22	2.1×10^{-3}
02NEW19	Observation Well	Pumping	1	-	Neuman	20	9.9×10^{-4}
					Theis	18	9.1×10^{-4}
			2	-	Theis	5.2	1.0×10^{-2}
02NEW18	Observation Well	Pumping	1	-	Neuman	6.4	1.2×10^{-3}
					Theis	8.1	8.5×10^{-4}
			2	-	Theis	9.9	5.7×10^{-3}
02NEW17	Observation Well	Pumping	1	-	Neuman	12	2.4×10^{-4}
					Theis	12	2.4×10^{-4}
			2	-	Theis	61	1.5×10^{-3}
02HP01	Observation Well	Pumping	1	-	Neuman	14	2.1×10^{-4}
					Theis	14	1.6×10^{-4}
			2	-	Theis	14	2.9×10^{-3}
02PZ10	Observation Well	Pumping	1	-	Neuman	4.0	-
					Theis	5.3	9.4×10^{-5}
			2	-	Theis	43	4.9×10^{-4}

Notes:
feet²/day square feet per day
gpm gallons per minute
ID Identification
S storativity
T transmissivity

Table 5-8: Estimates of Transmissivity Value at Well 02NEW13

Well ID	Well Type	Data Type	Extraction Rate (gpm)	Analysis Method	T (feet^2/day)	S
02NEW13	Pumping Well	Recovery	0.30	Recovery Test	4.2	-

Notes:
feet²/day square feet per day
gpm gallons per minute
ID Identification
S storativity
T transmissivity

Table 5-9: Estimates of Transmissivity and Storativity Values at Well 02NEW02

Well ID	Well Type	Data Type	Extraction Rate (gpm)	Analysis Method	T (feet^2/day)	S
02NEW02	Pumping Well	Pumping	4.07	Recovery Test	4400	-

Notes:
feet²/day square feet per day
gpm gallons per minute
ID Identification
S storativity
T transmissivity

Calculated parameters using the distance-drawdown method are based on all the available observation well information. Therefore, the values are an average in the covered area. However, it assumes the aquifer is homogeneous and isotropic, which it is not. All methods have necessary simplifying assumptions that are rarely applicable for real aquifers, thus, the calculated values represent estimated ranges. Table 5-10 summarizes the range of calculated values from each well.

Table 5-10: Summary of Ranges of the Estimates of Transmissivity and Storativity

Contaminated Area	Well ID	Well Type	T (feet^2/day)	S
PCE	02DGMW61	Pumping Well	16 – 62	$4.3x10^{-3}$ – $5.8x10^{-2}$
	02NEW22	Observation Well	9.9 – 49	$2.2x10^{-3}$ – $8.9x10^{-2}$
	02PZ07	Observation Well	41 – 170	$4.8x10^{-3}$ – $5.5x10^{-2}$
	02NEW08A	Pumping Well	20 – 92	-
	02NEW14	Observation Well	9.0 – 240	$4.9x10^{-5}$
	02PZ09A	Observation Well	12 – 200	$4.4x10^{-4}$ – $1.4x10^{-3}$
	02PZ08	Observation Well	10 – 12	$9.2x10^{-3}$
TCE	02DGMW60	Pumping Well	3.9 – 6.8	$4.0x10^{-4}$ – $8.5x10^{-3}$
	02NEW13	Pumping Well	6.4 – 14	$2.0x10^{-4}$ – $2.5x10^{-3}$
	02PZ06A	Observation Well	3.0 – 6.7	$3.5x10^{-5}$ – $7.3x10^{-4}$
	02PZ05	Observation Well	4.7 – 22	$2.3x10^{-4}$ – $2.1x10^{-3}$
	02NEW19	Observation Well	5.2 – 20	$9.1x10^{-4}$ – $1.0x10^{-2}$
	02NEW18	Observation Well	6.4 – 9.9	$8.5x10^{-4}$ – $5.7x10^{-3}$
	02NEW17	Observation Well	12 – 61	$2.4x10^{-4}$ – $1.5x10^{-3}$
	02HP01	Observation Well	14*	$1.6x10^{-4}$ – $2.9x10^{-3}$
	02PZ10	Observation Well	4.0 – 43	$9.4x10^{-5}$ – $4.9x10^{-4}$
Perchlorate	02NEW02	Pumping Well	4400	-

Notes:
* Same T values were generated by different analyses; however, a range of S values were generated.
feet²/day square feet per day
gpm gallons per minute
ID Identification
S storativity
T transmissivity

5.2.5 Mass Removal Estimates

Groundwater samples were collected before, during, and after the long-term aquifer tests. The analytical sampling results for PCE, TCE, 1,2,3-TCP and perchlorate are presented in Appendix G. TCE, PCE, 1,2,3-TCP, and perchlorate mass removal rates were estimated using TCE/PCE/1,2,3 TCP, and perchlorate concentrations, and pumping rate data from each test (listed in Table 2-10). The mass of TCE/PCE/1,2,3-TCP/perchlorate removed was estimated by multiplying the mass of groundwater (gallons times specific weight) for a specified time period by the average concentrations of TCE/PCE/1,2,3-TCP/perchlorate for that time period. Average TCE/PCE/1,2,3-TCP/perchlorate concentrations were calculated using the maximum weekly concentrations obtained at the pumping well before, during, and after each test. Table 5-11 summarizes the calculated mass removal rates. Based on the results shown above, a pump and treat system for remediation at this site would not be

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
13	**nature and extent of releases in IRP Site 1 groundwater**	**Section 2.3.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 3.2.1. AECOM. April 2011.

3.2.1 IRP Site 1

Various investigations have been conducted at IRP Site 1, each targeted toward specific environmental media or COPC, to adequately define the nature and extent of releases at the site.

The groundwater investigations performed as part of these studies are summarized in Table 3-2. A total of 59 monitoring wells and piezometers (2-inch groundwater monitoring wells) were installed at IRP Site 1 and along the western reach of Borrego Canyon Wash between IRP Sites 1 and 2. Groundwater samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), perchlorate, explosives residues, n-nitrosodimethylamine (NDMA), petroleum hydrocarbons, metals, pesticides/polychlorinated biphenyls (PCBs), dioxins/furans, radionuclides, and general chemistry (including nitrate, nitrite, sulfate, alkalinity, and negative log of the hydrogen ion concentration [pH]). In addition to the wells, in 2005, 44 Hydropunch™ samples were collected south of the IRP Site 1 boundary to delineate the extent of perchlorate, and characterize the geology and hydrogeology. Selected wells were also routinely sampled as part of the Stationwide Groundwater Monitoring Program from 1992 until November 2006. Since 2007, selected wells at and downgradient of IRP Site 1 are being monitored as part of groundwater monitoring program for sites within former MCAS El Toro for which record of decision has not been finalized (i.e., Anomaly Area 3, and IRP Sites 1 and 2).

Table 3-3 presents a summary of detected analytes (excluding perchlorate) in IRP Site 1 groundwater wells during Stationwide groundwater monitoring, and sampling conducted as a part of the Phase I and Phase II RIs. A summary of general chemistry parameters for IRP Site 1 and 2 groundwater is presented in Table 3-4.

The Phase II RI Report provided a comprehensive assessment of the nature and extent of impacted soil and groundwater at IRP Site 1 based on the results of these investigations. The aquifer characterization and treatability studies performed subsequent to the Phase II RI provided further assessment of the extent of perchlorate in groundwater.

Low concentrations of VOCs were reported in IRP Site 1 groundwater during a few monitoring events. However, continued presence of these VOCs was not verified. These results indicate that negligible VOC-impacted groundwater is present at IRP Site 1. SVOCs were detected sporadically and at very low concentrations during the Stationwide groundwater monitoring. Only one SVOC (bis(2-ethylhexyl phthalate) was reported in groundwater during the Phase II RI. This indicates that negligible SVOC-impacted groundwater is present at IRP Site 1.

Low concentrations of total petroleum hydrocarbons (TPH) as motor oil, diesel oil, and gasoline were also reported in IRP Site 1 groundwater prior to 2007. However, based on the data presented in the Annual 2009 Groundwater Monitoring Report for Anomaly Area 3, and IRP Sites 1 and 2 (Trevet 2009), TPH has not been reported in any IRP Site 1 well since 2007. Therefore, this report recommended that TPH analysis of IRP Site 1 groundwater samples be discontinued. The California Department of Toxic Substances Control (DTSC) concurred with this recommendation and the RWQCB, Santa Ana Region did not have any comments.

With the exception of perchlorate, none of the other chemicals (VOCs, SVOCs, petroleum, radionuclides, metals and explosives) were above the thresholds that warrant further evaluation in the FS. The following section provides a brief summary of the perchlorate distribution.

3.2.1.1 PERCHLORATE

Perchlorate sampling was conducted at IRP Site 1 as part of Stationwide groundwater monitoring (CDM 1997 through 2005 and Trevet 2009), Stationwide perchlorate evaluation (BNI 1999a), verification of perchlorate study (Earth Tech 2001a), and Phase II RI (Earth Tech 2006a). Results for these investigations are summarized in the Phase II RI Report. Additionally, perchlorate sampling was conducted at IRP Site 1 as part of the *Aquifer Characterization and Bench-Scale Treatability Testing* activities (ECS 2006) and as part of an in-situ bioremediation pilot study (AECOM and ECS 2010). These results indicate that perchlorate was reported throughout IRP Site 1, between IRP Sites 1 and 2 along the western reach of Borrego Canyon Wash, at several locations within the IRP Site 2 boundary, and downgradient of IRP Site 2.

Figure 3-7 presents perchlorate results for the latest sampling round prior to initiation of the 2009-2010 in-situ bioremediation pilot study conducted. These results indicate the following:

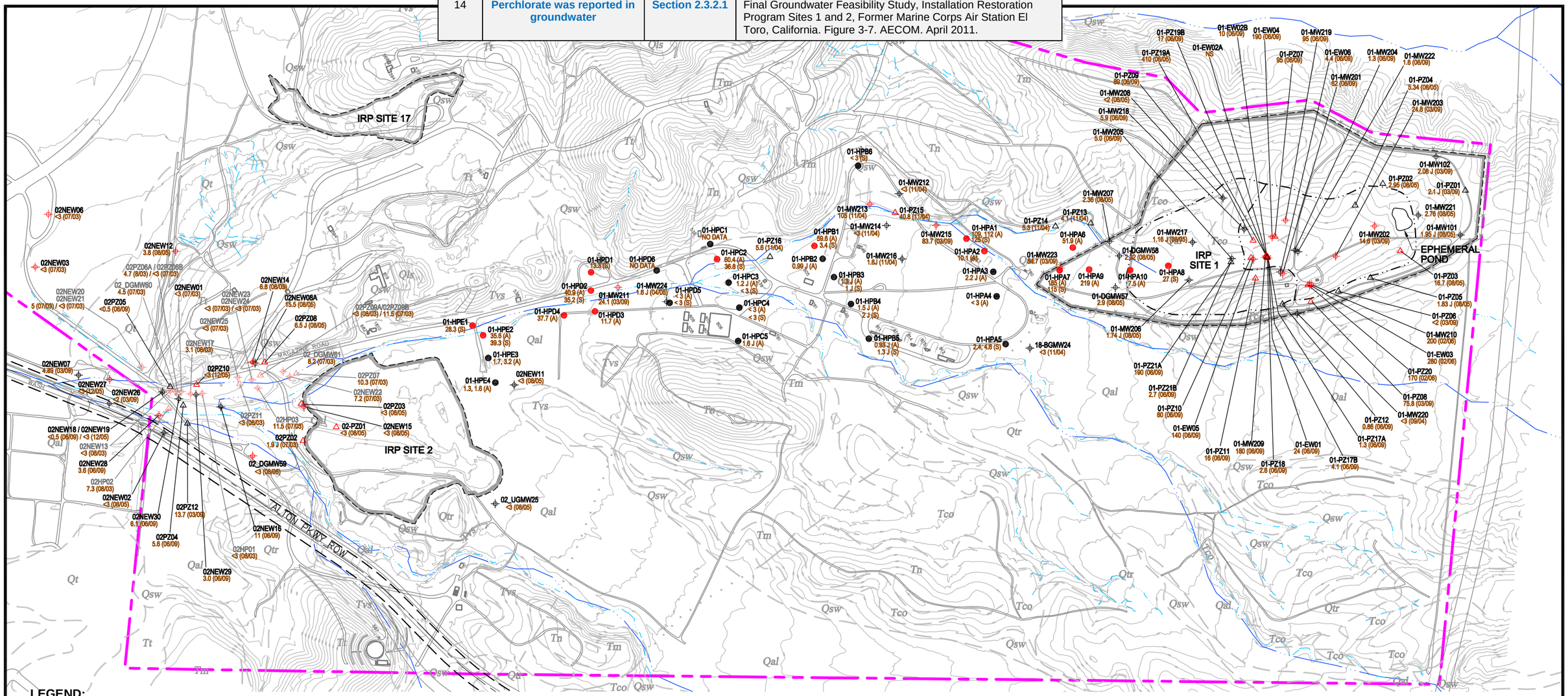
- The highest concentration of perchlorate (410 µg/L) was reported in the central portion of IRP Site 1 near the location of piezometer 01-PZ19A..
- Perchlorate was reported in groundwater in the central portion of IRP Site 1 in the Northern EOD Training Range at concentrations exceeding the drinking water equivalent level (DWEL) of 24.5 µg/L (U.S. EPA 2006a) and the California MCL of 6 µg/L by more than one order of magnitude. An analysis of historical operations and soil sampling results indicates that this area (hereinafter interchangeably referred to as perchlorate Source Area or central Source Area) is likely the source of perchlorate for areas located south of IRP Site 1, including the area between IRP Site 1 and IRP Site 2 (see Section 3.3.1 for details).
- Perchlorate concentrations exceeding the DWEL of 24.5 µg/L (U.S. EPA 2006a) extended from the central portion of IRP Site 1 up to the location of the east-west oriented line passing through locations of Boreholes 01-HPE1 through 01-HPE2. South of IRP Site 1, perchlorate concentrations exceeding the DWEL and the California MCL closely followed the western reach of Borrego Canyon Wash.
- South of the east-west oriented line passing through the locations of Boreholes 01-HPE1 through 01-HPE2, perchlorate concentrations reported were less than the DWEL but exceeded the California MCL.
- The highest concentration of perchlorate in IRP Site 2 groundwater was 15.5 µg/L reported in a sample taken from Monitoring Well 02-NEW08A during the groundwater monitoring round conducted in December 2005 (see Figure 3-7).

3.2.2 IRP Site 2

The Phase I RI identified COPCs based upon the analysis of groundwater samples (JEG 1993). Groundwater samples collected during the Phase II RI contained VOCs, SVOCs, pesticides, metals, and gross alpha-beta-emitting radionuclides (BNI 1996b). The compounds that exceeded MCLs include TCE, PCE, several metals, and gross alpha-emitting isotopes.

The verification of VOCs in the groundwater investigation performed in 2000 by Earth Tech confirmed localized concentrations of TCE and PCE in excess of the MCLs beneath Areas C1 and C2 (Earth Tech 2000a). However, the upgradient lateral extent of TCE and PCE was only partially defined (Earth Tech 2000a). Perchlorate was not reported. A supplemental investigation to evaluate the origin of radionuclides in groundwater confirmed that the radionuclides reported in groundwater at former MCAS El Toro are naturally occurring (Earth Tech 2001c). Subsequent groundwater monitoring results show consistent detections of VOCs and perchlorate at selected IRP Site 2 wells.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
14	Perchlorate was reported in groundwater	Section 2.3.2.1	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 3-7. AECOM. April 2011.



LEGEND:

- 01-HPE4 — HYDROPUNCH SAMPLING LOCATION (PERCHLORATE LESS THAN 6 µg/L)
- 01-HPA1 — HYDROPUNCH SAMPLING LOCATION (PERCHLORATE MORE THAN 6 µg/L)
- 1.6 J (A), < 3 (S), J — HYDROPUNCH PERCHLORATE CONCENTRATION (A INDICATES ALLUVIUM SAMPLE, S INDICATES WEATHERED BEDROCK SAMPLE, J INDICATES ESTIMATED VALUE)
- 01-MW206 — 4-INCH GROUNDWATER MONITORING WELL (PERCHLORATE LESS THAN 6 µg/L)
- 01-MW201 — 4-INCH GROUNDWATER MONITORING WELL (PERCHLORATE MORE THAN 6 µg/L)
- 01-PZ02 — 2-INCH PIEZOMETER (PERCHLORATE LESS THAN 6 µg/L)
- 01-PZ08 — 2-INCH PIEZOMETER (PERCHLORATE MORE THAN 6 µg/L)
- 01-MW201 — ABANDONED 4-INCH GROUNDWATER MONITORING WELL (PERCHLORATE LESS THAN 6 µg/L)
- 01-MW201 — ABANDONED 4-INCH GROUNDWATER MONITORING WELL (PERCHLORATE MORE THAN 6 µg/L)
- 01-PZ08 — ABANDONED 2-INCH PIEZOMETER (PERCHLORATE LESS THAN 6 µg/L)
- 01-PZ08 — ABANDONED 2-INCH PIEZOMETER (PERCHLORATE MORE THAN 6 µg/L)
- MCAS EL TORO BOUNDARY
- EOD RANGE BOUNDARY
- IRP SITE BOUNDARY (1, 2, AND 17)
- EPHEMERAL STREAM OR WASH (INTERPOLATED FROM TOPOGRAPHIC DATA)
- GEOLOGIC FAULT, DOTTED WHERE INFERRED
- EXISTING FENCE

DESCRIPTION OF MAP UNITS:

Qal	Flood Plain and Stream Channel Deposits (Holocene and Late Pleistocene)
Qsw	Sheetwash Deposits (Holocene to Middle Pleistocene)
Qtr	Trail Ridge Sands (Pleistocene)
Tn	Niguel Formation
Tco	Oso Member
Tm	Monterey Formation (Miocene)
Tt	Topanga Foundation (middle Miocene)
Tvs	Sespe and Vaqueros Formations

NOTES:

1. DATA SOURCE: MARCH 2009 GROUNDWATER MONITORING (TREVET 2010); JUNE 2009 PRE-BASELINE SAMPLING (AECOM and ECS 2010); PHASE II RI (EARTH TECH 2006b; & AQUIFER CHARACTERIZATION AND BENCH-SCALE TREATABILITY TESTING (ECS 2006)

<	LESS THAN
µg/L	MICROGRAMS PER LITER
EOD	EXPLOSIVE ORDNANCE DISPOSAL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
NS	NOT SAMPLED
RI	REMEDIAL INVESTIGATION

NORTH

0 350 700 FEET

SCALE: 1" = 700'

Feasibility Study — Draft Final

Pre-Pilot Study
Perchlorate Concentrations in Groundwater

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	3-7

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 3-7.dwg Time: Sep 30, 2010 - 3:20pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
15	**nature and extent of releases in IRP Site 2 groundwater**	**Section 2.3.2.2**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 3.2.2. AECOM. April 2011.

Perchlorate sampling was conducted at IRP Site 1 as part of Stationwide groundwater monitoring (CDM 1997 through 2005 and Trevet 2009), Stationwide perchlorate evaluation (BNI 1999a), verification of perchlorate study (Earth Tech 2001a), and Phase II RI (Earth Tech 2006a). Results for these investigations are summarized in the Phase II RI Report. Additionally, perchlorate sampling was conducted at IRP Site 1 as part of the *Aquifer Characterization and Bench-Scale Treatability Testing* activities (ECS 2006) and as part of an in-situ bioremediation pilot study (AECOM and ECS 2010). These results indicate that perchlorate was reported throughout IRP Site 1, between IRP Sites 1 and 2 along the western reach of Borrego Canyon Wash, at several locations within the IRP Site 2 boundary, and downgradient of IRP Site 2.

Figure 3-7 presents perchlorate results for the latest sampling round prior to initiation of the 2009-2010 in-situ bioremediation pilot study conducted. These results indicate the following:

- The highest concentration of perchlorate (410 µg/L) was reported in the central portion of IRP Site 1 near the location of piezometer 01-PZ19A..
- Perchlorate was reported in groundwater in the central portion of IRP Site 1 in the Northern EOD Training Range at concentrations exceeding the drinking water equivalent level (DWEL) of 24.5 µg/L (U.S. EPA 2006a) and the California MCL of 6 µg/L by more than one order of magnitude. An analysis of historical operations and soil sampling results indicates that this area (hereinafter interchangeably referred to as perchlorate Source Area or central Source Area) is likely the source of perchlorate for areas located south of IRP Site 1, including the area between IRP Site 1 and IRP Site 2 (see Section 3.3.1 for details).
- Perchlorate concentrations exceeding the DWEL of 24.5 µg/L (U.S. EPA 2006a) extended from the central portion of IRP Site 1 up to the location of the east-west oriented line passing through locations of Boreholes 01-HPE1 through 01-HPE2. South of IRP Site 1, perchlorate concentrations exceeding the DWEL and the California MCL closely followed the western reach of Borrego Canyon Wash.
- South of the east-west oriented line passing through the locations of Boreholes 01-HPE1 through 01-HPE2, perchlorate concentrations reported were less than the DWEL but exceeded the California MCL.
- The highest concentration of perchlorate in IRP Site 2 groundwater was 15.5 µg/L reported in a sample taken from Monitoring Well 02-NEW08A during the groundwater monitoring round conducted in December 2005 (see Figure 3-7).

3.2.2 IRP Site 2

The Phase I RI identified COPCs based upon the analysis of groundwater samples (JEG 1993). Groundwater samples collected during the Phase II RI contained VOCs, SVOCs, pesticides, metals, and gross alpha-beta-emitting radionuclides (BNI 1996b). The compounds that exceeded MCLs include TCE, PCE, several metals, and gross alpha-emitting isotopes.

The verification of VOCs in the groundwater investigation performed in 2000 by Earth Tech confirmed localized concentrations of TCE and PCE in excess of the MCLs beneath Areas C1 and C2 (Earth Tech 2000a). However, the upgradient lateral extent of TCE and PCE was only partially defined (Earth Tech 2000a). Perchlorate was not reported. A supplemental investigation to evaluate the origin of radionuclides in groundwater confirmed that the radionuclides reported in groundwater at former MCAS El Toro are naturally occurring (Earth Tech 2001c). Subsequent groundwater monitoring results show consistent detections of VOCs and perchlorate at selected IRP Site 2 wells.

The results of groundwater monitoring at IRP Site 2 were used to define the extent of the PCE impacted groundwater above 5 μg/L as shown on Figure 3-8. This figure represents the latest available PCE analytical results prior to 2009-2010 in-situ bioremediation pilot study for selected monitoring locations. Two wells (02NEW14, and 02NEW22) have PCE concentrations slightly above the MCL of 5 μg/L. The historical concentrations of PCE in Wells 02NEW08A and 02DGMW61 show that the concentrations of PCE have decreased over time. Detailed historical concentrations versus time graphs (including precipitation) are presented on Figures 3-9, 3-10 and 3-11. In addition, the results of the pre- and post- IRP Site 2 long-term aquifer test groundwater sampling show that the extent of the PCE impacted groundwater have decreased to two small areas, slightly above the MCL (CDM 2004). An additional assessment to further define the extent of the PCE-impacted groundwater is not necessary. Based on the historical groundwater sample results the PCE-impacted groundwater has naturally attenuated to slightly above the MCLs.

The lateral and vertical extent of TCE has been defined, as shown on Figure 3-8. Similar to PCE, this figure presents the latest available TCE analytical results prior to the in-situ bioremediation pilot study for each monitoring location. TCE has been reported below the MCL in off-Station Well 02NEW26 (screened in the alluvial-bedrock contact) at a concentration of 3.5 μg/L during the August 2005 sampling event. TCE was also reported in Well 02NEW28, located approximately 10 feet inside the Station Boundary, at a concentration of 25 μg/L. Based on the spatial distribution of TCE and the location of the inferred upgradient hydraulic barrier, the source of TCE appears to have originated from point sources in unauthorized disposal Area C2, downgradient of the former operational landfill areas. The historical concentrations of TCE in Well 02DGMW60 show that the concentrations of TCE have remained relatively stable to slightly decreasing since 1996. Between 1992 and 1996 the TCE concentrations increased from between 61 μg/L and 98 μg/L to 203 μg/L. In addition, the results of RIs and groundwater sampling conducted during the aquifer test show that the extent of the TCE-impacted groundwater has remained relatively stable over time (JEG 1993, BNI 1996b, Earth Tech 2006b). Based on the historical sample results and spatial distribution of TCE, the TCE-impacted groundwater is stabilized and appears to be slowly naturally attenuating.

The occurrence of 1,2,3-trichloropropane (1,2,3-TCP) was limited to wells with elevated TCE concentrations (Figure 3-8). The extent above the reporting limit has been defined.

Several other VOCs including cis-1,2-DCE and 1,1,2-trichloroethene (1,1,2-TCA) were consistently reported in direct correlation with the detection of TCE (Figure 3-12).

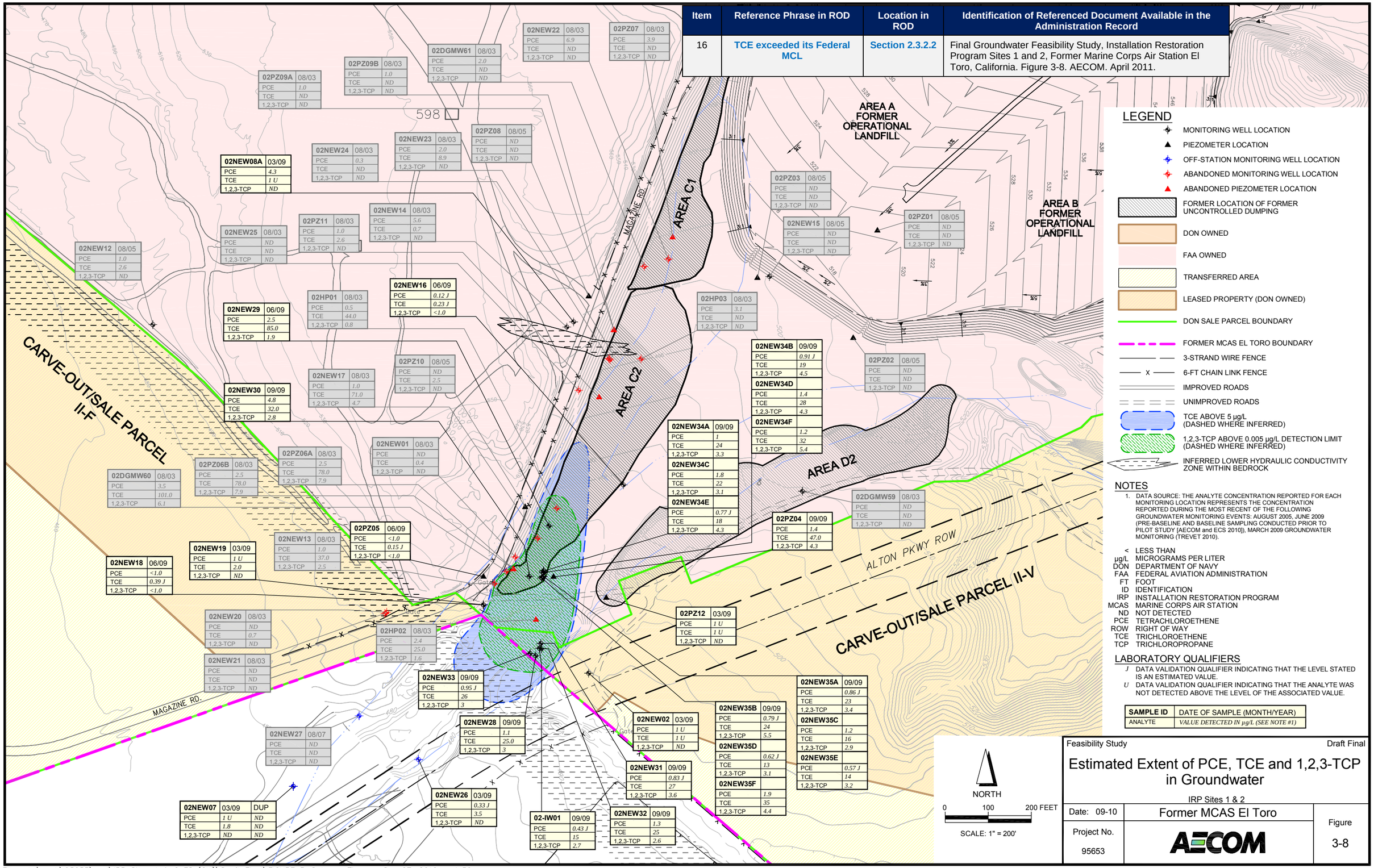
Perchlorate above the California MCL of 6 μg/L extends north to IRP Site 1 to approximately the Station Boundary (Figure 3-7). Perchlorate was reported in three off-Station wells below its California MCL of 6 μg/L. Based on the data collected during IRP Site 2 investigations along with the IRP Site 1 RI the reported perchlorate at IRP Site 2 is related to the release of perchlorate at IRP Site 1.

1,4-Dioxane was not reported in the wells sampled as part of the aquifer test at IRP Site 2 (Earth Tech 2006b). The reporting limit for 1,3-dioxane during this sampling event was equal to its California public health action of 3 μg/L. No additional sampling for 1,4-dioxane is required.

3.2.3 Conclusions

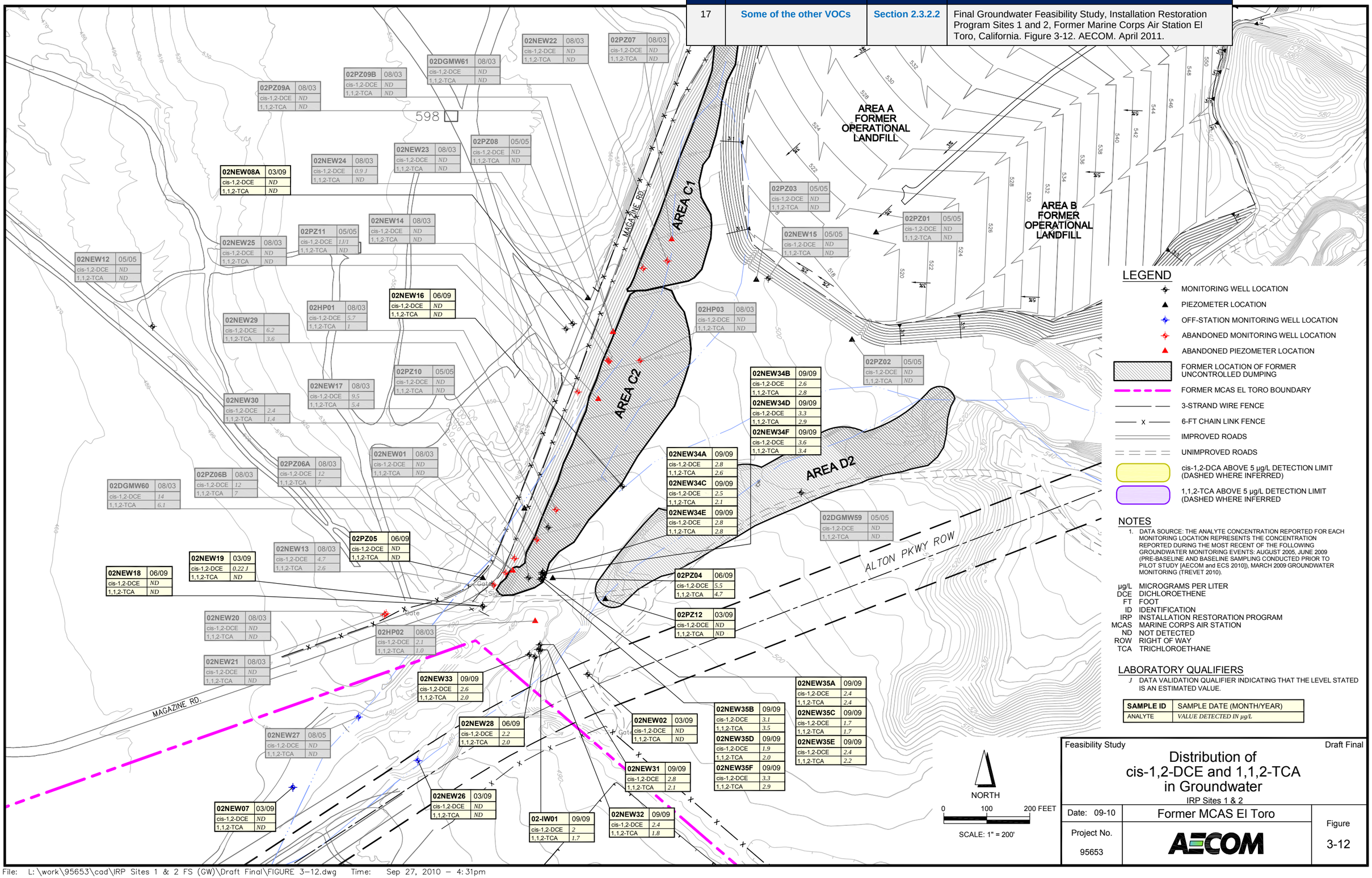
The groundwater investigations indicate that the only significant COPC in IRP Site 1 groundwater is perchlorate. Concentrations of other chemicals including VOCs, SVOCs, petroleum hydrocarbons, explosives residue (including NDMA), and radionuclides were not detected in IRP Site 1 groundwater at thresholds that would trigger response actions.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
16	TCE exceeded its Federal MCL	Section 2.3.2.2	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 3-8. AECOM. April 2011.



File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 3-8.dwg Time: Sep 27, 2010 - 4:30pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
17	Some of the other VOCs	Section 2.3.2.2	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 3-12. AECOM. April 2011.



File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 3-12.dwg Time: Sep 27, 2010 - 4:31pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
18	IRP Site 1	Section 2.5	Final Phase II Remedial Investigation Report, IRP Site 1, Explosive Ordnance Disposal Range, Former Marine Corps Air Station, El Toro, California. Section 6. December 2006.

6. Screening Risk Assessment – Human Health

6.1 INTRODUCTION

6.1.1 Purpose

This risk assessment is part of the Phase II RI for IRP Site 1 at Former MCAS El Toro, California. Detailed information regarding the RI (e.g., nature and extent of contamination, contaminant transport, and fate) is contained in Sections 4 and 5, and the approved Work Plan, wherein the risk assessment objectives were outlined (Earth Tech 2001a). However, where appropriate, information that is relevant to the interpretation of the risk evaluation has been summarized and included herein to provide all additional facts that were considered prior to completing the risk evaluation. Supporting tables are provided in Appendix G of this document.

A Tier 1 screening risk assessment (SRA) was conducted for IRP Site 1 to help risk managers determine if further action at the site is warranted. The decision for further action will include consideration of the potential for adverse human health effects as a result of exposure to chemicals detected at the site. These chemicals, termed COPCs, were identified and risk was evaluated for receptors that exist now (current conditions) or those that may exist in the future (future conditions). Analytical results from surface soil, subsurface soil, groundwater, surface water, and sediment analyses were used to identify the COPCs for each exposure medium evaluated in the SRA.

6.1.2 Human Health Screening Risk Assessment

This human health SRA quantitatively focused on the potential for human exposure to surface and subsurface soil, groundwater, surface water and sediment that may have been contaminated by past operations. As noted in the approved Work Plan (Earth Tech 2001a), a preliminary determination was made documenting that the potable use of groundwater at the site was negligible, despite its regulatory classification as a potential drinking water source. Although future groundwater use as a drinking water supply is believed to be unlikely, the SRA conservatively evaluates potential exposure to, and risk from, this medium, assuming residential use.

6.1.3 Guidance Documents

The human health SRA is based on a standard approach developed in accordance with guidelines from the following documents and communications:

- DON Human Health Risk Assessment Policy 5090 Ser N453E/1U595168 (DON 2001b)
- Navy Background Chemical Levels Policy 5090 Ser N45C/N4U732212 (DON 2004a)
- Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual (Parts A, B and E) (EPA 1989, 1991a, 2004c)
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors. (EPA 1991b)
- Exposure Factors Handbook (EPA 1997a)
- Communications between EPA Region 9 Toxicologist Dr. Daniel Stralka and Xuannga Mahini of Ogden Environmental and Energy Services, Inc. (Stralka 1995)

Risk assessments are key components of the Environmental Restoration Program employed by the DON. Pursuant to the DON policy 5090 Ser N453E/1U595168 (DON 2001b), the determination of human health risk at a site of concern is clearly prescribed to ensure sufficient resources are allocated for the protection of human health. The DON policy for conducting human health risk assessments

(HHRAs) identifies a three-tiered approach that may be implemented in its entirety depending on the level and magnitude of incremental risk or hazard that is determined in prior tiers. The tiers that are discussed in the DON policy are listed below.

Tier 1 - Screening Risk Assessment (SRA)

Tier 2 - Baseline Human Health Risk Assessment (BHHRA)

Tier 3 - Evaluation of Remedial Alternatives

The evaluation contained herein is Tier 1, the SRA. As defined by Navy Policy Ser N453E/1U595168 (DON 2001b), the purpose of the Tier 1 SRA is to identify COPCs that may pose excess risks to human health. This SRA incorporates all elements the Navy has identified as necessary for a screening assessment (DON 2001b); additionally, this SRA also includes elements typically of the Tier 2 assessment to satisfy screening requirements of EPA Region 9. Examples of additional elements traditionally included in the Tier 2 assessment include the evaluation of cumulative risks and the evaluation of risks under both a high-end level of exposure (reasonable maximum exposure [RME]) and an average level of exposure (central tendency exposure [CTE]), as well as a detailed qualitative evaluation of the uncertainty associated with this evaluation.

This Tier 1 SRA consists of two parts: Tier 1A, the risk-based screening (RBS) which satisfies the EPA Region 9 requirements of a screening preliminary risk evaluation (PRE), and Tier 1B, a site-specific risk-based evaluation (SSRBE) which satisfies the EPA Region 9 requirements for the site-specific PRE.

In certain instances, a SRA is not required. This can occur when negligible contamination is detected at a site. The SRA is, however, conducted if analytical data from the site investigation indicate that contamination is, or may be, of sufficient magnitude and distribution to warrant continuance of the risk assessment process.

The Tier 1A RBS methodology is consistent with Risk Assessment Guidance for Superfund (RAGS) sites (EPA 1989, and 1991a) and is conducted using risk-based concentration benchmarks (i.e., the EPA Region 9 PRGs (EPA 2004a) for the residential and industrial exposure scenarios) as the basis for comparison with site data. Based on recommendations from EPA Region 9 (Stralka 1995), the Tier 1A RBS (or screening PRE) is performed when:

- The complete or potentially complete exposure pathways of concern at a site are the same as those used to develop EPA Region 9 PRGs (EPA 2004a), and
- Pathway-specific exposure factors are expected to be similar to those used by the EPA for calculation of EPA Region 9 residential and/or industrial PRGs.

If complete or potentially complete exposure pathways for the site are not addressed in the use of the EPA Region 9 PRG tables (e.g., construction/utility worker), or if site conditions warrant the use of exposure factors that differ from those used to develop EPA Region 9 PRGs, a Tier 1B SSRBE is performed. Additionally, if the Tier 1A results indicate potentially significant health risks, the analysis proceeds to Tier 1B to derive more realistic, site-specific measures of risk.

6.2 DATA EVALUATION AND REDUCTION

Section 6.2 presents the details of the data quality assessment process and results. The following text summarizes the methods used to perform the data quality assessment for application to the SRA.

6.2.1 Data Quality Assessment

A data quality assessment was conducted, which included a review of analytical methods; reporting limits; laboratory, field, and method blanks; and quality assurance/quality control (QA/QC) procedures. This section presents the results of the data quality assessment for each element most pertinent to the SRA.

Soil, groundwater, surface water, and sediment data were reviewed in the following manner:

- A minimum of 20 percent of the analytical data were validated according to Navy "Level D" data validation criteria.

- A maximum of 80 percent of the data were validated according to Navy "Level C" (NFESC 1999).

Rejected Data. Data assigned an "R" qualifier (rejected) during data validation were eliminated from the database and not used for the SRA. In soil, a total of 49 analytical results were rejected. Of these results, seven were rejected for 1,2-dichloroethane, one for 2-butanone, and 41 acetone measurements were rejected. The rejected results are summarized in Table G-1, Appendix G. Data was rejected due to failures of laboratory quality control or calibration and corrective action could not be taken to validate the data. The effect of the rejected data on the risk estimates is discussed in Section 6.6.5, Uncertainties in the Screening Risk Assessment. All usable soil data were compared to EPA Region 9 residential and industrial soil PRGs (EPA 2004a). None of the analytical results for groundwater, surface water or sediment was rejected during the validation process, and all results were considered usable for the SRA.

Laboratory Contaminants. All data have been validated and the third-party validators determined that there is no objective evidence to qualify acetone and methylene chloride data based on their association with field or laboratory blanks. The measurements were retained for risk assessment purposes.

Chemicals Analyzed with Multiple Methods. Compounds such as 2,4-dinitrotoluene and 2,6-dinitrotoluene were analyzed using two methods: SVOC (SW8270) analysis and Nitroaromatics (SW8330) analysis. In reviewing the data, the data validators determined which of the two results to retain. In most cases, results by the SVOC method were rejected while those of the Nitroaromatics method were retained. However, in at least one instance (including the maximum reported concentration of 2,4-dinitrotoluene), the result with the Nitroaromatics method was determined to be less reliable (due to matrix interference) and the SVOC method result was retained.

For comparison purposes, soil data were segregated into surface soil data and subsurface soil data. Surface soil is defined as soil collected from 0 to 2 feet bgs. Subsurface soil is defined as soil collected from the 0 to 10-feet bgs.

6.2.2 Sample Reporting Limit Evaluation

The magnitude of the sample reporting limits (RLs) may have a substantial effect on the results of the risk assessment. RLs may be set at levels determined by the analytical method or may become elevated due to sample preparation procedures or during sample analysis. Potential causes of elevated RLs include percent soil moisture, limited sample volume, and matrix interferences where high levels of non-target compounds limit the ability to detect target chemicals, or dilutions required to detect certain target compounds mask the detection of other chemicals. The potential presence of chemicals in environmental media at concentrations below the highest sample reporting limit could result in a potential underestimation of cancer risk or adverse noncarcinogenic health effects if the

concentration were deemed to be negligible and exposure were to occur. However, it is also possible that these chemicals are not present, and therefore, do not contribute to additional risk for human receptors. The assumption that the chemical is present when, in fact it is not, would potentially result in an overestimation of the potential for adverse health effects. For these reasons, a detailed evaluation of the sample reporting limits was performed before cancer risk or noncarcinogenic health effects were assessed to ensure that the risk estimate was as accurate and unbiased as possible.

Table G-2, Appendix G, presents those chemicals with nondetect values (i.e., reporting limits) that exceed a designated screening criterion. These screening criteria were selected as follows:

- For soil samples, the screening criteria were the EPA Region 9 residential soil PRGs (EPA 2004a). However, the PRGs do not have criteria for TPH. The CRWQCB recommends the use of the ASTM standard for Risk Based Corrective Action (RBCA), ASTM E-1739-95 (ASTM 1995), to evaluate potential health risk due to TPH (CRWQCB 1996). Because the ASTM standard provides Tier 1 screening levels for indicator chemicals (i.e., benzene, ethylbenzene, toluene, xylene [BTEX], and PAHs), reporting limits for petroleum hydrocarbons were evaluated by reviewing those of indicator chemicals in soil.
- Groundwater screening criteria were EPA Region 9 tap water PRGs (EPA 2004a). Because the CRWQCB (1996) recommends the use of the ASTM standard for RBCA to evaluate potential health risk due to petroleum hydrocarbons, the evaluation of indicator chemicals (and not hydrocarbon mixtures) was deemed sufficient to assess reporting limits.
- For surface water, the screening criteria were the EPA Region 9 residential tap water PRGs (EPA 2004a) as they were deemed to be conservative values for the assessment of RLs.
- For sediment, the screening criteria were the EPA Region 9 residential soil PRGs (EPA 2004a) they were deemed to be conservative values for the assessment of RLs.

Table G-2, Appendix G, illustrates the frequency that reporting limits exceed screening criteria. Typically, the reporting limit may be elevated due to sample matrix interferences. For the surface soil samples, 15 VOCs, 26 SVOCs, and two inorganic chemicals had reporting limits that exceeded screening criteria. Except for the following seven chemicals, the frequency of RLs for nondetected chemicals that exceeded screening criteria is less than five percent. Only one chemical, hexachlorobenzene, had a range of reporting limits that were greater than the screening criterion for 100 percent of the samples.

Arsenic

Bis(2-Chloroethyl) ether

Hexachlorobenzene

n-Nitrosodi-n-propylamine

Dibenz(a,h) anthracene

Benzo(a)pyrene

Perchlorate

For the subsurface soil, 16 VOCs, 27 SVOCs, and three inorganic chemicals had reporting limits that exceeded the screening criterion. Except for the following 10 chemicals, the frequency of RLs for nondetected chemicals that exceeded screening criteria is less than five percent. Only one chemical, hexachlorobenzene, had a range of reporting limits that were greater than the screening criterion for all samples.

Arsenic

Bis(2-Chloroethyl) ether

Hexachlorobenzene

n-Nitrosodi-n-propylamine

Dibenz(a,h) anthracene

Benzo(a)anthracene

Benzo(b)fluoranthene

Benzo(a)pyrene

Indeno(1,2,3-c,d)pyrene

Perchlorate

For groundwater, there were numerous nondetected chemicals with RLs for all samples that exceeded screening criteria including three VOCs, 21 SVOCs, three explosives residues, and five inorganic chemicals. These include the following chemicals.

1,1,2,2-Tetrachloroethane	cis-1,3-dichloropropene
trans-1,3-Dichloropropene	2,4,6-Trichlorophenol
3,3'-Dichlorobenzidine	3-Nitroaniline
4-Nitroaniline	Benzo(a)anthracene
Benzo(b)fluoranthene	Benzo(k)fluoranthene
Benzo(a)pyrene	Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl)ether	BEPH
Carbazole	Dibenz(a,h)anthracene
Hexachlorobenzene	Hexachlorobutadiene
Indeno(1,2,3-c,d)pyrene	Nitrobenzene
n-Nitrosodi-n-propylamine	n-Nitrosodimethylamine
Pentachlorophenol	1,2-Dinitrobenzene
2,4,6-Trinotrotoluene	RDX
Perchlorate	Antimony
Arsenic	Lead
Thallium	

When sample reporting limits for nondetected chemicals exceeded the screening criteria, additional uncertainty may be introduced into final risk estimates. Where sample reporting limits appeared to be

inordinately high relative to other samples evaluated, an additional evaluation of the data was performed in the data reduction step (Section 6.2.3.3). The influence of elevated reporting limits on the SRA results is qualitatively discussed in Section 6.6.5, Uncertainties in the Screening Risk Assessment.

6.2.3 Data Reduction

The SRA focuses on data from the impacted area(s) within the study site. Chemicals that have been detected at least once are considered COPCs for the Tier 1A RBS (or screening PRE under the EPA Region 9 terminology). Relevant data sets are identified to facilitate the estimation of chemical exposure point concentrations (EPCs) to which receptors may reasonably be exposed. If environmental samples are analyzed for a chemical using more than one analytical method, then the results that are most reliable (as indicated by data validation qualifiers or laboratory data qualifiers), have the lowest detection limits, and provide the most representative environmental concentrations with respect to exposure are selected.

Conclusions and recommendations of the risk assessment are often based on the reasonable maximum exposure (RME) that a receptor may encounter. Key in determining the RME is a statistical evaluation of the data set, which provides summary statistics such as maximum detected concentration, minimum detected concentration, number of detects, and upper confidence levels on the mean value. Prior to making this summary, the data set was manipulated for input into the risk model. Thus, the data set was "reduced" by (a) averaging original and field duplicate samples to yield one datum per sampling locus, (b) choosing appropriate analytical methods, and (c) eliminating elevated or inordinately high nondetect values. Each of these steps is discussed in the sections that follow.

6.2.3.1 Field Duplicate Samples

For soil samples, field duplicates were treated in the following manner:

Case 1: The original sample and field duplicate results for the COPC were above the reporting limit for the COPC.

Both values were averaged to obtain an average concentration for the sample pair before the statistical summary was performed.

Case 2: One sample of the duplicate pair had a concentration that was nondetect for the COPC, while the other exceeded the reporting limit.

The nondetect value was assigned a value of one-half its reporting limit and was then averaged with the detected concentration. If a qualifier existed on the detected concentration, that qualifier remained with the "averaged" value.

Case 3: Both samples had COPC concentrations that were nondetect.

The two values (i.e., RL) were averaged to obtain an average RL for the sample pair. Prior to summarizing the data statistically for EPC determination (i.e., calculation of the 95th upper confidence limit [UCL] on the arithmetic mean), the average RL of the sample pair was then assigned a value of one-half of that average RL. In so doing, the underestimation of risk due to use of a "biased low" data set (resulting from assigning the surrogate concentration twice during the process) was minimized.

6.2.3.2 Appropriate Analytical Methods

When more than one analytical method was used to determine presence and quantity of a particular chemical, the “best” of the analytical results was used for quantitative evaluation. The best analytical

results were selected in accordance with the data usability guidelines for risk assessment (EPA 1992a) and the analytical method with the more reliable (and sometimes, most conservative) results was selected for quantitation.

6.2.3.3 ELEVATED REPORTING LIMITS FOR NONDETECT VALUES

One or more sample-specific factors (e.g., matrix interferences) may result in RLs for a particular chemical that, in some samples, may be unusually high. As noted above, potential causes of elevated RLs include percent soil moisture, limited sample volume, and matrix interferences (i.e., high levels of non-target compounds that limit the ability to detect target chemicals, or dilutions required to detect certain target compounds mask the detection of other chemicals). Sometimes these elevated RLs greatly exceed the detected results for the same chemical in other samples, suggesting that the elevated RL is not representative of the data set as a whole or site conditions. Inclusion of these data when determining the EPCs (e.g., calculating the 95 percent UCL) could correspondingly result in poorly characterized risk (EPA 1989). Therefore, sample results that were reported as nondetections with RLs that exceed twice the maximum detected concentration were not included in the statistical analysis. The chemicals reported as nondetections with RLs (for a specific chemical) that exceeded twice the maximum detection are summarized below in Table 6-1 according to the medium evaluated.

Table 6-1: Summary of Chemicals Having Reporting Limits Exceeding Twice the Maximum Detected Concentration

Surface Soil		Subsurface Soil	
Chemical	ND > 2 times Max[a]	Chemical	ND > 2 times Max[a]
2,6-Dinitrotoluene	72	2,6-Dinitrotoluene	148
2-Butanone	67	2-Butanone	143
2-Hexanone	8	2-Hexanone	7
4-Methyl-2-Pentanone	83	4-Methyl-2-Pentanone	173
Acetone	64	Acetone	5
Bis(2-Ethylhexyl)Phthalate (BEPH)	2	Bis(2-Ethylhexyl)Phthalate (BEPH)	12
Chloroform	79	Chloroform	160
Diethyl Phthalate	70	Cobalt	1
Fluoranthene	71	Diethyl Phthalate	110
Motor Oils	1	Fluoranthene	146
Phenol	1	Hexachlorobenzene	112
--	--	Motor Oils	5
--	--	Phenol	4
--	--	Selenium	1
--	--	Tetrachloroethene	172
--	--	Thallium	1

Notes:
[a] number of analyses having reporting limits greater than 2 times the maximum detection
> = more than
ND = non-detect

6.2.4 Summary Statistics for Sample Data

Summary statistics (e.g., frequency of detection, maximum values) for the detected chemicals in surface soil, subsurface soil, groundwater, sediment, surface water samples, all of which were evaluated in this RBS, appear in Tables G-3 through Table G-7, Appendix G. One-half the sample RL (U or UJ qualified) was used as a proxy value for nondetects in all statistical calculations. Rejected data and nondetect data with elevated RLs were not used to calculate summary statistics or conduct statistical comparisons. A 95 percent UCL is included based on the method(s) described in Section 6.4.4.

6.3 SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Analytes expected to be characteristic of releases at IRP Site 1 were used to identify COPCs. The chemical groups included metals, VOCs, SVOCs, dioxins/furans, explosives residues, perchlorate, and petroleum hydrocarbons. As such, the Work Plan proposed a comprehensive list of chemicals for testing (Earth Tech 2002). From all data derived from the analyses, all usable (non-rejected) contaminant chemicals detected at least once in an environmental medium (i.e., soil, groundwater, surface water, or sediment) were considered COPCs for the RBS. The selection of COPCs followed a tiered approach as outlined in the DON Human Health Risk Assessment Policy (DON 2001b).

To determine whether the COPCs should be further evaluated in the Tier 1B SSRBE, maximum detected concentrations are compared to EPA Region 9 residential PRGs. COPCs having maximum detected concentrations greater than the residential screening criteria are retained for further evaluation in the SSRBE to determine the magnitude of exposure associated with incremental cancer risk or noncancer hazard based on hypothetical or planned reuse.

6.3.1 Essential Nutrients

Calcium, magnesium, potassium, and sodium are referred to as essential nutrients. These chemicals do not have toxicity criteria or PRGs, and are generally considered to be of minor, if any, concern in risk assessments performed for hazardous waste site remedial activities. While these essential nutrients were not quantitatively evaluated in this Report, they have been summarized and presented for information purposes in subsequent risk summary tables.

6.3.2 Summary of Chemicals of Potential Concern by Media for Each Site

All chemicals detected in surface soil, subsurface soil, groundwater, surface water, and sediment were retained as COPCs for the human health RBS evaluation. A summary of the COPCs that were evaluated in each environmental medium is provided in the following subsections.

6.3.2.1 SURFACE AND SUBSURFACE SOIL

VOCs, SVOCs, dioxins, explosives residues, TPH, and inorganic chemicals (including perchlorate) were detected in surface soil samples collected at the site. All of the above chemicals or classes were detected in the subsurface soil with the addition of one explosive residue and three metals.

6.3.2.2 GROUNDWATER

Groundwater samples were collected from each of the monitoring wells installed at IRP Site 1. Chemicals detected in groundwater were dominated by inorganic elements. The VOCs detected in groundwater samples included BTEX, cis-1,2-dichloroethene, methylene chloride, and TCE, BEPH was the only SVOC detected in groundwater. Diesel and oil range organics were also detected. All detected chemicals were retained as COPCs for the human health RBS.

6.3.2.3 SEDIMENT

Chemicals detected in sediment samples collected from the Ephemeral Pond were dominated by inorganic elements. Toluene, pyrene, and TPH were also detected.

6.3.2.4 SURFACE WATER

Chemicals detected in surface water samples that were collected from the Ephemeral Pond, or in the outfall from the Ephemeral Pond, as well as in the stream leading downgradient from IRP Site 1, were dominated by inorganic elements. Acetone, RDX, and TPH were also detected.

6.3.3 Chemicals Without Toxicity Values

Several chemicals detected in the various environmental media do not have toxicity values with which to derive PRGs and evaluate chemical-specific risks. The omission of these chemicals from the risk evaluation is addressed qualitatively in Section 6.6.5.3, Uncertainties in the Toxicity Assessment.

6.4 EXPOSURE ASSESSMENT

The exposure assessment section identifies land use and receptors that currently, or in the future, are likely to use the property and, as a result, may contact COPCs identified in the previous sections.

6.4.1 Land Use and Receptors

6.4.1.1 CURRENT LAND USE AND RECEPTORS

IRP Site 1 is located in the northeast portion of Former MCAS El Toro in the foothills of the Santa Ana Mountains. A great portion of the land immediately surrounding Former MCAS El Toro, including areas adjacent to IRP Site 1, has been used for agricultural activities. Continued urbanization, however, has brought housing developments about ½-mile to the northeast of IRP Site 1. The land located farther north and northeast of the site near the foothills of the Santa Ana Mountains remains essentially undeveloped. Areas located to the south, southeast, and southwest have been developed for commercial, light industrial, and residential uses.

According to the Santa Ana Region Basin Plan (CRWQCB 1995), the groundwater beneath Former MCAS El Toro has potential beneficial uses for a municipal water supply, agricultural and industrial supplies, and industrial process supply. Groundwater in the vicinity of Former MCAS El Toro is mostly used for irrigation of agricultural and greenbelt areas (i.e., parkways and parks). Potable water in the area is imported from various sources, and the remainder comes from local resources, including groundwater. The nearest municipal wells used as drinking water sources are associated with the recently installed Irvine Desalter project and are located within approximately 5 miles of IRP Site 1, near the intersection of Irvine Center Drive and Culver Drive. It is anticipated that the new wells will be operational by October 2006. The following current human receptors were identified for potential evaluation in the human health SRA:

- Current offsite residents (adult/child),
- Current offsite workers
- Current onsite industrial workers,
- Current construction/utility workers, and
- Current casual trespassers (restricted to the adult)

6.4.1.2 FUTURE LAND USE AND RECEPTORS

Because unrestricted future development is possible, various types of future potential receptors may occur at the site. Future use could include those supporting residential or industrial activities, or may include other site-specific possibilities such as a wildlife reserve or as a training site for investigative detonations in a manner similar to previous training activities performed by the Orange County Sheriff and the FBI. The receptors identified as those most likely to encounter residual chemical concentrations in the various media at IRP Site 1 include:

- Future onsite residents (adult/child),
- Future offsite residents (adult/child),
- Future offsite workers
- Future onsite industrial workers,
- Future construction/utility workers,
- Future casual trespassers (restricted to the adult),
- Future wildlife reserve workers, and a
- Future EOD Training Range supervisor in charge of detonation operations.

The EOD Training Range supervisor would likely be present for all future detonation operations and is considered the most highly exposed individual for this potential future use.

6.4.2 Conceptual Site Model

The Conceptual Site Model (CSM) is a schematic representation of the chemical source areas, chemical release mechanisms, environmental transport media, potential exposure routes, and potential receptors. It is used to guide the evaluation of potential exposures so that relevant pathways, exposure routes, and ultimately risks can be evaluated in the SRA. The primary purpose of the CSM in this risk evaluation is to represent chemical sources and exposure pathways that may result in human health risks. Only potentially complete exposure pathways are evaluated quantitatively in the risk assessment, consistent with EPA Guidance (EPA 1989).

A complete exposure pathway includes all of the following elements:

- Sources and type of chemicals present
- Affected media
- Chemical release and transport mechanisms
- Known and potential routes of exposure
- Known or potential human and environmental receptors

The absence of any one of these elements results in an incomplete exposure pathway. Thus, for an incomplete pathway with no potential human exposure, the potential for adverse health effects would be deemed negligible and does not warrant further evaluation. Figure 6-1 is the CSM for current and anticipated future receptors potentially exposed to COPCs in surface soil, subsurface soil, and groundwater, as well as surface water and sediment associated with IRP Site 1.

The exposure pathways for each scenario and each receptor shown in the CSM are described in Section 6.4.3.

6.4.3 Exposure Pathways

Exposure pathways are specifically associated with the environmental medium that is being evaluated. In a generic context, soil, water, and air pathways may facilitate exposure; each of these might result in intake by applicable exposure routes, such as ingestion, dermal absorption, or inhalation. In most settings, exposure pathways may be incomplete or complete, as discussed in Section 6.4.2. The rationale for making this determination is presented below.

6.4.3.1 INCOMPLETE EXPOSURE PATHWAYS

Of those exposure pathways that are presented on Figure 6-1, several have been deemed to be incomplete, insignificant, or not applicable to the SRA. Thus, these pathways do not warrant quantitative assessment. The rationale for excluding a pathway from further evaluation follows:

- Ingestion of plants and animals that are grown or raised in site surface soil is considered an incomplete exposure pathway since no current agricultural activities occur onsite and future agricultural activities are deemed unlikely. Future residents are not anticipated to engage in agricultural activities (i.e., gardening) to the extent that exposure to chemicals in the surface soil would result in significant chemical intake.
- Ingestion of plants and animals that are grown or raised with site surface water or in sediment is considered an incomplete exposure pathway for current receptors since no agricultural activities currently occur onsite and future agricultural activities are deemed unlikely. Future residents are not anticipated to engage in agricultural activities (i.e., gardening) to the extent that exposure to chemicals in surface water would result in significant chemical intake.
- Ingestion of chemicals in subsurface soil is considered an incomplete exposure pathway for offsite receptors, current casual trespassers, and current onsite industrial workers as direct contact with this secondary source is unlikely. Additionally, future trespassers, wildlife reserve workers, and an EOD Training Range supervisor are not expected to directly contact subsurface soil.
- Dermal contact with chemicals in subsurface soil is considered an incomplete exposure pathway for the casual trespasser and current onsite industrial workers as direct contact with this secondary source is unlikely. Additionally, future trespassers, wildlife reserve workers, and an EOD Training Range supervisor are not expected to directly contact subsurface soil.
- Inhalation of fugitive particles from contaminated subsurface soil by current offsite receptors, and current onsite industrial workers and current casual trespassers is incomplete since these receptors cannot interface with subsurface soil. Where subsurface soil is excavated, exposure to fugitive particulates is insignificant for future casual trespassers, wildlife reserve workers, or an EOD Training Range supervisor relative to other exposure pathways such as direct contact with surface soil.
- Dermal contact with impacted groundwater is considered an incomplete pathway for current onsite workers and casual trespassers and current offsite residents since impacted groundwater onsite is not currently used nor has it migrated to wells for current offsite receptors. Future trespassers, wildlife reserve workers, or an EOD Training Range supervisor are not expected to contact groundwater. Future potential exposure for construction/utility workers is insignificant relative to other exposure pathways.
- Inhalation of VOCs in ambient air from impacted groundwater by current onsite workers, offsite residents (adults/children), current and future onsite construction/utility workers and casual trespassers, future wildlife reserve workers, or an EOD Training Range supervisor is insignificant as the chemical intake anticipated for these receptors is relatively less as compared to other exposure pathways.

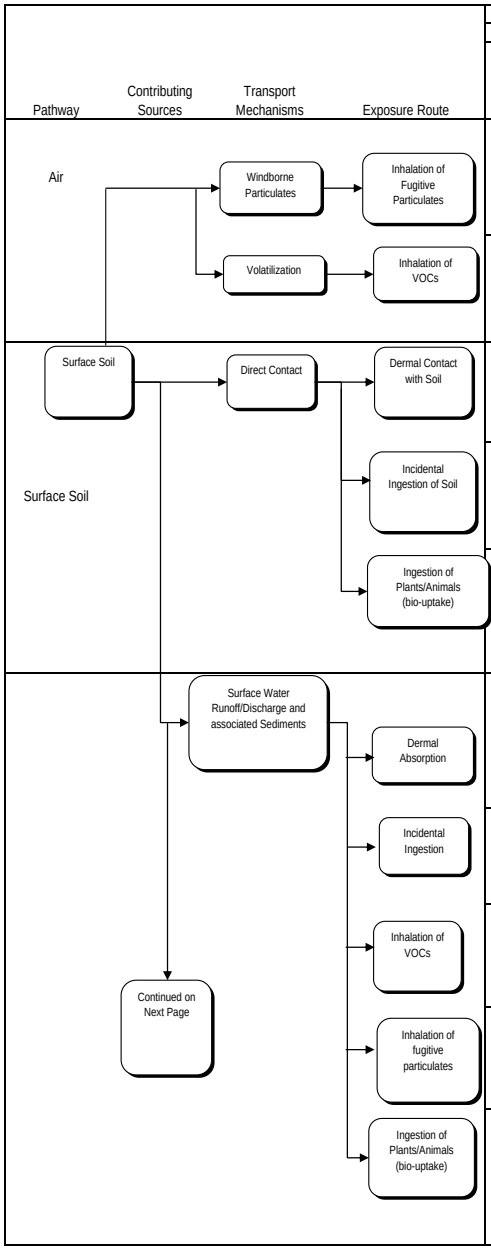
- Ingestion of plants and animals that are grown or raised with impacted groundwater by current or future onsite industrial workers, construction/utility workers, casual trespassers, future wildlife reserve workers, or a future EOD Training Range supervisor is considered an incomplete exposure pathway since no current agricultural activities occur onsite and future agricultural activities are unlikely to lead to exposure for these receptors. This pathway is incomplete for current offsite residents since impacted groundwater has not migrated to offsite wells used by this receptor. For future onsite residents, this exposure pathway is insignificant relative to other exposure pathways such as ingestion and dermal contact with surface soil.
- Ingestion of impacted groundwater as a drinking water source for current offsite residents or onsite industrial workers, construction workers, and casual trespassers is considered an incomplete exposure pathway as impacted groundwater is not currently used onsite nor has it migrated to wells used by offsite receptors. Additionally, future construction workers, casual trespassers, wildlife reserve workers, or a future EOD Training Range supervisor are not expected to use the groundwater onsite as a source for drinking water.
- Ingestion of chemicals in plants/animals grown or raised with impacted groundwater by current offsite residents (adults/children) is incomplete, as impacted groundwater has not migrated to wells used by offsite receptors. For future onsite residents (adults/children), the pathway is considered insignificant relative to other exposure pathway such as ingestion and dermal contact with surface soil.

6.4.3.2 POTENTIALLY COMPLETE EXPOSURE PATHWAYS

Based on analysis of the CSM, the following exposure pathways were considered for evaluation:

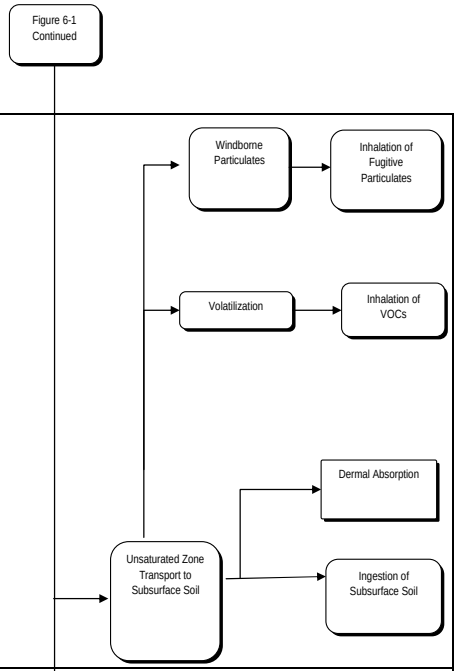
- Incidental ingestion of chemicals in surface soil by future onsite residents (adults/children) and current and future industrial workers, current and future construction/utility workers, current and future casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Dermal adsorption of chemicals from surface soil by future onsite residents (adults/children) and current and future industrial workers, current and future construction/utility workers, and current and future casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Inhalation of fugitive particulates from surface soil by future onsite residents (adults/children) and current and future industrial workers, current and future construction/utility workers, current and future casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Inhalation of VOCs in ambient air from impacted surface soil by future onsite residents (adults/children) and current and future industrial workers, current and future construction/utility workers, current and future casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Incidental ingestion of chemicals in subsurface soil by future onsite residents (adults/children), current and future construction/utility workers, and future industrial workers through excavation or gardening activities.
- Dermal adsorption of chemicals from subsurface soil by future onsite residents (adults/children), current and future construction/utility workers, and future industrial workers through excavation or gardening activities.

FIGURE 6-1: Conceptual Site Model for IRP Site 1



Receptors									
Current Land Use			Future Land Use						
Off-Site Residents (Adult/Child) or Onsite Workers	Construction/ Utility Workers	Casual Trespassers (adult)	Off-Site and On-Site Residents (Adult/Child)	On-Site Industrial Workers	Construction/ Utility Workers	Casual Trespassers (adult)	Wildlife Reserve Worker	EOD Range Supervisor	Rationale
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Inhalation may be a potentially complete pathway for fugutive dust generated during dry, windy conditions, during construction activities or potential future blasting operations.
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	The inhalation of VOCs is a potentially complete exposure pathway for all curren and future onsite receptors. This pathway is insignificant for offsite receptors due to dispersion of airborne chemicals.
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Direct contact with surface soil is a potentially complete pathway for current and future residents, onsite workers, casual trespassers, and future wildlife reserve worker or range supervisor.
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Incidental ingestion of surface soil by future onsite residents and current and future onsite workers, construction/utility workers, casual trespassers wildlife reserve worker or range supervisor is potentially complete.
Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	There are no current agricultural activities on-site. Pathway is considered insignificant relative to other potential exposure pathways for future onsite residents as gardening would not likely result in significant chemical intake. Other future onsite receptors are not expected to engage in gardening or other agricultural activities.
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Pond adjacent to IRP Site 1 does have standing water upon occasion. Therefore, surface water and associated sediments provide a secondary source for exposure via this pathway.
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Pond adjacent to IRP Site 1 does have standing water upon occasion. Therefore, surface water and associated sediments provide a secondary source for exposure via this pathway.
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Surface water and associated sediments provide a secondary source for VOCs that may be emitted into ambient air.
Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Inhalation may be a potentially complete pathway for fugutive dust generated during dry, windy conditions or during construction activities.
Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	There are no current agricultural activities on-site. Pathway is considered insignificant relative to other potential exposure pathways for future onsite residents as gardening (watered with surface water) would not likely result in significant chemical intake. Other future onsite receptors are not expected to engage in gardening or other agricultural activities.

FIGURE 6-1: Conceptual Site Model for IRP Site 1



Pathway / Contributing Sources / Transport Mechanisms / Exposure Route	Receptors: Current Land Use: Off-Site Residents (Adult/Child) or Onsite Workers	Current Land Use: Construction/ Utility Workers	Current Land Use: Casual Trespassers (adult)	Future Land Use: Off-Site and On-Site Residents (Adult/Child)	Future Land Use: On-Site Industrial Workers	Future Land Use: Construction/ Utility Workers	Future Land Use: Casual Trespassers (adult)	Future Land Use: Wildlife Reserve Worker	Future Land Use: EOD Range Supervisor	Rationale
Windborne Particulates → Inhalation of Fugitive Particulates	Incomplete	Potentially Complete	Incomplete	Potentially Complete	Potentially Complete	Potentially Complete	Insignificant	Insignificant	Insignificant	Inhalation may be a potentially complete pathway for current construction/utility workers as fugutive dust may be generated during excavation of subsurface soils. Exposure pathway is potentially complete for future construction workers, residents and industrial workers as construction activites may bring subsurface soils to the surface but the pathway is considered insignificant relative to other exposure pathways for the casual trespasser, wildlife reserve worker or range supervisor.
Volatilization → Inhalation of VOCs	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	The inhalation pathway for VOCs in ambient air is potentially complete for all receptors. For future onsite residents and industrial workers, the inhalation of VOCs in indoor air is also potentially complete.
Unsaturated Zone Transport to Subsurface Soil → Dermal Absorption	Incomplete	Potentially Complete	Incomplete	Potentially Complete	Potentially Complete	Potentially Complete	Incomplete	Incomplete	Incomplete	Infiltration to subsurface soil is potentially complete. Subsurface soils may be contacted by onsite workers or residents through excavation or gardening activities. Casual trespassers, wildlife preserve worker or range supervisor will not likely come into contact with subsurface soils.
Unsaturated Zone Transport to Subsurface Soil → Ingestion of Subsurface Soil	Incomplete	Potentially Complete	Incomplete	Potentially Complete	Potentially Complete	Potentially Complete	Incomplete	Incomplete	Incomplete	Infiltration to subsurface soil is potentially complete. Subsurface soils may be contacted by future onsite workers or residents through excavation or gardening activities. Casual trespassers, wildlife reserve worker or range supervisor will not likely come into contact with subsurface soils.
Unsaturated/Saturated Zone Transport to Groundwater → Dermal Absorption	Incomplete	Potentially Complete	Incomplete	Potentially Complete	Potentially Complete	Insignificant	Incomplete	Incomplete	Incomplete	Groundwater offsite used for irrigation, but impacted groundwater has not migrated to offsite wells used by these receptors. No other current receptor potentially exposed. Future casual trespassers are not expected to contact groundwater such that exposure is incomplete. Future exposure to groundwater may occur for construction/utility workers, future onsite residents or future onsite workers, but for construction/utility workers, the pathway is insignificant relative to other exposure pathways.
Unsaturated/Saturated Zone Transport to Groundwater → Inhalation of VOCs from Groundwater	Insignificant	Insignificant	Insignificant	Potentially Complete	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Currently, inhalation of VOCs in ambient air resulting from VOCs that migrated from groundwater is insignificant as chemical intake is less relative to other pathways. Future exposure to groundwater may lead to inhalation of VOCs in ambient air by future onsite residents during household use or by construction/utility workers during excavation activities. For the latter, however, exposure is insignificant relative to other pathways.
Unsaturated/Saturated Zone Transport to Groundwater → Ingestion of Plants/ Animals (bio-uptake)	Incomplete	Incomplete	Incomplete	Insignificant	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Groundwater may potentially be used for irrigation purposes. While exposure for current offsite residents and future offsite and onsite residents is possible, it is considered insignificant relative to other exposure pathways.
Unsaturated/Saturated Zone Transport to Groundwater → Drinking Water	Incomplete	Incomplete	Incomplete	Potentially Complete	Potentially Complete	Incomplete	Incomplete	Incomplete	Incomplete	Groundwater at the site is currently not used, therefore exposure pathways are incomplete. Additionally, future construction workers, casual trespassers, wildlife reserve workers or range supervisor are not expected to come in direct contact with groundwater or use it as a source for drinking water. Future residents could use groundwater as a future source of drinking water.

- Inhalation of fugitive particulates from subsurface soil by future onsite residents (adults/children), current and future construction/utility workers and future industrial workers through excavation or gardening activities.
- Inhalation of VOCs in ambient air from impacted subsurface soil by future onsite residents (adults/children), and current and future industrial workers, construction/utility workers, casual trespassers (adults), future wildlife reserve worker and future EOD Training Range supervisor.
- Inhalation of VOCs in indoor air resulting from surface soil or subsurface soil by future onsite and offsite residents and onsite industrial workers.
- Dermal contact with chemicals in groundwater by future potential onsite and offsite residents (adults/children) and onsite industrial workers.
- Ingestion of impacted groundwater as drinking water for future onsite and offsite residents (adults/children) and future onsite industrial workers.
- Inhalation of VOCs in ambient air from impacted groundwater by future potential onsite and offsite residents (adults/children).
- Inhalation of VOCs in indoor air as a result of VOC migration from impacted groundwater by future onsite residents and industrial workers.
- Ingestion of chemicals in surface water by current offsite and future onsite residents (adults/children), current and future onsite industrial workers, construction/utility workers, casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Dermal contact with chemicals in surface water by current offsite and future onsite residents (adults/children), current and future onsite industrial workers, construction/utility workers, casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Inhalation of VOCs from surface water by future onsite residents (adults/children) and current and future onsite industrial workers, construction/utility workers, casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Ingestion of chemicals in sediment by current offsite and future onsite residents (adults/children), current and future onsite industrial workers, construction/utility workers, casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Dermal contact with chemicals in sediment by current offsite and future onsite residents (adults/children), current and future onsite industrial workers, construction workers, casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Inhalation of VOCs from sediment by future onsite residents (adults/children) and current and future industrial workers, construction/utility workers, casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.
- Inhalation of fugitive particulates from sediment by current offsite and future onsite residents (adults/children), current and future onsite industrial workers, construction/utility workers, casual trespassers (adults), future wildlife reserve worker, and future EOD Training Range supervisor.

Exposure for offsite residents would most likely be through ingestion of impacted groundwater. Currently, the nearest drinking water well is approximately 10 miles away, thereby minimizing the potential for exposure (and pathway is considered incomplete). In the future, however, the nearest drinking water well could theoretically be as close as the property boundary. Beyond this point, the Navy has no jurisdiction in determining the use of the land. Using this rationale, potential risks to offsite residents were qualitatively evaluated at the property boundary of IRP Site 1 using exposure parameters for future onsite residents and onsite chemical concentrations.

The pathways by which future wildlife reserve workers may become exposed is likely similar to those for future industrial workers; however the degree of exposure (i.e., chemical intake) for the wildlife reserve workers is considered less based on activity patterns. Therefore, the evaluation of the site for potential future industrial exposures is most likely protective of potential wildlife reserve workers, such that the wildlife reserve worker in not evaluated quantitatively in this SRA.

6.4.3.3 SUMMARY OF SOURCES AND EXPOSURE PATHWAYS

A description of exposure pathways reasonably anticipated for each impacted medium at the site is described.

Surface Soil. Significant potential pathways for human exposure at the site include direct contact by dermal absorption and incidental ingestion of COPCs in surface soil. The inhalation of VOCs was conservatively included despite that chemicals of this constituent class are not persistent in the shallow soil environment unless a current VOC source is present at shallow depths. The inhalation of other compounds via particulates is also included, although the presence of vegetation, buildings and pavement currently onsite may limit the amount of dust generation. Exposure to chemicals via the inhalation pathway could become more significant during or after future construction activities when vegetation, buildings or pavement is removed.

Subsurface Soil. Exposure to chemicals in subsurface soil at this site may occur via direct contact with the soil (by dermal adsorption or incidental ingestion), and inhalation of VOCs and particulates during construction activities or while future potential residents are gardening. Future industrial workers may also be potentially exposed if subsurface soil is brought to the surface by future excavation activities. Evidence of limited contamination of VOCs in the subsurface suggests a low potential for chemical vapors in soil gas and possible vapor migration into future buildings.

Some of the chemicals detected in the subsurface could potentially leach into groundwater. With the exception of the VOCs and perchlorate, there is minimal potential for COPCs to leach from soil to groundwater. Most inorganics have limited mobility in soil of neutral pH, particularly soil with high silt and clay content. Dioxins tend to be relatively immobile because of their low solubility and high affinity for soil. Long-chain petroleum hydrocarbons (i.e., diesel and oil range) tend to adsorb strongly to soil. However, VOCs and perchlorate in soil tend to be more mobile and could readily migrate to groundwater.

Groundwater. Exposure to chemicals in groundwater is typically through tap water ingestion or dermal contact and inhalation of VOCs (if present) during household use. Groundwater beneath the site may potentially be used as a source of drinking water or for irrigation purposes. However, exposure to contaminants in food items that have been irrigated or watered with impacted groundwater is considered insignificant relative to exposure through direct use of the impacted groundwater. The migration of VOC vapors from groundwater into future buildings is possible.

Surface Water. Exposure to chemicals in surface water may potentially occur primarily through ingestion and dermal contact by current offsite and future onsite residents, and current and future

onsite workers, construction workers and casual trespassers. While the inhalation of VOCs is a potentially complete exposure pathway, contaminant intake from this pathway is relatively insignificant when compared to ingestion and dermal contact due to dilution of chemicals in ambient air.

Sediment. Exposure to chemicals in sediment may potentially occur primarily through ingestion and dermal contact by current offsite and future onsite residents, and current and future onsite workers, construction workers and casual trespassers. The inhalation of fugitive particulates provides a secondary pathway for exposure.

6.4.4 Estimation of Exposure Point Concentrations

Exposure point concentrations (EPCs) are used in both the RME and average (or CTE) risk characterization; the same EPC is used in both CTE and RME risk characterization based on EPA Guidance (EPA 1992b). When data sets are relatively small (less than or equal to 10 samples), there is great uncertainty in the confidence of the calculating of a 95 percent UCL; therefore, the 95 percent UCL is only generated for data sets with 11 or more detections. In general, when the maximum detected concentration exceeds the 95 percent UCL, the 95 percent UCL is chosen as the EPC. Alternatively, when the maximum value is less than the 95 percent UCL, the maximum value is chosen as the EPC. According to the EPA's most recent guidance for calculating UCLs for EPCs (EPA 2002a), "defaulting to the maximum value of small data sets" may be the best approach to use in evaluating risk at a site." To derive the 95 percent UCL and to minimize uncertainties that may arise with the use and application of various statistical software packages, ProUCL (Version 3, EPA 2004b) was used to calculate the 95 percent UCLs. To simplify, the following rules were applied when choosing the EPC:

1. When the number of detections was fewer than or equal to 10, the maximum detected concentration was used as the EPC.
2. When the number of detections was greater than or equal to 11, the 95 percent UCL on the mean was calculated using the ProUCL software; the 95 percent UCL was selected based on the recommended output of the ProUCL results.
3. When the 95 percent UCL was greater than the maximum detected concentration, the latter was used as the EPC based on EPA Guidance (EPA 2002a).

Dioxins/furans are special case chemicals for which EPCs are calculated based on the potential risks that could occur based on the additive nature of these special case chemicals. A discussion of the toxicity of this chemical class and the necessity of deriving a total EPC for the class is presented in Section 6.5.1.2.

Dioxins/Furans

Dioxins and furans were detected in soil samples collected at IRP Site 1. A residential PRG is only available for 2,3,7,8–TCDD. A provisional but generally accepted method exists that allows conversion of analytical concentrations to toxic equivalents relative to 2,3,7,8–TCDD. Specifically, for each sample, the concentration (or one-half of the reporting limit for nondetects) of each dioxin/furan congener is multiplied by a WHO-based TEF to convert the concentration to an equipotent concentration of TCDD (EPA 2000b). Available TEFs for dioxins and furans along with the TCDD-equivalent concentrations for each sample location are presented in Tables G-8 and G-9, Appendix G, for the surface soil and subsurface soil, respectively. The converted equipotent concentrations were then summed to obtain a toxicity equivalent quotient (TEQ) EPC for each sample. For these calculations, nondetected dioxin and furan results were estimated as one-half the

reporting limits unless the constituent was not detected anywhere else onsite. Then, the constituent results were included in the total. The TEQ approach is described mathematically in EPA Guidance (2000b) as:

$$Total\ \ Toxicity\ \ Equivalence\ \ (TEQ) = \sum_{n=1}^{k} C_n \quad * \quad TEF_n$$

Where:

C_n = Concentration of the individual congener in the complex mixture under analysis

TEF = Toxicity equivalency factor of the individual congener

The TCDD equivalents for surface and subsurface soil depths are presented in Tables G-8 and G-9, Appendix G. The uncertainty associated with the TEF method is presented in Section 6.6.5, Uncertainties in the Screening Risk Assessment.

6.5 RISK-BASED SCREENING EVALUATION

The human health RBS included the following steps:

- *Development of a CSM* (Section 6.4.2). Analysis of the CSM identified potentially complete exposure pathways for both current and future land uses.
- *Identification of relevant data sets*. For this risk assessment, surface soil (0 to 2 feet), subsurface soil (0 to 10 feet), surface water, sediment, and groundwater data were evaluated. Any data assigned an "R" qualifier were eliminated from the database and not used in the screening RBS. Nondetected results with RLs exceeding two times the maximum detected concentration were excluded from the data sets. TPH analytical data were screened against non-risk-based criteria but were not included in the quantitative evaluation.
- *Identification of COPCs*. Any detected chemical was considered a COPC.
- *Selection of EPCs*. The process by which the appropriate EPC is derived is summarized in Section 6.4.4.
- *Comparison of COPC EPCs to Screening Criteria.* The EPCs were compared to EPA Region 9 (EPA 2004a) residential and industrial PRGs to provide options for land use considerations.
- *Assessment of Soil Vapor Migration.* EPCs in soil and groundwater were used to model indoor air concentrations, which were compared to EPA Region 9 ambient air PRGs (EPA 2004a).

EPA Region 9 soil PRGs are concentrations of COPCs in soil that are based on standardized equations and exposure factors for residential and industrial land use. Corresponding to the points of departure defined in the NCP (EPA 1990) (i.e., a cancer risk of 10^{-6} or a noncancer hazard quotient [HQ] of 1), PRGs represent COPC concentrations at or below which no substantive adverse health effects are likely to occur from the exposures assumed in the screening RBS.

EPA Region 9 PRGs do not consider all possible exposure pathways. For instance, some of the exposure scenarios for which the PRG use is not intended include exposure to COPCs in indoor air from soil gas; water used for swimming, wading, or bathing; food such as contaminated fish, meat, dairy products, fruit, or vegetables; and groundwater contaminated from leaching processes. Further, and as noted by EPA Region 9, PRGs are not intended as stand-alone decision-making tools or as substitutes for EPA guidance when preparing risk assessments. However, they do suffice to evaluate

the potential for adverse health effects for a relatively wide range of exposure conditions and land uses (i.e., residential and industrial) commonly encountered by the DON. In such applications, risk can be adequately characterized if exposure assumptions inherent in the PRGs are similar to those made in the exposure assessment of the RBS.

The EPA Region 9 PRGs are used to identify COPCs for further evaluation and to illustrate risk/hazard estimates for the default residential and industrial scenarios. For instance, EPCs for chemicals in soil exceeding residential PRGs are identified as COPCs in the SSRBE (or site-specific PRE under the EPA Region 9 terminology). Such a comparison also provides insight into the potential for unrestricted land use for the site, and in cases where the site is industrial, PRGs for industrial land use are potential target cleanup goals protective of industrial workers. The Tier 1A RBS first entailed a comparison of site EPCs to residential PRGs for relevant exposure pathways. This comparison was performed:

- If the complete or potentially complete exposure pathways of concern at a site were identical to those used in the development of PRGs, and
- If the pathway-specific exposure parameters were similar to the EPA Region 9 default assumptions used to develop the PRGs.

As a conservative approach, the screening RBS consisted of a comparison of site EPCs to residential PRGs. EPCs were then compared to industrial PRGs. If the cumulative risk was below the target incremental cancer risk of 10^{-6} or the target noncancer HI of 1.0, the risk evaluation was considered complete. If potential risk exceeded the target risk of 10^{-6} or the target noncancer hazard of 1.0, or if exposure pathways and parameters were identified that were not consistent with those used to develop the PRGs (such as the casual trespasser and construction/utility worker), a SSRBE was completed. In this case, only those chemicals that exceeded the residential PRG screening process were carried forward.

For PRGs to be relevant in the evaluation, exposure pathways and exposure parameters in the CSM should be similar to those used to develop the PRGs used for comparison. The industrial exposure pathways and default exposure parameters are assumed to be the same as those used to develop industrial PRGs. However, there are no available Region 9 PRGs for receptors equivalent to the construction/utility worker, casual trespasser (adult) or EOD Training Range supervisor. Therefore, the risk evaluation for these receptors was conducted in the SSRBE if concentrations exceeded residential PRGs.

In addition to the PRG comparisons, EPCs in soil and groundwater were used to model potential VOC concentrations in indoor air using the EPA Johnson & Ettinger (J&E) model (EPA 2004e), using the California EPA-recommended indoor air exchange values (Cal-EPA 2004). This additional evaluation is necessary because a) the inhalation of VOCs in indoor air is considered potentially complete for future onsite residents and industrial workers, and b) EPA Region 9 does not consider this exposure pathway in the development of its PRGs.

Evaluation of risks for each of the receptors identified for IRP Site 1 considers the various behaviors and levels of activity by which potential exposure may occur. Risks are determined assuming two levels of exposure: a high-end level or RME; and an average or CTE. PRGs were therefore calculated assuming both RME and CTE scenarios. The purpose for providing risk estimates under both exposure scenarios is to give a sense of the variability surrounding a risk estimate; the two comparisons provide a bounded risk estimate for typical exposures.

6.5.1 Selection of Screening Criteria

As noted above, the general approach for the human health RBS is to conduct a risk screening using EPA Region 9 PRGs. Chemical-specific toxicity values are integrated with the exposure parameters to derive the PRGs. A summary of the approach used to obtain toxicity values follows.

6.5.1.1 TOXICITY VALUES

Because PRGs are based on the toxicity of chemicals that may be ingested, inhaled, or dermally absorbed, it is helpful to understand the derivation of toxicity values used in a toxicity assessment. The purpose of the toxicity assessment is to weigh the available evidence regarding the potential for chemicals to cause adverse health effects and to provide a quantitative estimate of the relationship between the magnitude of exposure and the likelihood or severity of adverse health effects (i.e., dose-response assessment; EPA 1989). Toxicity values are used to provide a quantitative estimate of the relationship between the magnitude of exposure and the potential for adverse health effects.

Per United States Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) Directive 9285.7-53 (EPA 2003a), the current hierarchy for human toxicity values is:

- Tier 1 – EPA's Integrated Risk Information System (IRIS)
- Tier 2 – EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs)
- Tier 3 – Other Toxicity Values including Cal-EPA Toxicity Values

The primary source of toxicity information is EPA IRIS. When a toxicity value is not available in IRIS, other sources of toxicity information can be considered in accordance with EPA Guidance (EPA 2003a); these additional sources are often considered "provisional." In this assessment, any chemical for which a Region 9 PRG was predicated on a provisional toxicity value will be listed in the uncertainty section (6.6.5) and the effect on the risk estimates will be discussed in terms of a bias high or bias low based on available toxicity information.

Toxicity Values for Noncarcinogens. Toxicity values are presented as RfDs for noncarcinogens. The EPA Region 9 PRG tables provided virtually all the RfDs and sources of those PRGs used in the current SRA (EPA 2004a). Many of the RfDs used by EPA Region 9 in deriving PRGs were obtained from the IRIS database (EPA 2003b), but the RfD for perchlorate has since been revised (EPA 2005). The RfD for 2-methylnaphthalene was added to the IRIS database soon after the database search used in the development of Region 9 PRGs. The revised value for perchlorate and the new value for 2-methylnaphthalene are used to calculate PRGs using equations as presented by EPA Region 9. Noncarcinogenic chemicals with provisional values are listed and discussed in the uncertainty section 6.6.5.

Oral RfDs (expressed in units of milligrams per kilogram per day [mg/kg-day]) have been developed to evaluate the potential for adverse noncancer health effects from ingestion of chemicals. Chronic RfDs are specifically developed to be protective for long-term exposure to a chemical and are generally used to evaluate the potential noncancer effects associated with exposure periods between seven years and a lifetime (EPA 1989). The RfD is derived from a no-observed-adverse-effect-level (NOAEL) or a lowest-observed-adverse-effect-level (LOAEL). For the risk assessment, a NOAEL is the key datum obtained from a study of a dose-response relationship. It is the highest level tested at which no adverse effects were demonstrated. In some studies, only a LOAEL rather than a NOAEL is available. However, the use of a LOAEL requires additional uncertainty factors (UFs) and modifying factors (MFs) to ensure that a health-protective toxicity value is used (EPA 2003b).

UFs are typically 10 fold factors used for estimating RfDs from laboratory to account for the (1) variation in sensitivity among the members of the human population (i.e., inter-human or intra-species variability); (2) uncertainty in extrapolating animal data to humans (i.e., interspecies variability); (3) uncertainty in extrapolating from data obtained in a study with less-than-lifetime exposure to lifetime exposure (i.e., extrapolating from sub-chronic to chronic exposure); (4) uncertainty in extrapolating from a LOAEL rather than from a NOAEL; and (5) uncertainty associated with extrapolation from animal data when the database is incomplete.

MFs are included to reflect the scientific uncertainties not explicitly addressed using UFs, and range from 1 to 10. The default value for a MF is 1.

Methods used to derive inhalation RfDs are conceptually similar to those used to derive oral RfDs. However, the actual analysis of inhalation exposures is more complex than that for oral exposures because of the dynamics and differential structures of the respiratory system and the ability to account for the inhaled dose in the experiment design of laboratory studies. The reference values from inhalation studies are generally reported as a reference concentration (RfC) in air (milligrams per cubic meter [mg/m^3]). However, these values are converted to RfDs for use in risk assessments. As noted in its documentation, EPA Region 9 has converted inhalation RfCs to RfDs using a human body weight of 70 kilograms (kg) and inhalation rate of 20 cubic meters per day (m^3/day).

All noncancer HIs presented in this SRA, except that for perchlorate and 2-methylnaphthalene, are based on noncarcinogenic toxicity values recommended by EPA Region 9. Since the October 2004 presentation of the Region 9 PRG table, the RfD for perchlorate has been revised to 0.007 mg/kg-day (EPA 2005). This value represents a seven-fold increase over the RfD presented in the EPA Region 9 PRG table. Additionally, an oral RfD of 0.004 mg/kg-day for 2-methylnaphthalene from the IRIS database is included.

Toxicity Values for Carcinogens. The predominant theory behind cancer development as it relates to risk assessment is that a small number of molecular events can evoke changes in a single cell, which can lead to uncontrolled cellular proliferation and, eventually, to cancer. In this model (i.e., the linear low dose model), it is assumed that there is no level of exposure to a chemical that does not pose "a finite probability, however small, of generating a carcinogenic response" (EPA 1989). Recent insight into the cancer processes does, however, suggest that theoretically, a threshold mechanism may be operative, especially if the cancer is a "…secondary effect of toxicity or of an induced physiological change that is itself a threshold" (EPA 2003c). Data are not yet sufficient to apply the "threshold" concept in the development of risk assessments for carcinogens that are intended to be protective of the potentially exposed receptor group. Thus, the linear low-dose model is still considered applicable.

The evaluation of the chemical carcinogenicity is a complex process that can be summarized by two primary steps. Initially, the toxicity database for a substance is evaluated for its potential utility in assessing carcinogenic potential. In this step, a weight-of-evidence (WOE) classification is assigned to the chemical. The WOE classification scheme is designed to present the likelihood that a chemical will cause cancer in humans based on the strength of supporting human and/or animal data.

Currently, there are two WOE classifications available for use in conjunction with human health risk assessments. The most recent WOE classification is defined in the latest EPA cancer risk assessment guidelines (EPA 2005a) and is designed to revise and replace the *Guidelines for Carcinogen Risk Assessment* published in September 1986 (EPA 1986b). While the IRIS program will incorporate the new WOE discussion/criteria into revised or new IRIS chemical profiles, existing chemical profiles are still based on the 1986 EPA guidelines.

The WOE descriptors based on the 2005 Revised Guidelines are summarized as:

> "Likely to Be Carcinogenic to Humans" – this descriptor reflects strong evidence of carcinogenicity.
>
> "Suggestive Evidence of Carcinogenic Potential" – this descriptor is used when there is sufficient evidence to demonstrate potential carcinogenicity to humans.
>
> "Inadequate Information to Assess Carcinogenic Potential" – this descriptor is used when there is sufficient evidence to suggest a concern for potential carcinogenic effects in humans, but data are not sufficient for a strong conclusion.
>
> "Not Likely to Be Carcinogenic to Humans" – this descriptor is used when data are determined to be inadequate for applying one of the other three descriptors.

Because the revised cancer guidelines are not yet incorporated into many of the IRIS chemicals profiles at the time of this evaluation, the WOE classifications defined by the EPA (EPA 1989, 1986) and shown in the toxicity profiles on the IRIS system are still used when interpreting toxicity of COPCs at IRP Site 1. This WOE classification used in this risk assessment is defined as follows:

Group A:	Known human carcinogen
Group B:	Probable human carcinogen
Group B1:	Limited evidence of carcinogenicity in humans
Group B2:	Sufficient evidence in animals, but inadequate evidence in humans
Group C:	Possible human carcinogen (limited evidence of carcinogenicity in animals in the absence of human data)
Group D:	Human carcinogenicity not classifiable because of lack of data
Group E:	Evidence of noncarcinogenicity in humans (no evidence in at least two adequate animal tests in different species or in both epidemiological and animal studies)

Oral cancer slope factors (CSFos), are expressed as the proportion of a population affected per mg/kg-day dose and are typically reported in units of $(mg/kg\text{-}day)^{-1}$. Currently, CSFos are derived for chemicals with WOE classifications of A, B1, or B2, and occasionally C (noted above). Inhalation cancer toxicity data are presented as a unit risk (expressed as $[mg/m^3]^{-1}$ or micrograms per cubic meter $[\mu g/m^3]^{-1}$) and can be interpreted as "…the increase in the lifetime risk of an individual who is exposed for a lifetime to either 1 mg/m^3 or $\mu g/m^3$ of the cancer agent" (EPA 1986). EPA Region 9 converted unit risks to CSFo by multiplying by the inhalation rate of 20 m^3/day and dividing by a body weight of 70 kg. All PRGs for carcinogenic chemicals evaluated in this SRA are based on the CSFs recommended and used by Region 9 (EPA 2004a).

6.5.1.2 Availability of Toxicity Values

Some chemicals may exhibit both carcinogenic and noncarcinogenic health effects. Toxicity values are generally available for the oral route of exposure. Inhalation toxicity values have also been developed for some constituents. However, route-to-route extrapolations are frequently used when there are no toxicity values available for a given route of exposure. Oral CSFos and RfDos were used for both oral and inhalation routes of exposures for organic chemicals lacking inhalation values (EPA 2004a).

Chemical disposition in the body may determine the dose of toxicant that reaches the target organ, confounding the interpretation of toxicity values. For instance, dermal exposures rarely result in the entire applied dose entering systemic circulation. However, because this phenomenon is poorly quantified, toxicity values for evaluating risk from dermal exposure may employ route-to-route (oral to dermal) extrapolations that do not consider the fraction absorbed. Similarly, for the oral route, the orally administered dose is often not entirely absorbed from the gastrointestinal (GI) tract into systemic circulation. Because of incomplete absorption from the GI tract, correcting the administered dose by the fraction absorbed might be preferred to better determine a toxicity value that reflects the actual dose to the target organ.

However, this is not possible for many chemicals because sufficiently credible database does not exist to allow such refinements. Therefore, EPA Region 9 did not adjust toxicity values to correct for the fraction absorbed for any of the COPCs identified in the SRA (EPA 2004a).

Of all the toxicity data that are available, some chemicals do have data to enable quantitative development of toxicity values. In these instances, the toxicity of these chemicals is evaluated qualitatively in Section 6.6.5, Uncertainties in the Screening Risk Assessment. In some instances, because "groups" of chemicals may have similar toxicity (and therefore additive toxicity), it is important to consider the potential additive toxicity of these special case chemicals; these special case chemicals are discussed below.

Special Case Chemicals—Dioxins/Furans

When groups of structurally similar chemicals are present in the environment, it is important to adequately characterize the potential risks that could occur from exposure to such chemicals based on their additive nature. For the dioxins/furans, the TEFs derived by the WHO (WHO 1997) are sometimes used to estimate a total 2,3,7,8-TCDD TEQ concentration for comparison to the 2,3,7,8-TCDD PRG. The uncertainty associated with deriving the 2,3,7,8-TCDD TEQ concentration is presented in Section 6.6.5, Uncertainties in the Screening Risk Assessment. The procedure for deriving the 2,3,7,8-TCDD TEQ is provided in Section 6.4.4 with the TEQ results for soil being presented in Tables G-8 and G-9, Appendix G.

California-Approved Toxicity Values

The California Department of Toxic Substances Control, Human and Ecological Risk Division has established different toxicity values for several chemicals identified at IRP Site 1 than used by EPA Region 9. Chemicals include arsenic, chloroform, lead, naphthalene, and trichloroethylene. Cancer risk and noncancer hazard estimates were also calculated using these California-modified toxicity values (refer to Appendix G, Attachment A). A summary of these estimates are provided in Section 6.5.5.3.

6.5.1.3 SCREENING CRITERIA—EPA REGION 9 PRELIMINARY REMEDIATION GOALS FOR SOIL

The screening criteria for use in the RBS are based on those PRGs that have been developed by EPA Region 9 for the reasonable maximum exposure or RME scenario. Their development assumes that exposure to chemicals at or below PRG concentrations represent a minimal risk to human health. For soil, two sets of exposure criteria exist:

Residential PRGs for Soil: A conservative set of PRGs are applicable to sites 1) that currently or are anticipated to be used for residential purposes, or 2) for which the DON wishes to determine the potential for unrestricted transfer of property.

Industrial PRGs for Soil: One set is used for sites currently or anticipating industrial land use.

Groundwater: For groundwater, a single set of criteria are used.

Residential PRGs for Tap Water: A conservative set of PRGs used to evaluate consumption of water at the tap under the residential scenario.

The PRGs provided by EPA Region 9 are derived using standard equations and exposure factors for the RME scenario. The substitution of exposure factors under an average or CTE scenario produces another set of PRGs that is based on the CTE scenario. The exposure factors used in deriving residential and industrial PRGs under the CTE assumption are presented in Table G-10, Appendix G. By including PRGs for both RME and CTE scenarios, cumulative risk estimates for each receptor and exposure medium are presented for an average and high-end level of exposure. The presentation of both estimates provides a measure of the variability surrounding the risk estimate.

Some chemicals (e.g., TPH) do not have accepted toxicity values from which PRGs can be estimated based on potential health effects, but do have levels that are suggested for use by state governments and/or local municipalities. These levels are often based on aesthetic criteria or the toxicity of specific petroleum hydrocarbon fractions. In such instances, indicator chemicals (Section 6.2.2) accounted for the assessment of petroleum hydrocarbon toxicity while a non-health-based screening level was used for qualitative comparisons of petroleum hydrocarbon data. In other instances (i.e., lead), values deemed to be protective of the potential receptor groups are based on the potential for adverse health effects, but are not amenable to the evaluation of risk in the context of slope factors or RfDs. In this instance, screening levels for lead are included in the RBS tables for comparison purposes, but are not used in the calculation of cumulative incremental cancer risk or HI. Such comparisons for chemicals with non-risk-based screening levels are discussed in Section 6.5.5.

In summary, EPA Region 9 PRGs were used to derive estimates of carcinogenic risk and noncarcinogenic health effects in the RBS under the RME scenario. Calculated site-specific PRGs were used to evaluate risks and hazards under the CTE scenario. Incremental cancer risk and HQs were not estimated for COPCs without available PRGs. Comparisons of the EPCs to non-risk-based screening levels were not included in the cumulative incremental risk or the HI. Rather, these comparisons are presented qualitatively because the screening criteria are not risk-based.

6.5.2 Background Comparisons

IRP Site 1 is located in an area of California that characteristically has elevated levels of various elements (i.e., arsenic and chromium) in soil. Methods do exist to differentiate between concentrations of naturally occurring elements and those that may be associated with site related activities. This method (i.e., the onsite method) is a probabilistic methodology that has the potential to identify background concentrations thus allowing their exclusion from the risk assessment process pursuant to the EPA (EPA 1989). Derivation of the soil background concentrations for Former MCAS El Toro is presented in the *Final Technical Memorandum, Background and Reference Levels, Remedial Investigations, Marine Corps Air Station, El Toro, California* (BNI 1996).

However, rather than eliminate elements detected at concentrations equal to or below their background concentrations before risk is characterized, (DON 2004a) all data, regardless of source origin, have been included in the determination of cancer risk and noncancer hazard, per EPA Region 9 recommendations (Stralka 1995). Thus, incremental, or excess, risk is presented as the sum of estimated potential risks associated with all COPCs with EPA Region 9 PRGs (EPA 2004a), irrespective of elevated chemical concentration that may not be related to facility activity. However, to better ascertain the risks associated with site-related activities, cancer risks and noncancer hazards

are also presented without the contribution of background levels of metals. A single detection (i.e., the maximum detected concentration) above the background level was used to define a chemical that is considered site-related. The uncertainty associated with this definition is presented in Section 6.6.5, Uncertainties in the Screening Risk Assessment.

6.5.3 Estimation of Cumulative Health Risks

To evaluate risk from exposure to COPCs in soil, EPCs were compared to residential soil PRGs under either the RME or CTE scenario. The following soil and air pathways are considered in the development of soil PRGs:

- Incidental ingestion of chemicals in soil
- Dermal contact with chemicals in soil
- Inhalation of chemicals in fugitive dust
- Inhalation of VOCs

In accordance with EPA Region 9 PRG Guidance (EPA 2004a), exposure parameters for children aged zero to six years were used to estimate noncarcinogenic residential PRGs. Age-adjusted exposure parameters were used to estimate carcinogenic residential PRGs for individuals from zero to 30 years old (i.e., 30-year residents).

Excess (incremental) cancer risk associated with a COPC, using its EPC and carcinogenic PRG, was estimated using the following formula:

$$Excess\ \ Cancer\ \ Risk \quad = \quad TR \times \frac{EPC_i}{PRG_i}$$

Where:

TR = The target incremental lifetime cancer risk of $1x10^{-6}$

EPC_i = Exposure point concentration of $COPC_i$ detected in soil (µg/kg or mg/kg)

PRG_i = PRG for $COPC_i$ in soil (µg/kg or mg/kg) based on carcinogenic effects

A HQ for each COPC, using an EPC and its respective noncarcinogenic PRG, was estimated using the following formula:

$$Hazard\ Quotient(HQ) \quad = \quad THQ \times \frac{EPC_i}{PRG_i}$$

Where:

THQ = The target HQ of 1

The cumulative incremental cancer risk (or incremental lifetime cancer risk [ILCR]) is also estimated to evaluate potential exposure to multiple COPCs using the following equation:

$$\textit{Incremental Lifetime Cancer Risk} = \sum_{i=1}^{i=n}\left[TR \times \frac{EPC_i}{PRG_i}\right]$$

The cumulative noncarcinogenic HI for exposure to multiple COPCs was estimated as follows:

If the cumulative incremental cancer risk and noncancer HIs exceeded $1x10^{-6}$ and 1.0, respectively, and/or the lead EPC exceeded the residential PRG of 400 mg/kg, then EPCs were compared to industrial soil PRGs.

$$\textit{Cumulative Noncarcinogenic Hazard Index} = \sum_{i=1}^{i=n}\left[THQ \times \frac{EPC_i}{PRG_i}\right]$$

6.5.4 Indoor Air Evaluation

Certain volatile chemicals in soil and groundwater have the potential, through vaporization and soil gas migration, to enter into buildings, where persons may become exposed through inhalation. To evaluate whether this potentially complete exposure pathway is significant at IRP Site 1 and could potentially pose adverse health effects, concentrations of chemicals in indoor air were estimated using the Advanced J&E Model (EPA 2004e) and were compared to EPA Region 9 ambient air PRGs. Residential and industrial exposure scenarios were evaluated for soil at IRP Site 1 under the RME and CTE scenarios. A residential exposure scenario was evaluated for groundwater.

6.5.4.1 MODEL THEORY

The Advanced J&E Model (EPA 2004e) is a screening-level tool that incorporates both convective and diffusive mechanisms for estimating the transport of certain volatile chemical vapors emanating from either contaminated soil or groundwater into an indoor space located directly above the source of contamination. By applying the Advanced J&E Model, the user is able to estimate volatile chemical concentrations (and incremental risk due to the volatile chemicals) in the indoor space. In the case of IRP Site 1, this indoor space is a hypothetical future building.

EPA Region 9 ambient air PRGs were used to compare against the resulting concentrations in indoor air for screening purposes because:

1) Values are risk-based and incorporate inhalation toxicity values (RfDs or slope factors) accepted by EPA Region 9;
2) The ambient air PRGs incorporate a daily inhalation rate that is based on a 24-hour exposure (an entire day) and is therefore conservative;
3) The carcinogenic screening values are based on an age-adjusted residential exposure duration of 30 years to account for exposure as both a child and adult;
4) The noncarcinogenic screening values conservatively assume an adult exposure over the entire 30 years which results in a greater chemical dose than (and therefore is protective of) a child's six years of exposure.

6.5.4.2 VAPOR EMISSION AND MIGRATION FROM SOIL

At IRP Site 1, chemicals detected in soil at depths from 0 to 10 feet included 10 volatile organic compounds, nine SVOCs, 23 metals, two additional inorganic compounds, eight explosives residues, dioxins, and hydrocarbons. Of these chemicals, only 12 are sufficiently volatile to migrate in soil gas and enter buildings via vapor intrusion: acetone, BTEX, chloroform, hexachlorobenzene, methylethyl ketone, methylisobutyl ketone, 2-methylnaphthalene, naphthalene, and PCE.

6.5.4.2.1 Residential Scenario

Using the exposure point concentrations identified in the SRA at IRP Site 1 for each of these 12 chemicals in soil, the Advanced J&E Model (EPA 2004e) was utilized with the following assumptions:

- The hypothetical building was assumed to be a slab-on-grade construction with a depth of 15 centimeters (cm) since basements are uncommon in the vicinity of the site;
- Shallow soil onsite was determined to be mostly loamy sand (Earth Tech 2005);
- Depth to contamination was assumed to equal the depth of the maximum detected concentration;
- Soil parameters were measured to include fraction of organic carbon (0.005), total porosity (38.37 percent) and water-filled porosity (12.30 percent) (Earth Tech 2005);
- The residential indoor air exchange rate was set at 0.5 per hour (Cal-EPA 2004c). Although the default for J & E is 0.25 per hour, Cal-EPA recommends the use of 0.5 per hour for sites in California;
- The model was used to estimate the average vapor flow rate into buildings.

Using the above assumptions, indoor air VOC concentrations were estimated from soil exposure point concentrations and compared against ambient air PRGs to estimate incremental lifetime cancer risks and cumulative noncancer hazards under the RME scenario. To evaluate risks/hazards under the CTE scenario, modeled indoor air concentrations were compared to PRGs that were specifically calculated using equations of EPA Region 9 (2004a) and the exposure factors for the CTE scenario that are identified in Table G-10, Appendix G.

6.5.4.2.2 Industrial Scenario

To evaluate indoor air under an industrial use scenario, indoor air VOC concentrations were compared to PRGs that were calculated for an industrial worker. Using the same equations as EPA Region 9, values for exposure frequency (250 days/year) and exposure duration (25 years) were used for the industrial scenario. Additionally, the adult daily inhalation rate (20 m^3/day) was adjusted downward by a factor of 3 to account for an eight-hour work day. Indoor air VOC concentrations were estimated using the same J&E assumptions except that a commercial air exchange rate of one per hour was used, which is recommended by Cal-EPA for sites in California (Cal-EPA 2004c). The resulting PRGs and comparisons with estimated indoor air VOC concentrations are used to estimate incremental lifetime cancer risks and cumulative noncancer hazards.

6.5.5 Results of the Risk-Based Screening

If the maximum detected concentration was below the residential PRG for a particular chemical and the cumulative incremental cancer risks were below $1x10^{-6}$, and/or the HI was less than 1.0, then no further action was recommended for the site and the evaluation of risk was completed. If any of these criteria were exceeded, then an SSRBE was prepared. In the case of lead, if its EPC was less than the EPA Region 9 residential criterion of 400 mg/kg, no further action was recommended with respect to lead. Additionally, site-specific risk-based evaluations were prepared for the construction/utility worker, casual trespasser (adult), and EOD Training Range supervisor because exposure parameters for these receptors are different from those used to develop residential and industrial PRGs.

EPCs for chemicals detected in surface soil, subsurface soil, sediment, groundwater, and surface water collected from IRP Site 1 are compared to EPA Region 9 (2004a) residential and industrial PRGs for the appropriate medium (refer to Tables G-11 through G-22, Appendix G). The following text summarizes the carcinogenic risk and noncancer hazard estimated for these media under the residential and industrial land use scenarios.

6.5.5.1 RESIDENTIAL LAND USE EVALUATION

Because the site is located in a suburban and relatively undeveloped area of various uses, evaluation of the residential land use provides information for the unrestricted transfer of the property. This section summarizes the results of the residential evaluation of surface and subsurface soil, sediment, groundwater, and surface water. Potential risks associated with the EPC are estimated using comparisons between the EPC and either the Region 9 PRGs (under the RME scenario) or PRGs that were calculated for the CTE scenario (refer to Tables G-11 through G-18, Appendix G). To identify those COPCs in soil and sediment that require further evaluation in the SSRBE, maximum detections are compared to EPA Region 9 soil PRGs for residential and industrial exposure scenarios. For evaluating groundwater, EPCs are compared to tap water PRGs provided by EPA Region 9 (2004a). Results for the evaluation of each medium under a residential land use assumption follows.

Surface Soil. EPCs for surface soil data collected from IRP Site 1 were compared to EPA Region 9 residential soil PRGs under the RME scenario and site-specific PRGs under the CTE scenario (refer to Table G-11, Appendix G). The following paragraphs summarize the carcinogenic risk and noncancer hazard estimated for surface soil under the residential land use scenario.

Carcinogenic Risk. The incremental lifetime carcinogenic risk for surface soil exposure under an assumed residential land use is $8x10^{-6}$ for the RME scenario and $1x10^{-6}$ for the CTE scenario. Excluding the contribution of metals at background levels, these risk estimates remain the same. Only the risk estimate under the RME scenario is within the risk management range of 10^{-6} to 10^{-4} (as defined by the EPA). Under the RME scenario, arsenic (at 2.12 mg/kg) accounts for 70 percent of the risk with less contribution from n-nitrosodiphenylamine (nine percent), dioxin as represented by TCDD TEQ (nine percent), benzene (six percent), and RDX (6 percent). Only the maximum detected concentration for arsenic (8.6 mg/kg) exceeded its residential PRG; however, this maximum detection was the only surface soil sample result that exceeded the background value of 6.86 mg/kg for MCAS El Toro. The detected arsenic concentration range for other surface soil samples was 0.28 mg/kg to 4.3 mg/kg. Arsenic was retained for further evaluation in the SSRBE.

Noncarcinogenic Hazard. The cumulative noncancer hazards associated with potential exposure to the EPCs are expressed as HIs of 5 and 1 under the RME and CTE scenarios, respectively (refer to Table G-11, Appendix G). Excluding the contribution of metals at background levels, HIs remain the same. Only the RME HI exceeds the target HI of 1.0. Under the RME scenario, naphthalene (42 percent) and 2-methylnaphthalene (30 percent) represent much of the risk, while xylenes (7 percent), other organic compounds, perchlorate and metals (four percent or less) contribute less. As the

maximum detected concentrations for naphthalene and 2-methylnaphthalene exceeded RME PRGs, target organ segregation was considered unnecessary since the resulting HIs would not significantly change and would remain above the target hazard of 1 for certain target organs. Only the maximum detection of naphthalene and 2-methylnaphthalene exceeded residential noncarcinogenic PRGs; therefore, naphthalene and 2-methylnaphthalene were carried forward to the SSRBE. The maximum detected concentration and EPC for lead (88.5 and 16.5 mg/kg, respectively) are both below the EPA Region 9 Residential PRG of 400 mg/kg and the Cal-Modified PRG of 150 mg/kg.

Subsurface Soil. EPCs for chemical data for subsurface soil collected from IRP Site 1 are compared to EPA Region 9 residential soil PRGs and site-specific PRGs under the CTE scenario (refer to Table G-12, Appendix G). The following discussion summarizes the carcinogenic risk and noncancer hazard estimated for subsurface soil under the residential land use scenario.

Carcinogenic Risk. The cumulative carcinogenic risk for exposure to subsurface soil in the area of IRP Site 1 under an assumed residential land use is $1x10^{-5}$ for the RME scenario and $2x10^{-6}$ for an average or CTE scenario (refer to Table G-12, Appendix G). Both of these risk estimates are within the risk management range of 10^{-6} to 10^{-4}. Excluding the contribution of metals at background levels, these risk estimates remain the same. Arsenic accounts for approximately one-half of the risk under the RME scenario, with less contribution from RDX (22 percent), TCDD TEQ (11 percent), benzene, hexachlorobenzene, n-Nitrosodiphenylamine, and 2,4,6-trinitrotoluene (all five percent or less). While the cumulative risks under the RME and CTE scenarios are within the risk management range of 10^{-6} to 10^{-4}, only the maximum detected concentrations for arsenic, TCDD TEQ, and RDX exceeded the residential PRGs in subsurface soil. These three compounds were further evaluated in the SSRBE.

Noncarcinogenic Hazard. The cumulative noncancer hazards associated with potential residential exposure are expressed as HIs of 10 and 3, respectively, for the RME and CTE scenarios (refer to Table G-12, Appendix G). Both estimates exceed the EPA target HI of 1.0. Excluding the contribution of metals at background levels, HI estimates remain the same. The chemicals contributing most to the HI under the RME scenario include antimony (26 percent), thallium (23 percent), naphthalene (18 percent), and 2-methylnaphthalene (13 percent). These four COPCs were detected in fewer than five percent of the subsurface soil samples. No other constituent contributes over three percent of the cumulative hazard. The maximum detected concentration for several chemicals exceed their residential PRGs and were further evaluated in the SSRBE. These chemicals include naphthalene, 2-methylnaphthalene, aluminum, antimony, cadmium, copper, thallium, and zinc. The maximum detection for lead is 1,580 mg/kg, which is above the residential PRG of 400 mg/kg; however, the EPC for lead (93.4 mg/kg) was below the residential screening level, including the Cal-Modified PRG of 150 mg/kg. Lead was not carried forward to subsequent risk calculations in the SSRBE as its PRG is based on blood-lead levels and not a RfD.

Soil Vapor Migration. The evaluation of potential soil vapor migration into indoor air resulted in estimated incremental lifetime cancer risk under the assumed residential land use of $2x10^{-5}$ for the RME scenario and $5x10^{-6}$ for the CTE scenario (refer to Table G-13, Appendix G). Most of the potential carcinogenic risk (89 percent) is due to benzene, which was detected in only two percent of the subsurface soil samples. Noncancer hazard estimates from the potential exposure to VOCs in indoor air are 20 under the RME scenario and 4 under the CTE scenario. Approximately two-thirds of this hazard is due to naphthalene, which was detected in four percent of the subsurface soil samples.

Sediment. Sediment at IRP Site 1 was evaluated by comparing EPCs to residential PRGs (refer to Table G-14, Appendix G). Potential cumulative carcinogenic risk and noncarcinogenic hazard are presented below.

Carcinogenic Risk. The cumulative incremental carcinogenic risk for exposure to sediment in the area of IRP Site 1 under an assumed RME scenario of a residential land use ($2x10^{-6}$) is within the risk management range of 10^{-6} to 10^{-4}, but under a CTE scenario ($3x10^{-7}$) is below this range. Virtually all of the incremental cancer risk is due to arsenic, which was retained for further evaluation in the SSRBE. Each of the other constituents had a maximum detected concentration that was below its residential PRG.

Noncarcinogenic Hazard. The cumulative noncancer hazards associated with potential residential exposure to the EPCs in sediment at IRP Site 1 under the RME and CTE scenarios are expressed as HIs of 0.6 and 0.04, respectively. Both HIs are below the target HI of 1. The maximum detected concentrations for all noncarcinogens (including lead) are below the residential PRG; none of these chemicals were retained for further evaluation in the SSRBE.

Groundwater. Groundwater is evaluated as a source for drinking water with tap water PRGs being developed only under a residential land use scenario. Carcinogenic and noncarcinogenic risk evaluation was performed for unfiltered groundwater at IRP Site 1 under the residential land use scenario (refer to Table G-15, Appendix G). The following discussion summarizes the carcinogenic risk and noncancer hazard estimated for groundwater under the residential land use scenario.

Carcinogenic Risk. Under a RME scenario, the estimated cumulative carcinogenic risk associated with potential exposure to the EPC in unfiltered groundwater is $1x10^{-3}$, which exceeds the action level (10^{-4}) typically associated with remediation requirements. The incremental cancer risk under an average or CTE scenario is $5x10^{-5}$. TCE (88 percent under RME scenario) contributed most to the cumulative cancer risk with lesser contribution from arsenic, methylene chloride, BEPH and benzene. The maximum detected concentration for all five of these chemicals exceeded their respective tap water PRG. Because other site-specific receptors are not expected to contact groundwater at all or to a significant degree, these constituents were not further evaluated in the SSRBE. The potential risk associated with TCE is based on a maximum detected concentration of 27 µg/L during the initial round of sampling at IRP Site 1 monitoring wells in January 2002. Subsequent rounds of sampling during February 2002 and June 2002 have not confirmed the presence of TCE in these monitoring wells. Without consideration of TCE, the cumulative incremental cancer risk associated with exposure to groundwater under the RME and CTE exposure scenarios are $1x10^{-4}$ and $4x10^{-5}$, respectively.

Noncarcinogenic Hazard. The cumulative noncancer hazard associated with potential exposure to the EPC in groundwater is expressed as HIs of 10 and 5 under the RME and CTE scenarios, respectively. Perchlorate contributes approximately one-third of the total noncancer hazard with less contribution from TCE, chromium, nickel, and thallium. As the maximum detected concentrations and EPCs for each of these COPCs exceeded RME PRGs, target organ segregation was considered unnecessary since the resulting HIs would not significantly change and would remain above the target hazard of 1 for certain target organs. In the absence of an EPA Region 9 PRG for inorganic lead, the maximum concentration of lead (9.2 µg/L) is below the EPA Action Level of 15 µg/L.

BEHP and nitrate both exceeded their respective MCL. BEPH contributes only one percent to two percent of the total cancer risk estimate from potential exposure to groundwater and was detected in only one sample. Thus, the exceedance of the MCL by BEHP is less significant to the overall management decision for groundwater at the site. Nitrate was detected above the MCL of 10 mg/L in only two of 16 groundwater samples (Monitoring Wells 01-MW201 and 01-MW203). The 95 percent UCL of the onsite nitrate concentration was calculated to be 10.2 mg/L. Based on their relative contribution to risk and low occurrence, these constituents are not expected to trigger any response action.

Vapor Migration From Groundwater. The evaluation of potential vapor migration from groundwater through the soil column and into indoor air resulted in estimated incremental lifetime cancer risk

under the assumed residential land use of $3x10^{-5}$ for the RME scenario and $7x10^{-6}$ for the CTE scenario (refer to Table G-16, Appendix G). Virtually all of the potential carcinogenic risk is due to trichloroethylene, which was detected in only the January 2002 round of sampling. Confirmation sampling the following month and subsequent sampling events failed to confirm its presence. Noncancer hazard estimates from the potential exposure to VOCs in indoor air are less than 1 for both the RME and CTE scenarios.

Surface Water. Surface water at IRP Site 1 infrequently occurs in the Ephemeral Pond. The evaluation of surface water compares EPCs to tap water PRGs (refer to Table G-17, Appendix G). The uncertainty associated with the use of tap water PRGs is further examined in Section 6.6.5, Uncertainties in the Screening Risk Assessment.

Carcinogenic Risk. The cumulative carcinogenic risk for exposure to surface water in the area of IRP Site 1 under an assumed RME scenario of a residential land use is $3x10^{-5}$, while under the CTE scenario is $5x10^{-6}$. Both risk estimates are within the risk management range of 10^{-6} to 10^{-4}. These risk estimates are based on maximum detected concentrations. Arsenic (1.2 μg/L) and RDX (1 μg/L) account for 94 and six percent of the risk, respectively. The maximum detected concentrations in surface water for these two chemicals exceed the residential tap water PRGs. The use of dissolved metal analyses provides a similar conclusion (refer to Table G-18, Appendix G) with arsenic accounting for all of the cumulative cancer risk of $2x10^{-5}$ under the RME scenario.

Noncarcinogenic Hazard. The cumulative noncancer hazards associated with potential residential exposure to the EPCs in surface water at IRP Site 1 are expressed as an HI of 1 and 0.4, respectively, for the RME and CTE scenarios (refer to Table G-17, Appendix G). Neither of these hazard estimates exceeds the target HI of 1.0. While antimony accounts for the highest percentage of the cumulative noncancer hazard, the maximum detected concentration for antimony (and all other COPCs) was below their respective PRGs. The use of dissolved metal analyses results in a similar conclusion as the cumulative noncancer hazard is below 1 for both the RME and CTE scenarios (refer to Table G-18, Appendix G).

6.5.5.2 INDUSTRIAL LAND USE EVALUATION

As indicated in Section 6.5, the Tier 1A RBS includes the evaluation of the default industrial scenario in addition to the default residential scenario. Therefore, exposure to surface and subsurface soil for the industrial scenario was evaluated. Groundwater is evaluated only for its maximum beneficial (residential) use and not included in evaluation of the industrial land use. Tables G-19 and G-20, Appendix G, present the comparisons between EPCs and the EPA Region 9 industrial PRGs for surface and subsurface soil, respectively. Additionally, the potential risk associated with soil vapor migration into buildings is presented in Table G-21, Appendix G. The following discussion summarizes the carcinogenic risk and noncancer hazard estimated for surface and subsurface soil under the industrial land use scenario. These tables indicate that certain COPCs contribute to an incremental carcinogenic risk above EPA benchmark levels.

Surface Soil. EPCs for chemical data for surface soil collected from IRP Site 1 are compared to EPA Region 9 industrial soil PRGs and calculated PRGs for evaluating RME and CTE scenarios (refer to Table G-19, Appendix G). The following discussion summarizes the carcinogenic risk and noncancer hazard estimated for surface soil under the industrial land use scenario.

Carcinogenic Risk. The cumulative carcinogenic risk for the surface soil under an assumed RME scenario of an industrial land use is $2x10^{-6}$, which is within the risk management range of 10^{-6} to 10^{-4}. The cumulative risk under the CTE scenario is $3x10^{-7}$, which is below this range. Arsenic accounts for 62 percent of the cumulative RME carcinogenic risk, with benzene, n-nitrosodiphenylamine, TCDD TEQ, and RDX contributing less (14 percent, nine percent, eight percent, and six percent, respectively). Excluding the contribution of metals at background levels, carcinogenic risk estimates remain the same. Only the EPC for arsenic exceeded the industrial PRG.

Noncarcinogenic Hazard. The cumulative noncancer hazards associated with potential exposure to EPCs under the RME and CTE scenarios are expressed as HIs of 0.8 and 0.01, respectively, which are below the EPA target HI of 1. None of the maximum detected concentrations for COPCs exceeded the individual noncarcinogenic industrial PRGs.

Subsurface Soil. EPCs for chemical data for subsurface soil collected from IRP Site 1 are compared to EPA Region 9 industrial soil PRGs and calculated PRGs for evaluating RME and CTE scenarios (refer to Table G-20, Appendix G). The following discussion summarizes the carcinogenic risk and noncancer hazard estimated for subsurface soil under the industrial land use scenario.

Carcinogenic Risk. The cumulative carcinogenic risk from exposure to the COPCs in subsurface soil at IRP Site 1 under an assumed RME scenario of an industrial land use is $4x10^{-6}$, which is within the risk management range of 10^{-6} to 10^{-4}. Arsenic (43 percent) and RDX (22 percent) contribute most of the risk. Under an average or CTE scenario, the cumulative incremental cancer risk is $2x10^{-7}$, which is below the risk management range. Excluding the contribution of metals at background levels, carcinogenic risk estimates remain the same. Only the EPC for arsenic (2.79 mg/kg) exceeded its industrial PRG.

Noncarcinogenic Hazard. The cumulative noncancer hazards associated with potential industrial exposure to the EPCs in the subsurface soil at IRP Site 1 under the RME and CTE scenarios are expressed as HIs of 1 and 0.1, respectively. Except for lead, none of the maximum detected concentrations exceeded the noncarcinogenic industrial PRGs.

Soil Vapor Migration. The evaluation of potential soil vapor migration into indoor air resulted in estimated incremental lifetime cancer risk (ILCR) under the assumed industrial land use of $2x10^{-6}$ for the RME scenario and $3x10^{-7}$ for the CTE scenario (refer to Table G-21, Appendix G). Most of the potential carcinogenic risk (89 percent) is due to benzene, which was detected in only two percent of the subsurface soil samples. Noncancer hazard estimates from the potential exposure to VOCs in indoor air are 2 under the RME scenario and 0.4 under the CTE scenario. Approximately two-thirds of this hazard is due to naphthalene, which was detected in four percent of the subsurface soil samples.

Sediment. Sediment within the Ephemeral Pond at IRP Site 1 was evaluated by comparing EPCs to industrial PRGs for both the RME and CTE scenarios (refer to Table G-22, Appendix G). Potential cumulative carcinogenic risk and noncarcinogenic hazard are presented below.

Carcinogenic Risk. The ILCR for exposure to sediment in the area of IRP Site 1 under an industrial land use is below the risk management range of 10^{-6} to 10^{-4} for both the RME scenario (ILCR = $6x10^{-7}$) and the CTE scenario (ILCR = $3x10^{-8}$). Each constituent had a maximum detected concentration that was below its industrial PRG.

Noncarcinogenic Hazard. The cumulative noncancer hazards associated with potential industrial exposure to the EPCs in sediment at IRP Site 1 under the RME and CTE scenarios are expressed as HIs of 0.02 and 0.004, respectively. Both HIs are below the target HI of 1. The maximum detected concentrations for all noncarcinogens (including lead) are below the industrial PRGs.

6.5.5.3 RISK-BASED SCREENING SUMMARY

Table 6-2 summarizes the results of the screening risk evaluation. Risks are presented with and without the contribution from naturally occurring inorganic constituents.

The evaluation of surface soil exposure under the RME scenario resulted in potential incremental cancer risks that exceeded the target incremental cancer risk level of 10^{-6} for both the future resident (ILCR = $8x10^{-6}$) and industrial worker (ILCR = $2x10^{-6}$). Under the CTE assumption, these risk estimates decrease to $1x10^{-6}$ for the resident and $3x10^{-7}$ for the industrial worker. The incremental cancer risk estimates for subsurface soil increases for each of these receptors, as the incremental

cancer risks for exposure to subsurface soil by future residents and industrial workers under the RME scenario are $1x10^{-5}$ and $2x10^{-6}$, respectively. Regardless of the soil interval or receptor, arsenic contributes most to these risk estimates.

Estimated noncancer HI for the resident exposed to surface soil under the RME scenario is approximately 5, with naphthalene and 2-methylnaphthalene contributing 42 percent and 30 percent of the hazard, respectively. Naphthalene and 2-methylnaphthalene were detected in a single surface soil sample. Using the CTE assumption, the HI is reduced to approximately 1. As the maximum detected concentrations for naphthalene and 2-methylnaphthalene exceeded RME PRGs, target organ segregation was considered unnecessary since the resulting HIs would not significantly change and would remain above the target hazard of 1 for certain target organs. The HI for exposure to the subsurface by future potential residents under the RME scenario increased to 10 and was driven by the presence of antimony, thallium, naphthalene, and 2-methylnaphthalene. All four of these COPCs were detects in fewer than five percent of the subsurface soil samples. Under the CTE scenario, this HI is reduced to the target hazard of 3. For the industrial worker, hazard estimates are below or near 1.0 for both surface and subsurface soil. The incremental cancer risk estimates for exposure to sediment by residents under the RME scenario is $2x10^{-6}$, which is within the risk management range of 10^{-6} to 10^{-4}. Virtually all of the risk is due to arsenic. This risk estimate is reduced to less than 10^{-6} under the CTE scenario. The risk estimate for the industrial worker is below this risk management range. Cumulative noncancer HIs for the resident and industrial worker are less than the EPA target hazard of 1 for both RME and CTE scenarios. Arsenic in sediment (the only COPC) is at background levels.

Risks/hazards associated with potential soil vapor migration into indoor air from subsurface soil were evaluated for both the residential and industrial land uses. Assuming the RME scenario, the incremental lifetime cancer risk is estimated as $2x10^{-5}$ for the residential land use and $2x10^{-6}$ for the industrial land use. Under the CTE scenario, these estimates decrease to $5x10^{-6}$ and $3x10^{-7}$, respectively. Most of the potential carcinogenic risk (89 percent) is due to benzene, which was detected in only two percent of the subsurface soil samples. Noncancer hazard estimates from the potential exposure to VOCs in indoor air are 20 for the residential land use and 2 for the industrial land use under the RME scenario. Assuming the CTE scenario, these estimates decrease to 4 and 0.4, respectively. Approximately two-thirds of this hazard is due to naphthalene, which was detected in four percent of the subsurface soil samples. That the carcinogenic risk and noncancer hazard are driven by chemicals with infrequent detections belies the likelihood that a receptor would be expected to encounter these chemicals in indoor air.

The evaluation of groundwater resulted in a potential incremental cancer risk for the future onsite resident under the RME scenario (ILCR = $1x10^{-3}$) that exceeds the risk management range of 10^{-6} to 10^{-4}. Most of this risk is due to TCE, which has not been detected since the initial groundwater monitoring event. Under the CTE scenario, this risk estimate is reduced to $5x10^{-5}$. Attenuation processes including groundwater mixing and biodegradation reduce chemical concentrations in groundwater as it moves away from the IRP Site 1 plume, beyond the IRP Site 1 boundary. Where chemical concentrations are lower in groundwater moving away from the source area, risks associated with exposure to groundwater for potential future offsite residents are less. The likelihood of groundwater in the vicinity to be used for residential drinking water is unknown but expected to be low.

Evaluation of noncancer hazards associated with onsite exposure to groundwater resulted in an estimated HI of 10, which was due to the presence of perchlorate, TCE, and several metals. This HI is reduced to 5 under the CTE scenario. As the maximum detected concentrations and EPCs for each of these COPCs exceeded RME PRGs, target organ segregation was considered unnecessary since the resulting HIs would not significantly change and would remain above the target hazard of 1 for certain target organs. Because groundwater is evaluated for its most beneficial use (i.e., residential use as a drinking water source), it was not further evaluated for industrial use.

Potential cancer risks associated with potential vapor emission from groundwater into indoor air were evaluated for residential land use. Assuming the RME scenario, the ILCR is estimated as $3x10^{-5}$. Under the CTE scenario, this estimate decreases to $7x10^{-6}$. Most of the potential carcinogenic risk (99 percent) is due to TCE, the presence of which is no longer certain.

The ILCR estimates for exposure to surface water by future onsite residents is $3x10^{-5}$ under the RME scenario and $5x10^{-6}$ under the CTE scenario. Both risk estimates are within the risk management range of 10^{-6} to 10^{-4}. Arsenic is the main contributor to this risk. The HI for exposure to surface water is near 1.0 for the RME scenario, but less than 1 for the CTE scenario.

Risks are also presented using California-modified toxicity values (Table 6-3). The effect of using these State-approved values depends upon the medium evaluated, but generally, cancer risk estimates are altered; and noncancer hazard estimates remain unchanged.

Incorporating California-modified toxicity values, the evaluation of surface soil exposure under the RME scenario resulted in ILCRs of $1x10^{-4}$ for the resident and $4x10^{-5}$ for the industrial worker. ILCR from subsurface soil exposure remains approximately the same as that for surface soil for both the resident and industrial worker. Risk estimates that utilize California-modified toxicity values are approximately an order of magnitude higher than when estimated using EPA Region 9 PRGs. The main reason for this increase is that naphthalene, originally evaluated as a noncarcinogenic chemical by EPA Region 9, is considered a carcinogen by the State of California. Given the infrequency with which naphthalene was detected in soil (one percent in surface soil and four percent in subsurface soil), the higher estimated cancer risk belies the likelihood that a receptor encounters naphthalene at the site. The second reason for the increase in the cancer estimate is that California assigns a higher (i.e., more toxic) slope factor for arsenic.

Using California-modified toxicity values, the evaluation of potential soil vapor migration from subsurface soil into buildings resulted in ILCRs of $9x10^{-4}$ for the resident and $7x10^{-5}$ for the industrial worker. Under the CTE scenario, these estimates decrease to $2x10^{-4}$ and $1x10^{-5}$, respectively. As above, the increase results from the designation of naphthalene as a carcinogen by the State of California.

The evaluation of direct groundwater exposure using California-modified toxicity values resulted in the reduction of estimated cancer risk. A similar reduction in risk is seen from the potential inhalation of VOCs that have migrated from groundwater. This reduction of risk resulted from a lower assigned cancer potency for TCE by the State of California. This difference in toxicity for TCE has little significance since the chemical has not been detected in groundwater since the sampling event in January 2002.

The evaluation of surface water exposure using California-modified toxicity values results in an ILCR of $2x10^{-4}$ for the resident. This eight-fold increase in the estimated cancer risk from that using EPA Region 9 PRGs is due to the higher assigned slope factor for arsenic by the State of California.

6.6 SITE-SPECIFIC RISK-BASED EVALUATION

This section presents the process for conducting site-specific risk-based evaluations (or screening PREs under the EPA Region 9 terminology) for current and future industrial workers exposed to chemicals in surface soil, subsurface soil and sediment, as well as for the current and future construction/utility worker, casual trespasser (adult), and EOD Training Range supervisor potentially exposed to COPCs in surface soil and subsurface soil at IRP Site 1. Potential future residents are also considered site-specific receptors, but because the risks for them and industrial workers as default receptors were previously presented in the RBS, risks are not re-evaluated in the SSRBE to avoid redundancy. In the SSRBE, site-specific RBCs (i.e., PRGs) are developed for site-specific land use and exposure conditions not addressed during PRG development for EPA Region 9.

Table 6-2: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Screening Risk Assessment

Type	Resident		Industrial Worker	
	RME	CTE	RME	CTE
Surface Soil – Including Background				
ILCR	$8x10^{-6}$	$1x10^{-6}$	$2x10^{-6}$	$3x10^{-7}$
Contributors:	70% - arsenic	67% - arsenic	62% - arsenic	67% -n-Nitrosodiphenylamine
	9% - N-nitrosodiphenylamine	8% - N-nitrosodiphenylamine	14% - benzene	24% -arsenic
	9% - TCDD TEQ	8% - TCDD TEQ	9% -n-Nitrosodiphenylamine	3% - benzene
	6% - benzene	10% - benzene	8% - TCDD TEQ	3% - TCDD TEQ
HI	5	1	0.8	0.01
Contributors:	42% - naphthalene	64% - naphthalene		
	30% - 2-methylnaphthalene	26% - 2-methylnaphthalene		
Surface Soil- Excluding Background				
ILCR	$8x10^{-6}$	$1x10^{-6}$	$2x10^{-6}$	$3x10^{-7}$
Contributors:	70% - arsenic	67% - arsenic	62% - arsenic	67% -n-Nitrosodiphenylamine
	9% - N-nitrosodiphenylamine	8% - N-nitrosodiphenylamine	14% - benzene	25% -arsenic
	9% - TCDD TEQ	9% - TCDD TEQ	9% -n-Nitrosodiphenylamine	3% - benzene
	6% - benzene	10% - benzene	8% - TCDD TEQ	3% - TCDD TEQ
HI	5	1	0.7	<0.01
Contributors:	48% - naphthalene	66% - naphthalene		
	33% - 2-methylnaphthalene	27% - 2-methylnaphthalene		
Subsurface Soil– Including Background				
ILCR	$1x10^{-5}$	$2x10^{-6}$	$4x10^{-6}$	$2x10^{-7}$
Contributors:	50% - arsenic	48% - arsenic	43% - arsenic	49% - arsenic
	22% - RDX	20% - RDX	22% - RDX	21% - RDX
HI	10	3	1	0.1
Contributors:	26% - antimony	22% - antimony	52% - naphthalene	
	23% - thallium	20% - thallium	19% - antimony	
	18% - naphthalene	34% - naphthalene	17% - thallium	
	13% - 2-methylnaphthalene	14% - 2-methylnaphthalene		
Subsurface Soil- Excluding Background				
ILCR	$1x10^{-5}$	$2x10^{-6}$	$4x10^{-6}$	$2x10^{-7}$
Contributors:	50% - arsenic	48% - arsenic	44% - arsenic	49% - arsenic
	22% - RDX	20% - RDX	22% - RDX	21% - RDX
HI	10	3	1	0.1
Contributors:	27% - antimony	22% - antimony	53% - naphthalene	
	24% - thallium	20% - thallium	20% - antimony	
	18% - naphthalene	34% - naphthalene	18% - thallium	
	13% - 2-methylnaphthalene	14% - 2-methylnaphthalene		
Indoor Air- Vapor Migration from Soil				
ILCR	$2x10^{-5}$	$5x10^{-6}$	$2x10^{-6}$	$3x10^{-7}$
Contributors:	89% - benzene	89% - benzene	89% - benzene	89% - benzene
	8% - hexachlorobenzene	8% - hexachlorobenzene	9% - hexachlorobenzene	9% - hexachlorobenzene
HI	20	4	2	0.4
Contributors:	66% - naphthalene	66% - naphthalene	65% - naphthalene	
	33% - xylenes	33% - xylenes	34% - xylenes	

Table 6-2: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Screening Risk Assessment

Type	Resident		Industrial Worker	
	RME	CTE	RME	CTE
Sediment – Including Background				
ILCR	$2x10^{-6}$	$3x10^{-7}$	$6x10^{-7}$	$3x10^{-8}$
Contributors:	99% - arsenic	99% - arsenic	99% - arsenic	99% - arsenic
HI	0.6	0.04	0.02	<0.01
Sediment – Excluding Background				
ILCR	$4x10^{-10}$	$7x10^{-11}$	$6x10^{-11}$	$5x10^{-12}$
Contributors:				
HI	0.1	<0.01	<0.01	<0.01
Groundwater				
ILCR	$1x10^{-3}$	$5x10^{-5}$	Not Evaluated	Not Evaluated
Contributors:	88% - TCE	60% - TCE		
	9% - arsenic	34% - arsenic		
HI	10	5	Not Evaluated	Not Evaluated
Contributors:	31% - perchlorate	31% - perchlorate		
	21% - TCE	19% - TCE		
	13% - nickel	13% - nickel		
	13% - thallium	13% - thallium		
	11% - chromium	11% - chromium		
Indoor Air – Vapor Emission from Groundwater				
ILCR	$3x10^{-5}$	$7x10^{-6}$	Not Evaluated	Not Evaluated
Contributors:	99% - trichloroethene	99% - trichloroethene		
HI	<0.01	<0.01	Not Evaluated	Not Evaluated
Surface Water				
ILCR	$3x10^{-5}$	$5x10^{-6}$	Not Evaluated	Not Evaluated
Contributors:	94% - arsenic	94% - arsenic		
HI	1	0.4	Not Evaluated	Not Evaluated
Contributors:	32% - antimony			
	17% - iron			

Notes:
% = percent
< = less than
CTE = central tendency exposure
HI = hazard index
ILCR = incremental lifetime cancer risk
RDX = cyclotrimethylenetrinitramine
RME = reasonable maximum exposure
TCE = trichloroethene
TCDD TEQ = tetrachlorodibenzodioxin toxicity equivalency quotient

Table 6-3: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Screening Risk Assessment Using California-Modified Toxicity Values

Type	Resident		Industrial Worker	
	RME	CTE	RME	CTE
Surface Soil – Including Background				
ILCR	$1x10^{-4}$	$8x10^{-6}$	$4x10^{-5}$	$1x10^{-6}$
Contributors:	67% - naphthalene	56% - arsenic	77% - naphthalene	46% - arsenic
	31% - arsenic	40% - naphthalene	21% - arsenic	32% - naphthalene
HI	5	1	0.8	0.01
Contributors:	42% - naphthalene	64% - naphthalene		
	30% - 2-methylnaphthalene	26% - 2-methylnaphthalene		
Surface Soil – Excluding Background				
ILCR	$1x10^{-4}$	$8x10^{-6}$	$4x10^{-5}$	$1x10^{-6}$
Contributors:	67% - naphthalene	56% - arsenic	77% - naphthalene	46% - arsenic
	31% - arsenic	40% - naphthalene	21% - arsenic	32% - naphthalene
HI	5	1	0.7	<0.01
Contributors:	46% - naphthalene	66% - naphthalene		
	33% - 2-methylnaphthalene	27% - 2-methylnaphthalene		
Subsurface Soil– Including Background				
ILCR	$1x10^{-4}$	$1x10^{-5}$	$4x10^{-5}$	$1x10^{-6}$
Contributors:	59% -naphthalene	32% - naphthalene	70% - naphthalene	59% - arsenic
	35% - arsenic	58% - arsenic	25% - arsenic	32% - naphthalene
HI	10	3	1	0.1
Contributors:	26% - antimony	22% - antimony	52% - naphthalene	
	23% - thallium	20% - thallium	19% - antimony	
	18% - naphthalene	34% - naphthalene	17% - thallium	
	13% - 2-methylnaphthalene	14% - 2-methylnaphthalene		
Subsurface Soil– Excluding Background				
ILCR	$1x10^{-4}$	$1x10^{-5}$	$2x10^{-5}$	$1x10^{-6}$
Contributors:	59% -naphthalene	32% - naphthalene	45% - arsenic	59% - arsenic
	35% - arsenic	58% - arsenic	45% - naphthalene	32% - naphthalene
HI	10	3	1	0.1
Contributors:	27% - antimony	22% - antimony	53% - naphthalene	
	24% - thallium	20% - thallium	20% - antimony	
	18% - naphthalene	34% - naphthalene	18% - thallium	
	13% - 2-methylnaphthalene	14% - 2-methylnaphthalene		
Indoor Air- Vapor Migration from Soil				
ILCR	$9x10^{-4}$	$2x10^{-4}$	$7x10^{-5}$	$1x10^{-5}$
Contributors:	98% - naphthalene	98% - naphthalene	97% - naphthalene	97% - naphthalene
HI	20	4	2	0.4
	66% - naphthalene	66% - naphthalene	65% - naphthalene	
	33% - xylenes	33% - xylenes	34% - xylenes	

Table 6-3: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Screening Risk Assessment Using California-Modified Toxicity Values

Type	Resident		Industrial Worker	
	RME	CTE	RME	CTE
Sediment- Including Background				
ILCR	$2x10^{-5}$	$2x10^{-8}$	$4x10^{-6}$	$2x10^{-7}$
Contributors:	100% - arsenic	82% - arsenic 16% chromium	100% - arsenic	100% - arsenic
HI	0.6	0.04	0.02	<0.01
Sediment- Excluding Background				
ILCR	$4x10^{-10}$	$7x10^{-11}$	$6x10^{-11}$	$5x10^{-12}$
HI	0.1	<0.01	<0.01	<0.01
Groundwater				
ILCR	$7x10^{-4}$	$1x10^{-4}$	Not Evaluated	Not Evaluated
Contributors:	92% - arsenic	96% - arsenic		
HI	10	5	Not Evaluated	Not Evaluated
Contributors:	31% - perchlorate 21% - TCE 13% - nickel 13% - thallium 11% - chromium	30% - perchlorate 18% - TCE 13% - nickel 13% - thallium 11% - chromium		
Indoor Air-Vapor Emission from Groundwater				
ILCR	$7x10^{-7}$	$2x10^{-7}$	Not Evaluated	Not Evaluated
Contributors:	77% - TCE 21% - methylene chloride	77% - TCE 21% - methylene chloride	Not Evaluated	Not Evaluated
HI	0.008	0.001		
Surface Water				
ILCR	$2x10^{-4}$	$3x10^{-5}$	Not Evaluated	Not Evaluated
Contributors:	99% - arsenic	99% - arsenic		
HI	1	0.4	Not Evaluated	Not Evaluated
Contributors:	32% - antimony 17% - iron			

Notes:
% = percent
< = less than
RME = reasonable maximum exposure
CTE = central tendency exposure
ILCR = incremental lifetime cancer risk
HI = hazard index
TCE = trichloroethene

6.6.1 Selection of Chemicals of Potential Concern

For the SSRBE, COPCs were identified as those chemicals in the RBS evaluation with maximum detected concentrations in surface soil, subsurface soil, or sediment that exceeded its respective soil PRG. Because the SSRBE focuses on construction workers, casual trespassers, and the EOD Training Range supervisor, all of whom do not use groundwater or surface water for drinking purposes, COPCs in these two media were not further evaluated in the SSRBE. The COPCs

associated with surface soil are arsenic, naphthalene, and 2-methylnaphthalene while those for the subsurface soil are naphthalene, 2-methylnaphthalene, RDX, TCDD TEQ, aluminum, antimony arsenic, cadmium, copper, lead, thallium, and zinc. Arsenic is the only COPC in sediment.

Where the maximum EPC for an inorganic constituent was equal to or less than background levels, then the presence of this inorganic COPC was not considered attributable to site-related activities. Total cumulative incremental risk and HI were estimated both with and without contribution from naturally occurring inorganic constituents. Derivation of the soil background concentrations is presented in the *Final Technical Memorandum, Background and Reference Levels, Remedial Investigations, Marine Corps Air Station, El Toro, California* (BNI 1996).

6.6.2 Receptor Selection

IRP Site 1 is located in a semi-urban setting and corresponding mix of land uses. Such uses include residential, industrial, and agricultural use. It is anticipated that IRP Site 1 will be transferred to the FAA and EOD training by local and Federal law enforcement agencies will be performed. However, since reuse has not been finalized, several receptors other than residents and industrial workers (previously evaluated in the RBS) are evaluated to provide risk managers with risk estimates for alternate receptor scenarios. These receptors consist of construction/utility workers, casual trespassers and an EOD Training Range supervisor. Agricultural use is not anticipated at IRP Site 1. Activities that receptors may engage in are discussed below and a summary of the exposure factors used in deriving the site-specific, receptor PRGs is presented in Table 6-4.

Construction/Utility Workers. Exposure-relevant activities in which construction/utility workers may be engaged will typically include limited manual digging (substantial digging is typically done using mechanical equipment, which is likely to reduce the potential for exposure to soil), shoring excavation sidewalls, and removing and installing footings or utilities. In most instances, excavations are anticipated to be relatively shallow (i.e., 3 to 5 feet below grade). However, in situations that may require deeper excavations, such as the construction of additional buildings, excavation may be as deep as 10 feet. Due to the nature of the work, these receptors could be exposed to surface and subsurface soil during excavation work. Construction or utility work is generally a relatively short-term periodic nature. However, for purposes of evaluating this receptor group, it is conservatively assumed that the construction/utility workers may work at the site daily for three years under the RME scenario and six months under the CTE scenario. All exposure factors for the assessment of this receptor group are provided in Section 6.6.3.2

Casual Trespassers. Casual trespassers have been identified in the CSM as receptors to be evaluated in the SSRBE. Workers from other buildings in the vicinity could be exposed to COPCs while trespassing on the site or taking cigarette breaks. Therefore, casual trespassers are restricted to adults and are exposed only to surface soil. They are conservatively assumed to be exposed daily during the course of work over a period of employment. Their soil-contacting activities were assumed to be no greater than that of residents as opposed to occupational workers. All exposure factors for the assessment of the casual trespasser are presented in Section 6.6.3.2.

EOD Training Range Supervisor. The EOD Training Range supervisor was identified in the CSM as the most likely individual with the greatest potential exposure during possible detonation operations. While other workers involved with testing may come to IRP Site 1 during specific testing events, the EOD Training Range supervisor would likely be present for all testing occurrences. Detonations were conservatively assumed to occur once each week for 50 weeks per year under a RME scenario. Detonations were assumed to last only three minutes, but the exposure time for all pathways is assumed to be 30 minutes per day. All other inhalation factors and soil-contacting

factors were assumed to be equal to that of industrial worker. All exposure factors for the assessment of the EOD Training Range supervisor are presented in Section 6.6.3.1.

Chemical intake for the EOD Training Range supervisor is an integration of exposures from incidental ingestion, dermal absorption and inhalation. While intake through inhalation is typically estimated using either a default or site-specific particulate emission factor as recommended by the EPA Soil Screening Guidance (EPA 2004d), none of the recommended default values or algorithms are well suited for estimating airborne concentrations of COPCs during detonation events. To derive a more relevant particulate emission factor (PEF) estimate for the EOD Training Range supervisor, a site-specific PEF was calculated using the maximum PM10 concentration measured during a series of bomb tests at a distant site (ATSDR 2003) and the maximum arsenic concentration measured in surface soil at IRP Site 1.

Bombing operations in Vieques, Puerto Rico, resulted in a 60 percent increase in the average PM10 concentrations (i.e., 34.7 ug/m^3 versus 21.6 ug/m^3) in the closest town, 6 miles predominantly downwind from the testing facility (ATSDR 2003, Table 6). Applying this percent increase to the PM10 readings near IRP Site 1 results can be used in deriving a site-specific PEF value for the EOD Training Range supervisor.

The California EPA has a PM10 database (available at http://www.arb.ca.gov/aqd/oldpm10/pmgeosel.htm) that includes a Station called El Toro. PM10 data are available for years 1993 to 1997 and include the maximum 24-hour reading, maximum geometric and arithmetic means, the expected peak day concentration, and the 99th percentile of PM10 readings for each year. Given the few number of readings per year (12 or fewer), the maximum 24-hour reading and the 99th percentile are the same. The highest 24-hour PM10 reading of 122 ug/m^3 occurred in 1995. Using this highest reading and the estimated 60 percent increase due to detonation operations, one can derive a maximum PM10 concentration of 195 ug/m^3 under the RME scenario. Using this maximum PM10 value, a site-specific PEF of 5.1x10^6 was derived using the following equation:

$$\text{PEF } (m^3/kg) = \frac{1}{\text{PM10 } (\mu g/\, m^3)} \times 10^9\ \mu g/kg$$

The calculated PEF value was applied to COPCs in surface soil and sediment. The calculated PEF value was included with other RME exposure factors and the EPCs of various chemicals in surface soil and sediment in developing the PRGs for the EOD Training Range supervisor (Section 6.6.3). PRGs under the CTE scenario were similarly calculated using the highest geometric mean PM10 value of 32.5 ug/m3. The estimated PEF value under the CTE scenario is 1.9x10^7 m^3/kg.

6.6.3 Estimation of Site-Specific PRGs for Construction/Utility Worker, Casual Trespasser and EOD Training Range Supervisor

Cancer risks and HIs for the SSRBE were calculated in the same manner as described for the screening assessment. In the SSRBE, however, only those chemicals carried over from the RBS are evaluated in a site-specific (e.g., construction/utility worker, casual trespasser, or EOD Training Range supervisor) context. Because the exposure parameters for the receptor groups differ from those used by EPA Region 9 to develop residential or industrial PRGs, site-specific PRGs were developed according to the model below.

6.6.3.1 MODEL DEVELOPMENT

The model used for estimating the site-specific PRGs for COPCs at IRP Site 1 via ingestion of soil, dermal contact with soil, and inhalation of particulates is shown below. This model is based on the model used by EPA Region 9 for the development of PRGs.

$$PRG = \frac{TCR \times BW \times AT}{ED \times EF \times \left[\left(CSF_o \times IRS \times FI \times CF\right) + \left(CSF_o \times SA \times ABS \times AF \times EV \times CF\right) + \left(CSF_i \times IRA \times ET \times \left(\frac{1}{PEF} \right) \right) \right]}$$

Where:

PRG = Site-specific preliminary remediation goal for specific receptors (mg/kg)
TCR = Target cancer risk for exposure to carcinogenic chemicals (unitless)
BW = Body weight (kg)
AT = Carcinogenic averaging time (days)
ED = Exposure duration (years)
EF = Exposure frequency (days per year)
CSFo = Oral cancer slope factor for carcinogenic chemicals (mg/kg-day^{-1})
IRS = Ingestion rate of soil (mg/day)
FI = Fraction ingestion from source (unitless)
CF = Conversion factor (kg/mg)
SA = Exposed skin surface area (square centimeters [cm^2]/event)
ABS = Dermal absorption factor (unitless)
AF = Adherence factor (milligrams per square centimeter [mg/cm^2])
EV = Event frequency (events per day)
CSFi = Inhalation cancer slope factor for carcinogenic chemicals [(mg/kg-day)$^{-1}$]
IRA = Inhalation rate (cubic meters [m^3]/hour)
ET = Exposure time (hours/day)
PEF = Particulate emission factor (cubic meters per kilogram [m^3/kg])

A similar model is used to estimate the soil PRGs for noncarcinogenic chemicals. The model shown below was used for estimating the noncarcinogenic PRGs.

$$PRG = \frac{THQ \times BW \times AT}{\frac{IRS \times FI \times EF \times ED \times CF}{RfD_o} + \frac{SA \times AF \times ABS \times EF \times ED \times EVxCF}{RfD_o} + \frac{IRA \times ET \times EF \times ED \times \left(1/VF + 1/PEF \right)}{RfD_i}}$$

Where:

THQ = Target hazard quotient for exposure to noncarcinogenic chemicals (unitless)
RfDo = Oral reference dose for noncarcinogenic chemicals (mg/kg-day)
RfDi = Inhalation reference dose for noncarcinogenic chemicals (mg/kg-day)

6.6.3.2 EXPOSURE PARAMETERS

The exposure parameters used in the soil PRG equations were adapted primarily from the Exposure Factors Handbook (EFH) (EPA 1997a) and Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final Guidance (EPA 2004c). Where applicable, default factors from EPA Region 9 PRGs are used. The exposure parameters are summarized in Table 6-4.

6.6.3.3 INCREMENTAL TOXICITY VALUES (CANCER SLOPE FACTOR AND REFERENCE DOSE)

Toxicity values are chemical-specific values derived by EPA that are health-protective, upper bound estimates of potential toxicity or carcinogenicity of chemicals. Site-specific PRGs are based on the toxicity (i.e., potential for carcinogenic or noncarcinogenic effects) of chemicals that may be ingested, inhaled, or dermally absorbed. RfDs for noncarcinogens and CSFs for carcinogens used in developing PRGs for the construction/utility worker, casual trespasser, and EOD Training Range supervisor are presented in Table G-23, Appendix G.

6.6.3.4 SITE-SPECIFIC PRELIMINARY REMEDIATION GOALS

The exposure parameters discussed in Section 6.6.3.2 and the toxicity values presented in Section 6.6.3.3 were inserted into the equations presented in Section 6.6.3.1. The resulting site-specific PRGs for both site-specific receptors (construction/utility worker, casual trespasser, and EOD Training Range supervisor) are presented in Table G-24, Appendix G. EPCs at IRP Site 1 are compared to the site-specific PRGs for both the RME and CTE scenarios in Tables G-25 through G-31, Appendix G, with results presented below.

6.6.4 Site-Specific Risk-Based Evaluation Results for the Construction/Utility Worker, Casual Trespasser, EOD Training Range Supervisor and Wildlife Reserve Workers Receptors

The EPCs for COPCs in surface and subsurface soil were compared to PRGs developed specifically for the site-specific receptors. Cumulative incremental cancer risks and the HQ (i.e., the HI) were calculated. The results of the SSRBE (refer to Tables G-25 through G-31, Appendix G) are discussed below. Table 6-5 summarizes those results.

6.6.4.1 EVALUATION OF CONSTRUCTION/UTILITY WORKER

Surface Soil. The SSRBE results for surface soil under the construction/utility worker scenario are presented in Table G-25, Appendix G. Based on the maximum detected concentration, arsenic was treated as though it exceeds background levels. The cumulative incremental cancer risks for the RME and CTE scenarios are $5x10^{-7}$ and $2x10^{-8}$, respectively, with arsenic as the only contributor to the risk. Both estimates are below the risk management range of 10^{-6} to 10^{-4}. The RME cumulative incremental cancer risk, excluding background, remains at $5x10^{-7}$ because the reported level of arsenic is considered to be site-related. However, only the maximum detected concentration of arsenic (8.6 mg/kg) is above the background concentration of 6.86 mg/kg (refer to Table G-25, Appendix G). The cumulative noncarcinogenic HI due to exposure to surface soil by construction/utility workers is less than or equal to the target level of 1.0 for both the RME and CTE scenarios.

Table 6-4: Exposure Parameters for Site-Specific Risk-Based Evaluation Receptors

Parameter	Definition	Construction/ Utility Worker RME	Construction/ Utility Worker CTE	Casual Trespasser RME	Casual Trespasser CTE	EOD Training Range Supervisor RME	EOD Training Range Supervisor CTE
IRS	Soil Ingestion Rate (mg/day) [a]	330	165	50	50	100	50
FI	Fraction Ingestion from Source (unitless) [b]	1.0	0.5	1.0	0.5	1.0	0.5
IRA	Inhalation Rate (m^3/hour) [c]	2.5	1.3	1.0	1.0	0.83	0.63
PEF	Particulate Emission Factor (m^3/kg) [d]	1.32E+09	1.32E+09	1.32E+09	1.32E+09	5.1E+06	1.9E+07
SA	Exposed Surface Area (cm^2/event) [J]	3,300	3,300	5,700	3,300	3,300	3,300
AF	Weighted Adherence Factor (mg/cm^2) [e]	0.3	0.14	0.07	0.01	0.2	0.02
ABS	Absorption Factor (unitless) [f]						
	Arsenic; dioxins	0.03	0.03	0.03	0.03	0.03	0.03
	VOCs; inorganics	0	0	0	0	0	0
	SVOCs	0.1	0.1	0.1	0.1	0.1	0.1
	PAHs	0.13	0.13	0.13	0.13	0.13	0.13
ET	Exposure Time (hour/day) [g]	8	8	1	0.5	0.5	0.25
EF	Exposure Frequency (days/year) [h]	250	250	250	219	50	17
ED	Exposure Duration (year) [I]	3	0.5	25	6.6	25	6.6
EV	Event Frequency (events/day)	1	1	1	1	1	1
CF	Conversion Factor (kg/mg)	1.00E–06	1.00E–06	1.00E–06	1.00E–06	1.00E–06	1.00E–06
BW	Body Weight (kg)	70	70	70	70	70	70
AT	Averaging Time (days):						
	Noncarcinogenic	1,095	183	9,125	2,409	9,125	2,409
	Carcinogenic	25,550	25,550	25,550	25,550	25,550	25,550
TCR	Target Cancer Risk	1.00E–06	1.00E–06	1.00E–06	1.00E–06	1.00E–06	1.00E–06
THQ	Target Hazard Quotient	1.0	1.0	1.0	1.0	1.0	1.0

Notes:
CTE = central tendency exposure
EOD = explosive ordnance disposal
PAHs = polynuclear aromatic hydrocarbons
RME = reasonable maximum exposure
SVOCs = semivolatile organic compounds
VOCs = volatile organic compounds
cm^2/event = square centimeters per event
kg = kilograms
kg/mg = kilograms per milligram
mg/cm^2 = milligrams per square centimeters
mg/day = milligrams per day
m^3/hour = cubic meters per hour
m^3/kg = cubic meters per kilograms

n/a = not applicable; EPA dermal Guidance (2004c) states that there are too few data to extrapolate a reasonable default value for inorganics.

[a] RME value taken from *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December 2002b, OSWER 9355.4-24. CTE value of 165 mg/day assigned 1/2 the RME value. Ingestion rate for casual trespasser for both RME and CTE assigned the adult value recommended in Table 4-23 of Exposure Factors Handbook (EPA 1997a).*

[b] Assumes 100% of daily intake is from the contaminated source under the RME scenario and only 50 percent under the CTE scenario based on limited hours at the contaminated area.

[c] Table 5-23 of EFH 1997a. RME value for construction worker is based on heavy activities during short-term exposures for outdoor workers whereas the CTE value is the hourly average. RME and CTE value for casual trespasser is the mean inhalation rate for outdoor workers engaged in light activities during short-term exposures.

[d] Default PEF for Region 9 PRGs (2004a) was used except for the EOD Training Range supervisor which is described in section 6.6.2.

[e] *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment [Dermal Guidance])* (EPA 2004c). RME and CTE values for the construction worker taken from Appendix C and represent the 95th percentile and geometric mean of weighted adherence factors for the construction worker. RME and CTE values for the casual trespasser set equal to the recommended residential values (Exhibit 3-5) since soil-contacting activity of the casual trespasser would be no greater than that of a resident. [f] Chemical-specific values as presented in the Dermal Guidance (EPA 2004c)

[g] RME and CTE value for construction worker assumes the entire 8-hour work day is spent at the site. RME value for the casual trespasser is the total lunch time spent by a worker from nearby facility; CTE value assigned ½ of RME or 30 minutes. The 30 minute and 15 minute exposure time for the EOD Training Range supervisor under the RME and CTE scenarios were assumed.

[h] RME and CTE values for the construction worker and the RME value for the casual trespasser taken as the standard default value for industrial worker as presented in Region 9 PRGs (2004a). CTE value for casual trespasser assumed equal to that of an industrial worker and taken from Exhibit 3-5 of the Dermal Guidance (EPA 2004c).

[I] Duration of construction project assumed to be 3 years under the RME scenario and 6 months (0.5 year) under the CTE scenario. For the casual trespasser who is assumed to be a worker from a nearby facility, exposure duration would be similar to an industrial worker. Therefore, the RME value is the EPA Region 9 default value for the occupational worker. The CTE value for casual trespasser is the median tenure of occupational employees as presented in Table 15-158 of the Exposure Factors Handbook (1997a).

[J] Except for the RME value for the casual trespasser (set equal to that of a resident), surface area for all receptors set equal to the recommended value of 3,300 cm2 for industrial workers as presented in Exhibit 3-5 of the Dermal Guidance (EPA 2004c).

Subsurface Soil. The SSRBE results for subsurface soil under the construction/utility worker scenario are presented in Table G-26, Appendix G. These results indicate that concentrations of aluminum, antimony, cadmium, copper, lead, thallium, and zinc in subsurface soil are above background. Based on its maximum detected concentration, arsenic was treated as though it exceeds background. The average concentration of arsenic is consistent with background levels. The cumulative incremental cancer risk under the RME scenario ($1x10^{-6}$) and CTE scenario ($5x10^{-8}$) are near or below the risk management range of 10^{-6} to 10^{-4}. The primary contributors to risk are arsenic and RDX. Only the maximum detected concentration for arsenic exceeds the risk-based construction worker PRG in subsurface soil. The cumulative HIs under the RME and CTE scenarios are 3 and 0.4, respectively. While the HI associated with the RME scenario is above the EPA target HI of 1.0, that for the CTE scenario is below this target level. Antimony and thallium contribute most to the cumulative HI, with less contribution from naphthalene and 2-methylnaphthalene. Aluminum exceeds the maximum permissible conconcentration of 1E+05 mg/kg (refer to Table G-26, Appendix G).

Sediment. Sediment in the Ephemeral Pond at IRP Site 1 was evaluated against construction/utility worker PRGs for both RME and CTE scenarios (refer to Table G-27, Appendix G). Arsenic is the only chemical that is evaluated since it was the only constituent carried forward from the RBS. Cumulative incremental cancer risk including background is $2x10^{-7}$ for the RME scenario and $9x10^{-9}$ for the CTE scenario. Both estimates are below the risk management range of 10^{-6} to 10^{-4}. The maximum detection of arsenic in sediment (1.5 mg/kg) is below (or considered) background. Therefore, if one excludes background constituents, there is no incremental cancer risk associated with exposure to sediment for the construction/utility worker.

Arsenic was also evaluated against its noncarcinogenic PRG. The resulting cumulative HI is below 1.0 under both the RME and CTE scenarios.

6.6.4.2 EVALUATION OF CASUAL TRESPASSER

Surface Soil. The SSRBE results for surface soil under the casual trespasser scenario are presented in Table G-28, Appendix G. Based on the maximum concentration, arsenic is treated as though it exceeds background. The cumulative incremental cancer risks for the RME and CTE scenarios are $6x10^{-7}$ and $6x10^{-8}$, respectively. Both estimates are below the risk management range of 10^{-6} to 10^{-4}. These carcinogenic risk estimates are comprised entirely of arsenic since the non-risk-based PRGs for naphthalene and 2-methylnaphthalene (i.e., PRGs for both chemicals are based on soil saturation) preclude their use in risk estimates. The maximum detected concentration of arsenic in surface soil exceeds the carcinogenic trespasser PRG under the RME scenario but the EPC is below it. Because arsenic is treated as though it is above background, the cumulative incremental cancer risk, excluding background, is also estimated at $6x10^{-7}$ under the RME scenario because the reported level of arsenic is considered to be site-related. However, only the maximum detected concentration of arsenic (8.6 mg/kg) is above the background concentration of 6.86 mg/kg (refer to Table G-28, Appendix G). The cumulative noncarcinogenic HI due to exposure to surface soil by casual trespassers is less than the target level of 1.0 for both the RME and CTE scenarios.

Subsurface Soil. The casual trespasser is not expected to become exposed to subsurface soil, and therefore no risk estimate is provided for this soil interval.

Sediment. Sediment at IRP Site 1 was evaluated against casual trespasser PRGs for both RME and CTE scenarios (refer to Table G-29, Appendix G). Arsenic is the only chemical that is evaluated since it was the only constituent carried forward from the RBS. The cumulative incremental cancer risk including background is $2x10^{-7}$ for the RME scenario and $3x10^{-8}$ for the CTE scenario. These estimates are below the risk management range of 10^{-6} to 10^{-4}. The maximum detection of arsenic in

sediment (1.5 mg/kg) is below (or considered to be) background. Therefore, if one excludes background constituents, there is no incremental cancer risk associated with exposure to sediment for the casual trespasser. The cumulative noncarcinogenic HI due to exposure to sediment by casual trespassers is less than the target level of 1.0 for both the RME and CTE scenarios.

6.6.4.3 EVALUATION OF EXPLOSIVE ORDNANCE DISPOSAL TRAINING RANGE SUPERVISOR

Surface Soil. The SSRBE results for surface soil under the EOD Training Range supervisor scenario are presented in Table G-30, Appendix G. Based on the maximum concentration, arsenic is treated as though it exceeds background. The cumulative incremental cancer risks, including background, are $3x10^{-7}$ for the RME scenario and $3x10^{-9}$ for the CTE scenario. Both estimates are below are within the risk management range of 10^{-6} to 10^{-4}. These carcinogenic risk estimates are comprised entirely of arsenic since the non-risk-based PRGs for naphthalene and 2-methylnaphthalene (i.e., PRGs for both chemicals are based on soil saturation) preclude their use in risk estimates. The maximum detected concentration of arsenic in surface soil slightly exceeds the EOD Training Range supervisor PRG but the EPC is below it. Because arsenic is treated as though it is above background, the cumulative incremental cancer risk, excluding background, is also estimated at $3x10^{-7}$ because the reported level of arsenic is considered to be site-related. However, only the maximum detected concentration of arsenic (8.6 mg/kg) is above the background concentration of 6.86 mg/kg (refer to Table G-30, Appendix G). The cumulative noncarcinogenic HI due to exposure to surface soil by an EOD Training Range supervisor is less than the target level of 1.0 for both the RME and CTE scenarios.

Subsurface Soil. The EOD Training Range supervisor is not expected to become exposed to subsurface soil, and therefore no risk estimate is provided for this soil interval.

Sediment. Sediment at IRP Site 1 was evaluated against the EOD Training Range supervisor PRGs for both RME and CTE scenarios (refer to Table G-31, Appendix G). Arsenic is the only chemical that is evaluated since it was the only constituent carried forward from the RBS assessment. Cumulative incremental cancer risks, including background, are $1x10^{-7}$ under the RME scenario and $1x10^{-9}$ under the CTE scenario. These estimates are below the risk management range of 10^{-6} to 10^{-4}. The maximum detection of arsenic in sediment (1.5 mg/kg) is below (or considered to be) background. Therefore, if one excludes background constituents, there is no incremental cancer risk associated with exposure to sediment for the EOD Training Range supervisor. The cumulative noncarcinogenic HI due to exposure to sediment by the EOD Training Range supervisor is less than the target level of 1.0 for both the RME and CTE scenarios.

6.6.4.4 EVALUATION OF WILDLIFE RESERVE WORKER

Risks for the wildlife reserve worker are anticipated to be less than those for the industrial worker due to differences in activity patterns that reduce the expected chemical intake. Evaluation of the industrial worker is likely to be adequately protective of the wildlife reserve worker. As a result, the wildlife reserve worker was qualitatively evaluated. Exposure to either surface soil or subsurface soil results in estimated cumulative incremental cancer risks that are less than $2\ x10^{-6}$ (i.e., less than the ILCR for the industrial worker). Noncancer hazards are less than 1. Exposure to sediment would result in estimated cumulative incremental cancer risks and noncancer hazards that are within acceptable levels.

6.6.4.5 SITE-SPECIFIC RISK-BASED EVALUATION SUMMARY

Table 6-5 summarizes the results of the site-specific risk assessment. Risks for the wildlife reserve worker, which were qualitatively evaluated, are not included.

The evaluation of surface soil scenarios using EPCs resulted in no incremental cancer risks that exceeded the target incremental cancer risk level of 10^{-6} for the construction worker (ILCR = $5x10^{-7}$), casual trespasser (ILCR = $6x10^{-7}$) or EOD Training Range supervisor (ILCR = $3x10^{-7}$). Arsenic is the only carcinogenic COPC. Because the maximum detection of arsenic is greater than the background concentration, arsenic was evaluated as though it exceeded background, even though the only location where arsenic exceeds background is a single trench location. With this assumption, the cumulative incremental cancer risk, excluding background, remains the same for each receptor because the reported level of arsenic is considered to be site-related. Taking all arsenic data collectively, however, the average arsenic concentration in surface soil is consistent with background levels.

The site-specific incremental cancer risk estimates for subsurface soil are at or below the target level of 10^{-6} for the construction worker. The casual trespasser and EOD Training Range supervisor are not exposed to subsurface soil. The site-specific incremental cancer risk estimates for sediment are below the risk management range of 10^{-6} to 10^{-4} and cumulative noncancer HI is less than 1.0. Arsenic in sediment (the only COPC) is at background levels.

Evaluation of noncancer hazards associated with exposure to surface soil for the construction worker resulted in HIs equal to or below the target noncancer hazard of 1 (Table 6-5). Evaluation of noncancer hazards associated with exposure to subsurface soil resulted in HIs for the construction worker that exceeded the target noncancer hazard of 1.0 under the RME scenario (HI = 3) but below this target level under the CTE scenario (HI = 0.4). Antimony and thallium (present at levels above background) contribute most to this hazard. For the casual trespasser or EOD Training Range supervisor, noncarcinogenic HIs are below the target hazard of 1.0.

Risks are also presented using California-modified toxicity values (Table 6-6). The evaluation of surface soil exposure under the RME scenario resulted in cumulative lifetime cancer risks (or ILCRs) of $5x10^{-6}$ for the construction/utility worker, $6x10^{-6}$ for the casual trespasser, and $4x10^{-7}$ for the EOD Training Range supervisor. The estimated ILCR from subsurface soil exposure increases slightly (ILCR = $7x10^{-6}$) for the construction/utility worker. Risk estimates that utilize California-modified toxicity values are approximately an order of magnitude higher than when estimated using EPA Region 9 PRGs. The main reason for this increase is that naphthalene, originally evaluated as a noncarcinogenic chemical by EPA Region 9, is considered a carcinogen by the State of California. Given the infrequency with which naphthalene was detected in soil (one percent in surface soil and four percent in subsurface soil), the higher estimated cancer risk belies the likelihood that a receptor encounters naphthalene at the site. The second reason for the increase in the cancer estimate is that California assigns a higher slope factor (i.e., more toxic) for arsenic.

6.6.5 Uncertainties in the Screening Risk Assessment

Uncertainty is inherent in the risk assessment process. The level of certainty associated with the conclusions of the SRA is conditional upon the quality of data and models used to identify COPCs and estimate EPCs, the assumptions made in estimating exposure conditions, and the methods used to develop toxicity factors. Uncertainties in the risk assessment process could result in an overestimation or underestimation of risk. This risk assessment has been developed to be protective, rather than accurately predictive. As a result, the risk assessment is believed to represent a substantial overestimation of excess or incremental cancer risk and noncancer hazard. This section presents a discussion of some of the uncertainties inherent in the risk assessment with focus on key factors believed to influence the risk assessment process and application to risk management activities. Uncertainties involved in each major step of the risk assessment process (i.e., data assessment, exposure assessment, toxicity assessment, and risk characterization) are discussed separately below.

6.6.5.1 UNCERTAINTIES IN DATA ASSESSMENT

Rejected Results. As presented in Table G-1, Appendix G, some of the analytical results were determined to be unusable (i.e., R-flagged) for the quantitative risk evaluation due to the reasons described in Section 6.2. These results were excluded from the SRA. Specifically, seven of 174 surface and subsurface soil results (four percent) for cis-1,2-dichloroethane were rejected, one of 174 surface and subsurface soil results (< one percent) for 2-butanone were rejected, and 41 of 174 surface and subsurface soil results (24 percent) for acetone were rejected. All groundwater results were determined to be usable. Because some results were excluded from the quantitative evaluation, the results of the Tier 1 SRA may potentially be over- or underestimated.

Chemicals with Minimum Reporting Limits above the Screening Criteria. When a chemical was both detected and not detected in a sample medium, a proxy concentration of one-half the RL was assigned when calculating exposure point concentrations (such as the 95 percent UCL). If an analyte was not detected in the sample medium, then it is not included as a COPC in the risk assessment. Only one chemical not detected in soil had all of its RLs greater than the screening criteria. Numerous nondetected chemicals in groundwater had all of their RLs greater than screening criteria. Because these chemicals were not detected and therefore not evaluated as a COPC, potential risks/hazards would be underestimated if any of these chemicals is truly present at the RL.

Elevated Nondetects. Calculation of the 95 percent UCL does not include nondetect results with reporting limits two times the maximum detected concentration. Such results are excluded from the dataset. This practice is based on the discussion of unusually high sample quantitation limits in Section 5.3.2 of RAGS (EPA 1989). Based on this comparison (sample quantitation limit [SQL] compared with two-times the highest detect), nondetected results were excluded for several COPCs in surface and subsurface soil. The majority of chemicals having such elevated detection limits were VOCs and among those, chemicals often associated with laboratory contamination or found in blanks were evident. Key exceptions to this conclusion include fluoranthene, motor oil, and phenol in surface soil and cobalt, fluoranthene, hexachlorobenzene, motor oils, phenol, selenium, TCE, and thallium in subsurface soil. As a result of these excluded results, the potential risk may be underestimated.

Sample Quantitation Limit Evaluation. Several chemicals in surface soil, subsurface soil and groundwater were not detected in any of the collected samples. These chemicals may not have been detected because they truly are not present or the RL was insufficient to detect their presence. If any of these chemicals is truly present, risk would be underestimated. A comparison of the SQL to residential PRGs identified those chemicals for which the SQL was not low enough to detect concentrations at the defined residential PRG. Chemicals with 100 percent of the RLs exceeding the PRGs would potentially underestimate the reported risks if the chemical were truly present. Table G-2, Appendix G, illustrates those chemicals for which an SQL exceeded the residential PRG. When RLs exceed PRGs and the chemical is not detected in any sample, it is possible that the chemical is present at a concentration that may exceed the risk-based level. In this instance, risk may be potentially underestimated. However, it is also possible that these chemicals are not present in soil or groundwater, thus having no effect on the quantitative risk evaluation.

COPCs were identified based on the comparison of the maximum detected concentration with the residential PRG. When a chemical was never “detected” (where there were no analytical results above the SQL or estimated between the SQL and the Method Detection Limit [MDL]), then the RLs were compared to the residential PRG to ensure that potential COPCs were not overlooked or dismissed without justification.

Table 6-5: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Site-Specific Risk-Based Evaluation

Medium and Type of Evaluation	Construction/Utility Worker		Casual Trespasser		EOD Training Range Supervisor	
	RME	CTE	RME	CTE	RME	CTE
Surface Soil – Including Background						
ILCR	$5x10^{-7}$	$2x10^{-8}$	$6x10^{-7}$	$6x10^{-8}$	$3x10^{-7}$	$3x10^{-9}$
Contributors:	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic
HI	1	<0.01	<0.01	<0.01	<0.01	<0.01
Contributors:	61% - naphthalene 37% - 2-methylnaphthalene	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]
Surface Soil – Excluding Background						
ILCR	$5x10^{-7}$	$2x10^{-8}$	$6x10^{-7}$	$6x10^{-8}$	$3x10^{-7}$	$3x10^{-9}$
Contributors:	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic
HI	1	<0.01	<0.01	<0.01	<0.01	<0.01
Contributors:	61% - naphthalene 37% - 2-methylnaphthalene	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]
Subsurface Soil – Including Background						
ILCR	$1x10^{-6}$	$5x10^{-8}$	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	60% - arsenic 26% - RDX 13% - TCDD TEQ	58% - arsenic 29% - RDX 13% - TCDD TEQ				
HI	3	0.4	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	29% - antimony 26% - thallium 24% - naphthalene 15% - 2-methylnaphthalene	47% - antimony [a] 42% - thallium [a]				
Subsurface Soil – Excluding Background						
ILCR	$1x10^{-6}$	$5x10^{-8}$	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	60% - arsenic 26% - RDX 13% - TCDD TEQ	58% - arsenic 29% - RDX 13% - TCDD TEQ				
HI	3	0.4	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	29% - antimony 26% - thallium 24% - naphthalene 15% - 2-methylnaphthalene	47% - antimony [a] 42% - thallium [a]				
Sediment – Including Background						
ILCR	$2x10^{-7}$	$9x10^{-9}$	$2x10^{-7}$	$3x10^{-8}$	$1x10^{-7}$	$1x10^{-9}$
Contributors:	100% - arsenic	100% -	100% -	100% -	100% -	100% - arsenic

Table 6-5: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Site-Specific Risk-Based Evaluation

Medium and Type of Evaluation	Construction/Utility Worker		Casual Trespasser		EOD Training Range Supervisor	
	RME	CTE	RME	CTE	RME	CTE
		arsenic	arsenic	arsenic	arsenic	
HI	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Contributors:	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic
Sediment – Excluding Background						
ILCR	--	--	--	--	--	--
HI	--	--	--	--	--	--
Groundwater	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Surface Water	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated

Notes:
% = percent
< = less than
CTE = central tendency exposure
EOD = explosive ordnance disposal
HI = hazard index
ILCR = incremental lifetime cancer risk
RDX = cyclotrimethylenetrinitramine
RME = reasonable maximum exposure
TCDD TEQ= tetrachlorodibenzodioxin toxicity equivalency factor
[a] = The non-cancer hazard cannot include naphthalene or 2-methylnaphthalene because soil saturation is the respective PRG.
-- Cancer risk or Hazard index cannot be calculated since the single COPC of arsenic is at background levels.

Table 6-6: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Site-Specific Risk-Based Evaluation Using California-Modified Toxicity Values

Medium and Type of Evaluation	Construction/Utility Worker		Casual Trespasser		EOD Training Range Supervisor	
	RME	CTE	RME	CTE	RME	CTE
Surface Soil – Including Background						
ILCR	$5x10^{-6}$	$1x10^{-7}$	$6x10^{-6}$	$4x10^{-7}$	$4x10^{-7}$	$2x10^{-8}$
Contributors:	59% - arsenic 41% - naphthalene	100% - arsenic [a]	57% - arsenic 43% - naphthalene	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]
HI	1	<0.01	<0.01	<0.01	<0.01	<0.01
Contributors:	61% - naphthalene 37% - 2-methylnaphthalene	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]
Surface Soil – Excluding Background						
ILCR	$5x10^{-6}$	$1x10^{-7}$	$6x10^{-6}$	$4x10^{-7}$	$4x10^{-7}$	$2x10^{-8}$
Contributors:	59% - arsenic 41% - naphthalene	100% - arsenic [a]	57% - arsenic 43% - naphthalene	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]
HI	1	<0.01	<0.01	<0.01	<0.01	<0.01
Contributors:	61% - naphthalene 37% - 2-methylnaphthalene	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]	100% - arsenic [a]
Subsurface Soil – Including Background						
ILCR	$7x10^{-6}$	$2x10^{-7}$	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	61% - arsenic 33% - naphthalene	90% - arsenic [a]				
HI	3	0.4	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	29% - antimony 26% - thallium 24% - naphthalene 15% - 2-methylnaphthalene	47% - antimony[a] 42% - thallium[a]				
Subsurface Soil – Excluding Background						
ILCR	$7x10^{-6}$	$2x10^{-7}$	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	61% - arsenic 33% - naphthalene	90% - arsenic [a]				
HI	3	0.4	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Contributors:	29% - antimony 26% - thallium 24% - naphthalene	47% - antimony[a] 42% - thallium[a]				

Table 6-6: Summary of Incremental Lifetime Cancer Risks and Noncancer Hazards for Site-Specific Risk-Based Evaluation Using California-Modified Toxicity Values

Medium and Type of Evaluation	Construction/Utility Worker		Casual Trespasser		EOD Training Range Supervisor	
	RME	CTE	RME	CTE	RME	CTE
	15% - 2-methylnaphthalene					
Sediment – Including Background						
ILCR	$1x10^{-6}$	$6x10^{-8}$	$2x10^{-6}$	$2x10^{-7}$	$2x10^{-7}$	$8x10^{-9}$
Contributors:	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic
HI	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Contributors:	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic	100% - arsenic
Sediment – Excluding Background						
ILCR	--	--	--	--	--	--
HI	--	--	--	--	--	--
Groundwater	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated
Surface Water	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated	Not Evaluated

Notes:
% = percent
< = less than
COPC = chemical of potential concern
CTE = central tendency exposure
EOD = explosive ordnance disposal
HI = hazard index
ILCR = incremental lifetime cancer risk
PRG = preliminary remediation goal
RME = reasonable maximum exposure
[a] = The cancer risk or non-cancer hazard cannot include naphthalene or 2-methylnaphthalene because soil saturation is the respective PRG.
-- Cancer risk or HI cannot be calculated since the single COPC of arsenic is at background levels.

The evaluation of the analytical RL is to ensure that the analytical limit is sufficient to reliably report the presence of a chemical in the medium of concern. MDLs are the lowest levels at which a method can detect a chemical given the reagents, sample matrix, and preparation steps of the analytical method. It does not include factors such as matrix interferences, variabilities in sample to sample results, etc. While, an evaluation of the MDL against the PRGs could have been conducted where MDLs were compared to the residential PRG, such a comparison does not consider the practical aspects of the analyses and could result in misleading the data quality evaluation. Therefore, as recommended by EPA Guidance (EPA 1989) the use of a more reliable value, the SQL, was used to make assessments of sufficiency of the analytical method. Because most of the SQL were deemed to be sufficiently low for the evaluation of risk, the use of the SQL in this context is not thought to add substantially to the uncertainty of the assessment.

6.6.5.2 UNCERTAINTIES IN EXPOSURE ASSESSMENT

Uncertainty in the exposure assessment is a function of several factors. Such factors include but are not limited to: completeness/representativeness of the site data; identification of COPCs; assumptions regarding actual current and/or future site land use; identification of relevant receptor

groups and activities; and even the extent to which certain chemicals are physiologically retained and transferred to target organs of the selected receptors.

Judgmental Sampling. For this site investigation, the data that have been collected are believed to be reasonably representative of current site conditions. COPCs have been selected based on prior knowledge of the site (i.e., areas identified through geophysical means as having been used as detonation pits) and an understanding of conditions that are likely to influence chemical fate and transport. Several samples have been collected in a judgmental (i.e., biased) fashion over a period of three years at different depths in order to characterize the extent of contamination. The biased sampling procedures are likely to overestimate exposure and associated risk because receptors are assumed to contact those areas preferentially.

Land Use Considerations. For this evaluation, assumptions have been made to both ensure conservatism and attempt to realistically characterize current and future site use. Conservativeness is embodied in the RBS that compares EPC to PRGs under the residential land use. This assumption overestimates risk but provides useful information to facilitate reasonable land use considerations. The site-specific risk-based evaluation evaluated alternate receptor scenarios. This evaluation is more likely to identify reasonably realistic risk given assumptions of receptor activities. Overall, therefore, selection and evaluation of the land uses in the risk assessment will tend, in general, to overestimate risks.

Selection of COPCs. Chemicals evaluated in this SRA were identified by a single detection in each of the environmental media. This conservative approach to identifying COPCs conflicts with some EPA Guidance (EPA 1989) in which a minimum of five percent detection is recommended. The use of the single detection to identify COPCs could overestimate the potential risk from exposure to chemicals detected at the site. For example, the noncarcinogenic HI for exposure to surface soil was driven to a large degree by naphthalene and 2-methylnaphthalene; however each of these two compounds were detected in only one of 72 samples. For subsurface soil, the risk drivers naphthalene, 2-methylnaphthalene, and RDX were detected in only four percent of the samples. Inclusion of these chemicals and their maximum detected concentrations as EPCs likely overestimates the true risk to which receptors at the site are exposed.

Receptor Selection and Exposure Factors. Receptor groups have been selected to be consistent with generic and site-specific land uses. Therefore, the risk assessment has assumed that relevant receptor groups consist of residential and industrial receptors. All of the exposure factors that are used to characterize chemical intake for these receptors are conservatively developed to ensure that, if anything, the risk is overestimated. Alternatively, the risk assessment has assumed that construction/utility workers, casual trespassers, and an EOD Training Range supervisor are relevant to a characterization of site-specific risks. Thus, these receptor groups have been evaluated with exposure factors that are somewhat less conservative but more realistic than those used in the RBS assessment. For instance, despite the fact that current construction work activities result in reduced exposures (i.e., direct contact is minimized with the use of machinery), risk to the receptor has been evaluated using many exposure factors that are recommended as default factors by the EPA to ensure protectiveness in the risk assessment. Because many of the exposure factors used in the evaluation have been developed to ensure protectiveness, the tendency for risk to be overestimated is likely.

Exposure Point Concentrations. Because of the inherent variability of sample collection, sample analysis, and chemical distribution in the environment, the determination of an EPC that represents an average exposure with confidence can be difficult. Defined as the lesser of the maximum detected concentration or the 95 percent UCL, the EPC that is chosen is the value that best represents the average exposure. EPA Guidance allows the use of the “lesser” of the two values between the maximum detected concentration and the 95 percent UCL. When samples are collected (and

therefore, define a data set), and when the variability among the observations is great, the 95 percent UCL will likely be greater than the maximum concentration. Defaulting to the lesser of the two concentrations helps to minimize the overestimation of risk, but does not eliminate the potential to overestimate the risk based on the "average" exposure condition, which is the anticipated level of exposure. The EPC could, in fact, yield an over- or underestimate of risk depending on the truly underlying distribution of the data/chemical concentrations.

Many of the higher detections of inorganic COPCs were located in the trench area and may not accurately reflect metal concentrations across the entire site and those which receptors may contact. For example, arsenic was treated as though it exceeded background levels based on a single surface soil sample and a single subsurface soil sample at 6 feet bgs. The high detections are included in the data set for the appropriate soil interval and would likely artificially elevate the surface soil EPC and subsurface soil EPC to which receptors are potentially exposed at the site.

Uncertainty Associated with Secondary Pathways Not Evaluated. Secondary pathways such as ingestion of homegrown produce were not evaluated in this assessment. Because secondary pathways are not quantitatively evaluated and because some of the chemicals detected have the potential to bioaccumulate in plants, potential risks could be underestimated. The inorganic chemicals detected in the soil medium were compared to published bioconcentration factors for soil to plant transfer (BCFp) (Bechtel Jacobs Company 1998). No inorganic chemical detected in the soil medium at IRP Site 1 had a BCFp greater than 1, therefore, bioaccumulation of these inorganic chemicals in plants (i.e., foodstuffs) is unlikely. Any organic chemical with a log Kow of greater than 3 is conventionally assumed to have the potential to bioaccumulate in the foodchain. The chemicals in the 0 to 10 feet bgs depth interval for soil with a log Kow of greater than 3 are:

- Ethylbenzene
- Xylenes
- 2-Methylnaphthalene
- BEPH
- Fluoranthene
- Hexachlorobenzene
- Naphthalene
- N-nitrosodiphenylamine
- 2,3,7,8-TCDD (and other dioxin congeners)

Use of Default Particulate Emission Factors. While it is true that activity-specific particulate emission factors (PEFs) may be developed to characterize risk during site-specific activities, the extent to which any activity dominates an exposure scenario is limited by the frequency of occurrence relative to other exposure routes (i.e., oral, dermal). In this assessment, the default PEF was used and the result on the risk estimate could be an over- or underestimate based on the actual PEF value that would result from any site-specific activities.

With the possible exception of the construction worker or EOD Training Range supervisor, it is not reasonably anticipated that the receptor would be exposed to particulates via inhalation over that which is assumed based on the default PEF. As for construction workers, there may be occasions wherein particles are suspended via other than wind erosion processes. However, these events are not expected to be typical and representative of the reasonable maximum exposures. As with any exposure factor, the use of a default rather than a site-specific factor is likely to overestimate risk.

However, it is not anticipated that the use of the default PEF would grossly overestimate risk because the oral ingestion rate of 330 mg/day is likely be the primary exposure route for particle associated chemicals.

In summary, based on the assessment of sampling, land use, receptor selection, and associated activities and exposure factors, the exposure assessment is believed to overestimate risk.

6.6.5.3 UNCERTAINTIES IN TOXICITY ASSESSMENT

Toxicity assessment involves the selection of noncancer toxicity indices (i.e., RfDs) and CSFs.

Reference Doses. RfDs are developed using animal data that must be applied to human receptors for the risk assessment. The process typically involves application of several uncertainty factors and modifying factors to animal test data that lower the RfD, given extrapolation from animal tests to human health risk assessment. For instance, uncertainty factors of 10 are often applied to animal data to reduce a threshold dose 10-fold to arrive at the RfD. This application of the uncertainty factors (UFs) is likely to overestimate noncarcinogenic toxicity as noted by Dourson et. al. (1997) and certainly does not reflect probabilities of excess exposures when exceedances of the RfD are noted (Clewell and Crump 2005).

Cancer Slope Factors. CSFs developed by the EPA are conservative and represent the upper bound limit (i.e., upper 95 percent UCL) on the probability of a cancer response occurring. Thus, the actual carcinogenic risk due to exposure to selected chemicals is likely to be lower than the actual risk experienced by the receptor. One other source of uncertainty in the toxicity assessment lies in extrapolating experimental carcinogenic observations at high doses to the low doses experienced by the human population of interest. Because there is no empirical way to detect risks below the five percent to 10 percent dose range, assumptions must be made about the shape of the dose-response curve in the low dose region (Rodricks, 1992). Because the standard default is to assume that all carcinogens have a linear no-threshold dose-response curve, the cancer potency for carcinogenic COPCs (e.g., arsenic) is likely overestimated.

Route-to-Route Extrapolation. When a chemical does not have a toxicity value for a specific exposure route, a known value from a different route is often substituted. In this assessment, inhalation toxicity values (CSFi or RfDi) are sometimes extrapolated from the oral values. Contrarily, the California-modified oral CSFo for naphthalene was extrapolated from the inhalation value. Despite the simple one-to-one extrapolation method, pharmacological differences for chemicals absorbed through the gastrointestinal tract and via the lung may result in somewhat different toxicological responses. Therefore, the use of the one-to-one extrapolation between the oral and inhalation exposure routes may result in either the underestimation or overestimation of resulting risks.

Chemicals with Non-Intergrated Risk Information System Toxicity Values. Per United States Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) Directive 9285.7-53 (EPA 2003a), the current hierarchy for human toxicity values is:

- Tier 1 – EPA's IRIS
- Tier 2 – EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs)
- Tier 3 – Other Toxicity Values including Cal-EPA Toxicity Values

The primary source of toxicity information is EPA IRIS. When a toxicity value is not available in IRIS, other sources of toxicity information can be considered in accordance with EPA Guidance

(EPA 2003a); these additional sources are often considered "provisional." In this assessment, the Region 9 PRGs for several chemicals were based on provisional toxicity values to derive site-specific PRGs. The chemicals with provisional RfDs (for noncancer risk) include:

- aluminum
- barium
- chloroform
- cobalt
- copper
- cis-1,2-dichloroethene
- iron
- methylene chloride
- methyl isobutyl ketone
- n-nitrosodiphenylamine
- TCE
- vanadium

The chemicals with provisional CSFs (cancer risk) include:

- cobalt
- methyltertbutyl ether
- 2,3,7,8-TCDD
- PCE
- TCE

Of particular note is the provisional slope factor for TCE since this compound is the carcinogenic risk driver in groundwater. Because the provisional toxicity values are not final IRIS values, the overall effect on the risk estimates for this risk assessment could be over- or underestimates. However, as provisional values are often set to ensure protectiveness in associated evaluations, this use of provisional values, including trichloroethylene, as well as the others, is likely to overestimate the risks.

Chemicals with Updated or Revised Toxicity Values (EPA) – Perchlorate. The RfD for perchlorate has recently been changed in IRIS to 7.0×10^{-4} mg/kg-day. This represents a seven-fold increase over the older value reported in the EPA Region 9 PRG tables. The newer value was used in this assessment.

Chemicals with Updated or Revised Toxicity Values (California). Several chemicals evaluated in this assessment have been recently assigned different toxicity values by the State of California. Chemicals include arsenic, chloroform, lead, benzo(k)fluoranthene, chrysene, naphthalene, and TCE. Toxicity values for these chemicals are considered Tier 3 values under the EPA hierarchy (EPA 2003a) but are peer reviewed and as such, the State of California does not consider theses toxicity values as provisional. EPA Region 9 provides PRGs for these chemicals but assigns them as "California (or Cal-) modified" (EPA Region 9 2004a).

Naphthalene. Naphthalene is not listed as a carcinogen in IRIS. However, in 2002, the National Toxicology Program (NTP) completed its bioassay of naphthalene exposure via the inhalation exposure route, concluding there was, "clear evidence of carcinogenicity" of the compound in rats via inhalation exposure (NTP 2000). Pursuant to that assessment, California EPA placed naphthalene on its list of chemicals that might cause cancer and developed a unit risk value for inhalation exposures in 2004 (Cal-EPA 2004b). However, EPA Region 9 subsequently applied a route to route extrapolation to the inhalation exposure data to develop a CSF for oral (CSFo) exposures.

Another EPA (2003d) study however strongly suggests that the assumption of carcinogenicity via the oral route is premature. Specifically, the EPA (2003d) stated the following:

> *"…. the NTP bioassay in rats showed clear evidence for carcinogenic activity within the nasal cavity, but not in other tissues. The new data [in this 2003 report] strengthen the association of carcinogenicity with the inhalation route of exposure and weaken the tenuous association with the oral route. For this reason, the carcinogenic potential of naphthalene via the inhalation route may need to be reevaluated."*

Based on the aforementioned documentation, the use of the oral route-to-route extrapolated CSF in the assessment likely accounts for an overestimation of ILCR.

Arsenic. Slope factors listed in IRIS for arsenic are 1.5 (mg/kg/day)-1 and 15 (mg/kg/day)-1 for oral and inhalation exposure routes, respectively. However, the slope factors developed by California (Cal-EPA 2004a) differ from those endorsed by the EPA with values of 9.5 (mg/kg/day)-1 and 12 (mg/kg/day)-1 for oral and inhalation exposure routes, respectively, suggesting that CalEPA cancer estimates are approximately 10 times greater than those of the EPA.

Different approaches used to establish the CSFs for the EPA and CalEPA explain the principal differences in the derivation of the associated slope factors. For instance, the EPA data set depends in large part on a single well documented and studied sample population located in Taiwan (Tseng 1984). This approach, though limited to the evaluation of skin cancer, provides the benefit of relatively controlled evaluations within a well studied population. Alternatively, CalEPA, in an attempt to evaluate the potential for internal cancers due to arsenic exposures re-assessed not only the Tseng data sets, but also several other data sets associated with potential exposure to various groups of potentially exposed individuals in a broader compliment of geographical locations and exposure scenarios. While the assessment of these many groups is likely to provide sufficient protection via the development of the associated slope factor, the pooling of various populations and cancer types likely results in a higher variation of tumor incidences or cancer responses that may lead to a higher slope factor, suggesting that the CalEPA slope factor is overly protective.

In addition, the inclusion of many data sets that demonstrate different cancers internal suggests that the evaluation may have included differential carcinogenic modes of action in the same numerical analyses. It is uncertain as to whether this would result in an overestimate of the slope factor but it is clear that isolation of a causal relationship between cancer incidence and exposures are confounded.

Chemicals Without Toxicity Values. When chemicals do not have available toxicity factors, then the chemicals cannot be evaluated and potential contribution to the risk/hazard estimates cannot be completed. In all likelihood, the detection of chemicals without toxicity values will yield an underestimate of risk because the chemicals would not be included in the cumulative risk/hazard estimates.

Chemicals detected in soil from the current data that do not have EPA Region 9 soil PRGs due to lack of toxicity values are listed below:

- TPH (various fractions)
- Phenanthrene
- Benzo(g,h,i)perylene
- Nitrate

Chemicals detected in groundwater that do not have EPA Region 9 Tap Water PRGs due to a lack of toxicity values are:

- TPH (various fractions)

Chemicals detected in surface water that do not have EPA Region 9 Tap Water PRGs due to a lack of toxicity values are:

- TPH (various fractions)
- Chloride
- Sulfate

Chemicals detected in sediment that do not have EPA Region 9 Tap Water PRGs due to a lack of toxicity values are:

- TPH (various fractions)

While the lack of toxicity values for the above COPCs imparts additional uncertainty into the risk assessment, the magnitude of this uncertainty is likely low and the effect on the overall risk assessment results for IRP Site 1 is expected to be minimal.

Infrequently Detected Chemicals: In this assessment, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and 2-hexanone were all detected and do not have toxicity values; therefore, risks are likely to be somewhat underestimated. However, all three chemicals had a low frequency of detection. 2-amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene were each detected in 1 sample out of a total of 148 analyses and 2-hexanone was detected in 9 samples out of a total of 174 analyses.

Essential Nutrients: While magnesium, calcium, potassium and sodium were detected, they too have no toxicity values, are essential nutrients and the magnitude of the detected concentrations in the media at IRP Site 1 is relatively small. Thus, it is not expected that the exclusion of these nutrients will underestimate risk.

Dioxins/Furans: The cancer risk from TCDD TEQs is estimated by summing the individual cancer estimates for each dioxin and dibenzofuran congener. The risk calculations for all congeners (with the exception of TCDD) are determined using estimated CSFs based on the assumption of toxicity equivalence to 2,3,7,8 TCDD. While the approach is an estimation procedure that depends on assumed toxicity of dioxin-like chemicals, it is generally understood that absent actual toxicity data for each dioxin congener, the TCDD TEQ process is a potentially better methodology to estimate cancer risk in potentially exposed populations. Nonetheless, despite its general acceptance in the scientific community, the methodology does assume additivity of like cancer effects derived from chemicals of similar structures. Thus based on its use in the risk assessment, cancer risks associated

with potential exposure to dioxins, as presented by the TEQ approach, may be somewhat overestimated.

Maximum Allowed Concentrations: Region 9 has established PRG "max" concentrations for some inorganic analytes or SVOCs with relatively low toxicity. PRG_{max} concentrations are non-health-based ceiling limit concentrations, and are fixed at 1E+05 mg/kg. If a health-based PRG was unavailable for comparison but a PRG_{max} was available, the PRG_{max} was used for qualitative comparison. PRG_{max} values were used as industrial soil PRGs in the evaluation of diethyl phthalate, phenol, aluminum, iron, and zinc. The maximum detected concentration of aluminum exceeded the 1E+05 mg/kg ceiling limit. However, it is not expected that these COPCs are present in concentrations that are likely to result in adverse health effects for the industrial receptor. It is not known whether hazards are overestimated or underestimated through use of "max" concentrations.

Saturation Concentrations: Some EPA Region 9 PRGs are listed as "sat" concentrations. These non-health-based PRGs correspond to a saturation concentration in soil where the absorptive limits of the soil particles and the available soil moisture have been reached. If a health-based PRG exceeded the PRG_{sat}, the PRG_{sat} was listed and used for qualitative comparison. The non-risk-based PRGs for several VOCs (2-butanone, 2-hexanone, 4-methyl-2-pentanone, ethylbenzene, toluene, and xylene) for the industrial receptor were the saturation concentrations reported by Region 9. Additionally, the non-risk-based PRGs for naphthalene and 2-methylnaphthalene were also saturation concentrations for the construction worker, trespasser, and EOD Training Range supervisor. Thus, their HQs and contributions to HI were not estimated and were not included in the calculation of the final HI. The exclusion of chemicals with the non-risk-based PRGs of "sat" concentrations from calculations of HI results in the underestimation of the resulting noncancer hazard. The degree of this underestimation is expected to be of minor significance.

6.6.6 Uncertainties in Evaluation of Indoor Air

Evaluation of the soil migration-indoor air pathway suggests that this exposure pathway is potentially the most significant pathway for a future resident. Incremental lifetime cancer risks via this pathway were twice that from direct contact. The use of the J&E model to estimate chemical concentrations in indoor air includes uncertainty in several areas:

1. The model assumes homogeneity of soil within a horizon. Therefore, selected site-specific values for various soil parameters may fail to provide an accurate measure of the soil variability.
2. The model evaluates building characteristics that, while remaining mostly constant, makes assumptions about the design of a building (e.g., height of the room, air-exchange rate) that is not yet planned for the site.
3. The model cannot assess the likelihood that a building will be constructed at all on the site, or the likelihood that it will be constructed atop or near the area of contamination.

In 2005, an assessment was conducted on the uncertainty of the J&E model on vapor intrusion calculations (Weaver 2005). The study identified a range for all soil and building parameters used in the J&E model, and systematically evaluated how the sensitivity of each variable magnitude affects the resulting risk (instead of indoor air concentration as used for IRP Site 1) as compared to the results using the defaults. One finding is that the air exchange rate in the building is the most sensitive factor, with the low-high values of 0.1 to 1.5 exchanges per hour changing the risk from the default situation by -83 percent to 150 percent. The next four most sensitive factors are water-filled porosity (-54 percent to 65 percent), mixing height of the air space in the building (-25 percent to 50 percent), depth to contaminant source (-20 percent to 35 percent) and soil porosity (-35 percent to 33

percent). When the variability of all parameters are considered simultaneously (9 parameters evaluated in all), the overall risk deviated from that of the default situation by -98 percent to 1,258 percent. Interactions among parameters such as multipliers or divisors of each other produce a synergistic effect that is not explained by the variability if individual parameters alone. Risks using the default settings may overestimate risk (or, as is used at IRP Site 1, indoor air concentration) by a factor of 2, or may underestimate the potential risk by a factor of 13.

A site-specific quantitative evaluation of the uncertainty of the J&E model at IRP Site 1 is likely to provide a similar result, with the exception that the air-exchange rate used for a residential setting (0.5 per hour) and the industrial setting (1.0 per hour) are greater than the default value of 0.25 per hour in the model. For the residential setting, an air exchange rate of 0.5 per hour is approximately the 25th percentile of rates measured in California residences (Cal-EPA 2004c). This value was used in the site-specific calculation of benzene (risk driver) concentration of 4.66 µg/m3 in indoor air. Substituting other values for the air exchange rate such as the lowest value evaluated above (0.1 per hour), the 10th percentile of rates in California residences (0.31 per hour) or 90th percentile (1.95 per hour) suggests that indoor benzene concentrations may be potentially overestimated by a factor of 2 to 5 or underestimated by a factor of 4. For the industrial setting, air exchange rate is not likely to be lower than 1.0 per hour because it is the minimum ventilation requirement pursuant to the 2001 Energy Efficiency Standards for Nonresidential Buildings (California Energy Commission 2001, as reported in Cal-EPA 2004c). Indoor benzene concentrations for the industrial setting could be underestimated by a factor of approximately 2.

The evaluation for risks associated with direct soil exposure (including ingestion, dermal contact, and inhalation of particulates and vapors in ambient air) utilizes the (95 to 99 percent) upper confidence limit of the mean soil concentration (or MDC, whichever is lower) and assumes that exposure could occur anywhere within the site where soil is accessible at the EPC. The same cannot be said of indoor air. Because the location of a residence is stationary, the risk for potential future residents from exposure to vapors in indoor air at the MDC can only be realized if a future residential home is built on an area that is impacted by the VOC in soil at the maximum detected concentration. Thus, the use of MDCs as EPCs for the indoor air scenario presents a “low probability exposure scenario” that, while possible, is not likely to occur.

Support for this “low-probability exposure scenario” concept is further illustrated by examining the frequency of detection and location of the MDC for each chemical whose soil concentrations might lead to levels in excess of the Region 9 PRGs for ambient air. Benzene, ethylbenzene, hexachlorobenzene, 2-methylnaphthalene, naphthalene and xylenes were detected in fewer than 5 percent of the total soil samples. This low frequency of detection suggests that the exposure probability from vapors in indoor air is correspondingly low as well. For many of the VOCs, including ethylbenzene, 2-methylnaphthalene, naphthalene and xylenes, the maximum detected concentration occurs at Trench 34. For benzene, the second highest detection occurs at this location as well. Thus, according to the J&E model, unless the construction of a future residence were to occur directly atop Trench 34 (which would provide the most likely opportunity for soil gas migration to result in exposures to residential receptors) exposure via the indoor air pathway is again likely to be low. Trench 29A (where the maximum detected concentration for benzene occurs and other VOCs are nondetect due to elevated reporting limits) provides a second location where soil vapor could lead to exposures to residential receptors.

While the use of the J&E model at IRP Site 1 may either overestimate risks from the inhalation of indoor VOCs by a factor of 2 to 5 or underestimate the risk by a factor of 13, its application assumes a building atop or near the 2 areas of contamination (Trenches 29A and 34). Thus, a larger overestimation of risks lies in the low likelihood or probability of that occurrence.

6.6.7 Uncertainties in Estimation of Site-Related Risk

EPA Guidance indicates that carcinogenic risks and HQs resulting from various multiple chemicals should be considered additive (EPA 1989). In the absence of supporting data for synergy or antagonism, the assumption of additivity could overestimate or underestimate potential cancer risk or HQs for receptors.

Definition of Site-Related Metals. A site-related release of a metal was identified when the maximum detected concentration exceeded the background level. The finding of a single sample result from background areas that slightly exceeds the reported background level (e.g., arsenic) may happen by chance, especially with an increasing number of samples (Gibbons 1991).

As noted in the preceding text, arsenic is a predominant COPC that has been included in its entirety in the estimation of risk associated with site-related activities. Arsenic is also a common naturally occurring element found in soil consistent with those of the site. The arsenic concentrations detected are consistent with background concentrations at El Toro since the EPCs of arsenic for surface soil and subsurface soil are below the Station average. Therefore, the inclusion of the contribution of naturally occurring arsenic tends to overestimate site-related risk to both generic and site-specific receptors.

6.7 SUMMARY AND CONCLUSIONS

The screening level risk assessment for surface and subsurface soil (i.e., comparison of data to residential and industrial criteria) resulted in cumulative incremental cancer risks within the risk management range of 10^{-6} to 10^{-4}. None of the cumulative incremental cancer risks exceeded $1x10^{-4}$ and most estimates were well below that level. Without the contribution of metals at background levels, risks changed little. Arsenic is the carcinogenic risk driver in soil; however, arsenic is present at concentrations consistent with background levels. Noncancer HIs for surface and subsurface soil range between 5 and 10 for the residential scenario and are near or below 1 for the industrial scenario. Antimony, thallium, and naphthalene are the main contributors to the HI.

Incremental lifetime cancer risks associated with the inhalation of VOCs that have migrated from subsurface soil to indoor air were within the risk management range of 10^{-6} to 10^{-4}. Noncancer hazard estimates exceeded the target HI of 1 for the resident but are based on infrequent (less than four percent) detections of the risk drivers (naphthalene and xylene).

The screening level risk assessment for sediment used residential soil PRGs for comparison. The assessment resulted in cumulative incremental cancer risks that are within the risk management range of 10^{-6} to 10^{-4} for the residential scenario but below this range for the industrial scenario. Noncancer HIs for both residential and industrial exposure scenarios were below 1.

The screening level risk assessment for groundwater resulted in cumulative incremental cancer risks of $1x10^{-3}$, which is primarily associated with TCE. The risk from TCE is based on detections during the initial groundwater sampling event in January 2002. However, TCE was not detected in subsequent groundwater monitoring events that represent current conditions. Other carcinogens detected above the tap water PRGs consist of arsenic, benzene, methylene chloride, and BEPH. Noncancer HIs for groundwater were approximately 10 for the residential scenario. Perchlorate is the main contributor to this hazard. Thallium, chromium, and nickel slightly exceeded their tap water PRGs.

ILCRs associated with the inhalation of VOCs that have migrated from groundwater to indoor air were within the risk management range of 10^{-6} to 10^{-4} but are based on TCE which has not been detected since the original groundwater sampling event of January 2002.

The screening level risk assessment for surface water used tap water PRGs for comparison. The assessment resulted in cumulative incremental cancer risks of $3x10^{-5}$, which is driven by arsenic. No other COPC exceeded its tap water PRG. Noncancer HIs for surface water are less than 1.

Based on the preceding information, the following points summarize the RBS from exposure to various media at the site assuming a residential exposure scenario:

- Estimated cancer risk from exposure to surface and subsurface soil, though within the risk management range of 10^{-6} to 10^{-4}, is driven by the presence of arsenic, which is at background levels. Noncancer hazards exceeded the target hazard of 1.0, but are based on chemicals that are detected in fewer than five percent of the samples. Maximum detections of these compounds were used to estimate the hazard.
- Estimated cancer risk from exposure to surface water and sediment, though within the risk management range of 10^{-6} to 10^{-4}, is driven by the presence of arsenic. The concentrations of arsenic detected in these media were less than detected in groundwater and soil, respectively.
- Estimated cancer risk from exposure to groundwater, though within the risk management range of 10^{-6} to 10^{-4}, is driven by the presence of TCE, which was only detected in the original groundwater sampling event. Although the risk estimate for arsenic also exceeded 10^{-6}, the maximum detection (4.4 μg/L) is below the MCL of 10 μg/L.
- Estimated noncancer hazard from exposure to groundwater (HI = 10 under a RME scenario) exceeds the target HI of 1.0, and is driven by the presence of perchlorate. Perchlorate was detected in 86 percent of the groundwater samples.
- The use of California-modified toxicity values resulted in approximately an order of magnitude increase in cancer risk estimates for surface and subsurface soil. The main reason for the increase is the designation of naphthalene by the State of California as a carcinogen. A higher slope factor for arsenic also contributes to the higher risk estimates. Risk estimates for groundwater exposure were lower.
- Estimated cancer risk from exposure to VOCs in indoor air is within the risk management range of 10^{-6} to 10^{-4}, while the noncancer hazard estimate exceeds the target HI of 1. Both estimates are driven by the presence of chemicals (benzene and naphthalene, respectively) that were detected in fewer than five percent of the samples.

The results of the site-specific risk-based evaluation indicate that:

- Surface soil (0 to 2 feet bgs) poses no unacceptable health risks for a construction worker or casual trespasser under either the RME scenario or the CTE scenario.
- The subsurface soil (0 to 10 feet bgs) does not pose a significant risk for the construction worker exposure scenario as excess cancer risks are very near or below the risk management range of 10^{-6} to 10^{-4}. Noncancer HI values are all less than 1.0.
- Sediments in the Ephemeral Pond do not pose a significant risk for the construction worker, casual trespasser, or EOD Training Range supervisor exposure scenarios as the only COPC (arsenic) is within background levels.
- Groundwater was not evaluated in the SSRBE since site-specific receptors are not expected to become significantly exposed to groundwater.
- The use of California-modified toxicity values resulted in approximately an order of magnitude increase in cancer risk estimates for surface and subsurface soil. The main reason

for the increase is the designation of naphthalene by the State of California as a carcinogen. A higher slope factor for arsenic also contributes to the higher risk estimates.

In summary, the risk estimates for the RBS are below the lower bound or within the EPA established cancer risk management range of 10^{-6} to 10^{-4} for all media except groundwater assuming its use as a potable water source. While the risk estimate for groundwater exceeds 10^{-4}, it is based on TCE, which has not been confirmed in groundwater by subsequent groundwater monitoring events suggesting that current conditions are not represented by those data that have been collected historically. Noncancer hazards for groundwater in the screening level evaluation are driven by perchlorate. However, it must be realized that there is no significant current use of groundwater at the site and the future use of this medium is believed to be unlikely. The evaluation of potential soil vapor migration of chemicals from soil into indoor air resulted in noncancer hazard estimates that exceeded target levels for the resident, but were based on chemicals which were infrequently detected in soil such that the maximum detected concentration was required in both the modeling effort and the resulting risk calculations.

In the SSRBE, excess cancer risks for all receptors and considered media were well below the lower bound (10^{-6}) of the cancer risk management range. The highest noncancer HI of 3 was calculated for the construction/utility worker potentially exposed to subsurface soil. Considering the inherent protectiveness built into establishment of the RfD, an HI value of 3 can be considered marginally greater than 1.0.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
19	IRP Site 2	Section 2.5	Draft Final Phase II Remedial Investigation Report, Operable Unit 2B – Site 2, Marine Corps Air Station, El Toro, California. Section 6. September 1996.

Section 6
HUMAN-HEALTH RISK ASSESSMENT

The Phase II site characterization program for Site 2, Magazine Road Landfill, was designed to ascertain the presence and concentrations of contaminants and determine the nature and extent of contamination. A baseline risk assessment was performed as part of the RI to assess potential impacts from contaminants at the site on human health if no remedial actions were taken. The baseline risk assessment documents the hazards and provides information necessary for making risk management decisions concerning the necessity for or selecting the nature and extent of remedial alternatives at the landfill.

This section briefly describes the approach used to estimate risk, the rationale for the approach, and summarizes the baseline risk assessment results. In addition, a qualitative uncertainty evaluation identifies and characterizes the effects of uncertainties on the risk results. Supplementary information is presented in Appendix S.~~Section 6 summarizes and discusses the results of the baseline human-health risk assessment of COPCs identified at Site 2. It also summarizes the procedures used to assess risk. Detailed information about the procedures (e.g., dose and chemical transport equations) and results (e.g., risk presented be each chemical via each exposure pathway) are presented in Appendix S.~~ The results of the baseline ecological risk assessment are presented in Section 7.

~~Baseline risk assessments are performed to determine the likelihood that exposure to chemicals found in soil, water, and other media suspected of being contaminated pose a threat to human health if no remedial action is taken.~~ Exposure conditions used in the estimation of risk are chosen to represent what is known as "reasonable maximum exposure~~.~~" (RME). Use of these exposure conditions tend to overestimate risk. This effort to overestimate risk is deliberate; it provides risk managers a margin of safety when making cleanup decisions.

The components of the baseline human-health risk assessment are:

- identification of COPCs - evaluates data and the chemicals that represent potential releases from the site;
- exposure assessment - identifies the populations that could be exposed (receptors), the ways that exposure could occur (exposure pathways), the concentration at the point of exposure (exposure point concentration), and the amount of chemical that could be taken into the body (chronic daily intake) over the exposure period;
- toxicity assessment - presents the toxicity values developed by U.S. EPA and California Environmental Protection Agency (Cal-EPA) that describe the potential cancer or noncancer health effects of the COPC;
- risk characterization - combines the quantitative information on exposure and toxicity into an estimate of the health risk; and
- uncertainty analysis - discusses the various sources of uncertainty and how the uncertainty could impact risk management decisions.

The baseline risk assessment was conducted in accordance with the Phase II Risk Assessment Work Plan, (BNI 1995f) and subsequent discussions with DTSC and U.S. EPA. ~~,~~ The work plan and amendment follow the guidelines published by the U.S. EPA in the Risk Assessment

Guidance for Superfund: Part A (U.S. EPA 1989a) and Part B (U.S. EPA 1991b), ~~which followed the guidelines from the U.S. EPA in the Risk Assessment Guidance for Superfund: Volumes I and II (U.S. EPA 1989a),~~ and supporting documents -and guidelines published by the California Environmental Protection Agency (Cal-EPA 1992).

~~Data for Site 2, collected during the Phase I and Phase II RIs, were combined to conduct the baseline human-health risk assessment presented in this section.~~

6.1 CHEMICALS OF POTENTIAL CONCERN

COPCs are the chemicals used to characterize the risk. This section presents an overview of the data evaluation process used to select the COPCs for human health and then discusses the COPCs selected for soil, air, seep water, and groundwater for Site 2. ~~Identification of COPCs involved the following steps:~~

- ~~identifying chemicals that may have entered the samples inadvertently after collection;~~
- ~~identifying naturally occurring chemicals present at concentrations within their respective background ranges; and~~
- ~~selecting the chemicals to be evaluated in the risk assessment.~~

6.1.1 Data Evaluation Process

Data collected during the Phase I and Phase II RIs were combined, as appropriate, to conduct the baseline human-health risk assessment. When more than one analytical method was used for an analyte, the results from the CLP method were chosen for inclusion in the risk assessment. Before COPCs for human health were selected, all chemical analytical data obtained during the Phase II RI field activities were validated to satisfy NEESA Level 4 (formerly Level D) requirements (see Section 4). Any Phase I data that did not meet Level D requirements were used "as is" (they were not revalidated). All data were evaluated for the data quality indicators [precision, accuracy, representativeness, completeness and comparability (PARCC)] as specified in the Guidance for Data Usability in Risk Assessment (U.S. EPA 1992a). Appendix O contains PARCC information. Data rejected during the validation process were not used in the baseline human-health risk assessment. All of the data used in the risk assessment were analyzed by the fixed-base analytical laboratory.

~~The objective of the data evaluation process is to select the COPCs that should be evaluated in the risk assessment. The selection criteria listed below follows appropriate U.S. EPA guidance (U.S. EPA 1989a).~~ Following the validation process, COPCs were selected based on appropriate U.S. EPA guidance (U.S. EPA 1989a). –The data evaluation process began by listing all chemicals positively identified in soil, sediments, seep water, groundwater, and air flux chamber samples. If the COPCs in the soil are depth related, each list is limited to chemicals found within the depth of concern. Next, the evaluation procedure eliminates the chemicals that are unlikely to pose a risk to human health as follows:~~.~~

~~Chemical analytical data obtained during the Phase II RI field activities were validated to satisfy NFESC Level D requirements. Any Phase I data that did not meet Level D requirements were used "as is" (they were not revalidated). All concentrations reported as being unusable (having an "R" qualifier) were eliminated from the data set. Analytical data were further evaluated to eliminate any unusable data points. The list of detected chemicals was then reviewed to eliminate any chemicals that were not COPCs (according to U.S. EPA guidance).~~

~~The criteria for eliminating chemicals from the COPC list are:~~

- ~~chemicals identified as acetone, methyl ethyl ketone, methylene chloride, toluene, or a phthalate ester (common laboratory contaminants) with every concentration reported as being less than ten times the concentration in associated blank samples;~~
- ~~any other chemical with every concentration reported as being less than five times the concentration in associated blank samples;~~
- naturally occurring inorganic chemicals (metals) for which the concentrations are within the range considered normal for the area around the site ~~(comparison was made by calculating the upper tolerance limit [UTL] for the background data [Appendix G] and comparing it with on-site data)~~; and
- essential nutritional elements of very low toxicity (i.e., calcium, iron, magnesium, potassium, or sodium) present at low concentrations.

The chemicals selected as COPCs at Site 2 are identified in Table 6-1. The frequency of detection, detection limits, and concentration range~~, and other data~~ are presented in Appendix S.

Analyses of soil/sediment, seep water, and groundwater samples produced a large number of organic compounds classified as TICs. Chemical analytical methods approved by U.S. EPA for site investigations are designed to detect and quantify a specific suite of chemicals. When chemicals that are not part of the suite are identified, they are classified as TICs. It should be noted that the names and reported concentrations of the TICs can be inaccurate. TICs may be assigned a specific name (e.g., heptadecane) or a descriptive name (e.g., C10-C30 hydrocarbon).

According to the U.S. EPA Risk Assessment Guidance for Superfund (U.S. EPA 1989a), there are two options in the evaluation of TICs in a risk assessment. These options depend on the relative number of TICs compared to the target analytes (non-TICs). First, when the relative number or the relative concentration of TICs to target analytes is low, TICs may be excluded from the risk assessment. When the opposite is true, an effort should be made to identify and quantify the TICs.

Table 6-1
COPCs[a] Evaluated in the Risk Assessment for Site 2

Chemical	Surface Soil/Sediment	Air	Seep Water	Groundwater
Volatile Organics				
2-butanone	X			
2-hexanone	X			
4-methyl-2-pentanone	X			
Acetone	X		X	
Anthracene[b]	X			
Benzene	X			
Biphenyl[b]			X	
Carbon disulfide			X	
Carbon tetrachloride	X			
Chlorobenzene		X		
Chloroform		X		X
1,2-dichlorobenzene		X		
1,4-dichlorobenzene		X		
1,2-dichloroethane		X		
Ethylbenzene	X			
Methylene chloride	X	X		
Phenanthrene[b]	X			
Tetrachloroethene				X
Toluene	X			
Total xylenes	X			
Trichloroethene	X	X		X
Semivolatile Organics				
Benz(a)anthracene	X			
Benzo(a)pyrene	X			
Benzo(b)fluoranthene	X			
Benzo(g,h,i)perylene	X			
Benzo(k)fluoranthene	X			
Benzoic acid			X	
Benzyl alcohol			X	
bis(2-ethylhexyl)phthalate	X			
Butyl benzyl phthalate	X			
Carbazole	X			
Chrysene	X			
Dibenz(a,h)anthracene	X			

(table continues)

Table 6-1 (continued)

Chemical	Surface Soil/Sediment	Air	Seep Water	Groundwater
Diethyl phthalate	X			
Fluoranthene	X			
Indeno(1,2,3-cd)pyrene	X			
Phenol				X
Pyrene	X			
Pesticides & PCBs[bc]				
4,4'-DDD[ed]	X			
4,4'-DDE[de]	X			
4,4'-DDT[ef]	X			
Alpha-BHC[fg]			X	
Alpha-chlordane	X			
Aroclor-1260	X			
Beta-BHC[fg]			X	
Endosulfan I	X			
Endosulfan sulfate	X			
Endrin	X			
Endrin aldehyde	X			
Gamma-chlordane	X			
Heptachlor				X
Heptachlor epoxide	X			
Herbicides				
2,4-DB[gh]	X			
Dalapon	X			
Dichloroprop	X			
MCPP[hi]	X			
Metals				
Aluminum			X	X
Arsenic				X
Barium			X	
Cadmium			X	
Chromium				X
Manganese			X	X
Nickel				X
Vanadium				X
Zinc			X	X

(table continues)

Table 6-1 (continued)

Chemical	Surface Soil/Sediment	Air	Seep Water	Groundwater
Inorganics				
Ammonia			X	X
Fluoride			X	X

Notes:
[a] COPC – chemical of potential concern
[b] classified as VOC on the basis of molecular weight and Henry's Law constant
[bc] PCB – polychlorinated biphenyl
[cd] DDD – dichlorodiphenyldichloroethane
[de] DDE – dichlorodiphenyldichloroethene
[ef] DDT – dichlorodiphenyltrichloroethane
[fg] BHC - benzene hexachloride
[gh] DB - dichlorophenoxybutyric acid
[hi] MCPP - 2-methyl-4-chlorophenoxyproprionic acid

The majority of the TICs at Site 2 are hydrocarbons typically associated with petroleum hydrocarbons. The TICs found in the soil, sediment, seep water, and groundwater and their highest measured concentrations are shown in Appendix S. None of these TICs are common priority pollutants, and there is little or no toxicological data available. Where TICs and target analytes were found together in a medium, there were fewer TICs than target analytes, and the sum of the highest measured concentrations of the TICs amounted to a very small percentage of the sum of the highest measured concentrations of the target analytes. Hence, the TICs were not included as COPCs. The positively identified organic COPCs were considered adequate to address the risks at Site 2.

6.1.2 ~~COPCs in~~ Soil and Sediment Data

The identification of COPCs in soil and sediment was based on surface data collected 0 to 2 feet bgs. Chemicals detected in soil samples more than 2 feet bgs are not included in the COPC list because no exposure route is complete for these chemicals. Section 6.2 discusses the soil interval selection criteria. ~~Surface soil (0 to 2 feet bgs) is the soil of concern in the human health risk assessment because a recreational child will come into contact with this media.~~ Sediment samples were collected from intermittent on-site drainages. These drainages are dry throughout most of the year. These dry sediments were considered to have the same properties as the surrounding surface soil. For this risk assessment, dry sediment samples are referred to and evaluated as soil samples. Soil and sediment sampling locations and associated samples used in the human-health risk assessment are listed in Table 6-2.

Both Phase I and II RI data from samples collected within the site boundaries were used to identify the COPCs in soil. Information on the metals was obtained from 41~~39~~ samples, whereas information on organic compounds was obtained from 24~~16~~ to ~~38~~39 samples (Appendix S).

Inorganic nutrients were excluded as COPCs. Metal soil concentrations at Site 2 were statistically compared with background concentrations to identify site-related analytes. The statistical approach was based on a comparison of maximum detected on-site concentrations to the 95th percentile of the background data~~,~~ and use of the Wilcoxon Rank Sum test and the Quantile test to analyze the hypothesis that on-site~~onsite~~ concentrations are less than or equal to background concentrations. Specifics for the statistical on-site~~onsite~~-background comparison methodology are detailed in Appendix N. All surface soil metals were eliminated from consideration as Site 2 COPCs (on-site~~onsite~~ concentrations were not significantly different from background concentrations). Forty-two~~one~~ organic chemicals were identified in Site 2 surface soil samples, and all were classified as COPCs (Table 6-1).

Table 6-2
Samples Used in the Risk Assessment for Site 2

Media	Station ID	Sample ID	Date Collected
Groundwater			
Downgradient			
	02NEW12	76B1115	28-Dec-95
	02NEW6	76B1111	27-Dec-95
	02NEW7	76B1112	27-Dec-95
	05 UGMW27	76E1106	08-Dec-95
Upgradient			
	02NEW11	76B1114	21-Dec-95
	02 UGMW25	76B1107	28-Nov-95
Seep water			
Seep			
	02SW1	76B4006	31-Aug-95
	02SW4A	76B4002	29-Aug-95
Upgradient			
	02 UGMW25	76B1004	17-Aug-95
Soil and& sediment			
	02_EF1	S1451014	11-Aug-92
	02_EF1	S1451015	11-Aug-92
	02_EF2	S1451001	11-Aug-92
	02_EF2	S1451008	11-Aug-92
	02_LF1	S1454009	10-Sep-92
	02_LF2	S1454011	10-Sep-92
	02_LF3	S1454010	10-Sep-92
	02_MM1	S1451003	11-Aug-92
	02_MM1	S1451013	11-Aug-92
	02_MM2	S1451010	11-Aug-92
	02_MM2	S1451016	11-Aug-92
	02_S&DB200	S1454012	10-Sep-92
	02_SA1	S1454467	10-Sep-92
	02_SA1	S1454470	10-Sep-92
	02_SA2	S1454480	10-Sep-92
	02_SA2	S1454485	10-Sep-92
	02_SA3	S1454466	08-Sep-92
	02_SA3	S1454496	08-Sep-92

(table continues)

Table 6-2 (continued)

Media	Station ID	Sample ID	Date Collected
	02_UGS	S1454008	10-Sep-92
	02_UGS	S1454502	10-Sep-92
	02_WF1	S1451009	11-Aug-92
	02_WF2	S1451000	11-Aug-92
	02_WF2	S1451005	11-Aug-92
	02BS1	76B6001	09-Nov-95
	02BS10	76B6010	09-Nov-95
	02BS11	76B6011	09-Nov-95
	02BS12	76B6012	09-Nov-95
	02BS13	76B6013	09-Nov-95
	02BS14	76B6014	09-Nov-95
	02BS15	76B6015	09-Nov-95
	02BS2	76B6002	09-Nov-95
	02BS3	76B6003	09-Nov-95
	02BS4	76B6004	09-Nov-95
	02BS5	76B6005	09-Nov-95
	02BS6	76B6006	09-Nov-95
	02BS7	76B6007	09-Nov-95
	02BS8	76B6008	09-Nov-95
	02BS9	76B6009	09-Nov-95
	02SE1	76B3001	17-Nov-95
	02SE2	76B3002	17-Nov-95
	02SE3	76B3003	15-Jan-96

Notes:
[a] water in the seep is groundwater; groundwater was used as the upgradient measurement
[b] soil background stations and sample IDs are presented in Appendix N, soil background.

~~Many of those COPCs (e.g., pesticides and PAH) are found throughout the United States in soil because of their widespread uses. For these anthropogenic (man-made) chemicals, U.S. EPA guidance suggests comparing on-site and background health risks. Therefore, for this risk assessment, the health risks for metals and pesticides identified in background samples were also calculated.~~

~~The majority of the organic COPCs identified at Site 2 are PAH or phthalates. These chemicals were not analyzed for in background samples because they are ubiquitous in an urban environment, and their presence at Site 2 may be unrelated to past practices. The health risks were calculated without comparing them to the background health risk.~~

6.1.3 Seep Water Data

Surface water data from the seep was evaluated to assess its contribution to the risk. Selection of surface water COPCs was based on data from two samples (Table 6-2) collected during the August 1995 sampling event as part of the Phase II field investigation. The seep is the only ephemeral on-site source of surface water; drainage washes are also ephemeral. Since surface water is not present long enough or in sufficient quantity in these latter locations, it was not quantified for use in the human-health risk assessment.

For the metal COPCs, seep water concentrations used in the baseline risk assessment were based on unfiltered samples. The chemicals selected as surface water COPCs are identified in Table 6-1 and comprise organic and inorganic analytes. Inorganic nutrients were excluded as COPCs. Hydrogeological information about the site indicates that the water in the seeps is groundwater. Therefore, inorganic chemicals were selected based on a comparison of measured concentrations in the seep water to the groundwater. Data collected from the upgradient monitoring well 02 UGMW25 during the August 1995 sampling event was used in the analysis. The maximum concentration at the seep was used to identify site-related inorganic COPCs; a statistical evaluation is not applicable for small data sets. Inorganic chemicals were identified as COPCs when the maximum concentration on-site~~onsite~~ exceeded the concentration of the same chemical in the upgradient groundwater. ~~Therefore, the maximum concentrations of the chemicals identified in the two seep water samples were compared to the maximum concentrations (i.e., background concentrations) of the same chemicals in monitoring wells upgradient of the seeps (02NEW-11 and 02UJMW-25). Only~~ Seven~~the~~ inorganic chemicals (i.e., aluminum, barium, cadmium, manganese~~manganense~~, zinc, ammonia, and fluoride) ~~with higher concentrations in the seep water samples~~ were identified by this process. All organic chemicals were classified as seep water COPCs at Site 2. ~~chosen as COPCs~~. Fourteen chemicals~~COPCs~~ were identified as seep water COPCs at Site 2~~by this process~~. Seven ~~Six~~ are inorganic chemicals ~~metals~~, and seven~~eight~~ are organic compounds~~.~~

6.1.4 Groundwater Data

The chemicals selected as groundwater COPCs are identified in Table 6-1. Selection of COPCs in groundwater downgradient from Site 2 was based on Phase II samples collected during the December 1995 sampling event at four downgradient wells. Table 6-2 presents the monitoring wells and associated samples. ~~on a comparison of maximum concentrations determined in the Phase II RI, in two upgradient wells (02NEW11 and 02UGWM25) with those from downgradient wells (02NEW12 and 05UGMW27).~~ For the metal COPCs, groundwater concentrations used in the baseline risk assessment were based on unfiltered samples. Inorganic chemicals were selected based on a comparison of the maximum concentration downgradient from Site 2 to the maximum concentration of the same chemical in groundwater upgradient of the site; a statistical comparison was not considered applicable due to the limited number of samples. Data collected from upgradient monitoring wells 02NEW11 and 02_UGMW25 during the November to December 1995 sampling event was used in the analysis. Inorganic chemicals present at concentrations above upgradient levels are considered to be COPCs (aluminum, arsenic, chromium, manganese, nickel, vanadium, zinc, ammonia and fluoride). Inorganic nutrients were excluded as COPCs. - All organic chemicals were classified as COPCs. ~~The chemicals selected as groundwater COPCs are identified in Table 6-1 and comprise those whose concentrations were higher in downgradient than in upgradient wells~~. Fourteen ~~Fifteen~~ COPCs were identified as groundwater COPCs at Site 2; nine ~~six are~~ inorganic~~metals,~~ and five ~~nine are~~ organic compounds.

6.1.5 Air Data

Air volatile ~~The~~ COPCs ~~for air~~ were identified from seven flux-chamber samples collected during the Phase II RI. Seven chlorinated VOCs (chlorobenzene, chloroform, 1,2- and 1,4-dichlorobenzene, 1,2-dichloroethane, methylene chloride, and trichloroethene) were identified and classified as air COPCs (Table 6-1). Soil particulate COPCs were identified from soil samples. Soil chemicals other than the VOCs were identified as air particulate COPCs.

6.2 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to evaluate the type and magnitude of exposures from COPCs present at a site to a human receptor. An exposure assessment is a multistage process. First, the receptors (i.e., members of the population or individuals at risk) are characterized. Then the complete exposure pathways and routes by which these receptors are likely to be exposed are identified. The final step is to quantify the chemical concentrations to which the receptors might be exposed (exposure point concentration) and the chemical intake rates associated with each route of exposure. The following sections describe the exposure scenarios, exposure pathways, hypothetical receptors, the methodology that will be used to quantify exposure for each pathway, and the reasons for their selection.

6.2.1 Receptor Analysis

MCAS El Toro is currently being used as a military air base, and its land use can be classified as industrial. Land uses adjacent to the site include industrial and agricultural activities. Currently, Site 2 is part of a 1,700-acre area that has been designated as a natural resource conservation area by the U.S. Marine Corps.~~set aside as a nature conservancy.~~ The site is situated between Borrego Canyon Wash and one of its tributaries and it is bisected by a man-made drainage channel. A dirt road is adjacent to the southern and eastern edge of the landfill. ~~The site is uninhabited. This land use is expected to continue for the foreseeable future, because building homes on a landfill is not permitted in California. Also, construction of offices on the landfill is highly unlikely given the hazards at the site.~~

Currently, the site has become overgrown with shrubs and grasses and there is no evidence of regular use ~~of the site~~ by anyone although~~. However,~~ there is evidence of potential unauthorized refuse disposal. Neither liners nor a gas-venting system have been used at the landfill. However, ~~T~~there are water and other utility lines buried on ~~the edge of~~ the landfill boundary~~ies~~, which presumably occasionally need repair or replacement.

Site 2 shows evidence of erosion and sedimentation from storm water. The residence time for storm water is short, and water is gone within hours or a day or two of most storms. During heavy storms, the flow rates are high, and this physical hazard is likely to preclude contact of receptors to surface water in the washes. Hence, long-term exposure to surface water is not considered feasible at the drainage channels since these drainages are dry throughout most of the year.

Site 2 also has ponded water about 8 months out of the year. The groundwater sampled during the Phase II RI feeds this ponded area. The pond or seep is shallow, easily waded, and has a dense growth of algae most of the season.~~ This area would be attractive to children interested in aquatic life.~~ Potential exposures to surface water chemicals could occur at the seep.

Based on the current and projected land use and on existing site conditions described above, the following potential receptors were chosen to assess risk:

- elementary/high school-age children playing unsupervised in the natural resource conservation area;~~nature conservancy;~~
- off-site hypothetical residents living at the edge of Site 2; and
- utility maintenance workers repairing or replacing utility lines at the edge of the landfill.

Exposure of these potential receptors was assessed as being greater than for any other potential receptor, and each was chosen for a specific reason. The recreational older child allows the assessment of COPCs in surface soil, seep water, and air on the site. The off-site hypothetical resident allows the assessment of COPCs in the groundwater leaving the site. The excavation worker allows the assessment of COPCs in subsurface soil.

As a natural resource conservation area, the site would be attractive to children of elementary/high school age. A younger child was rejected as an appropriate receptor for the estimation of on-site~~onsite~~ risk because a child of that age would have to be taken to the site by an adult. The adult would find the limited access to the site restrictive, the setting at the landfill hazardous, and would more likely take the younger child to an established recreational area (e.g., playground).

Residential or commercial use was considered unlikely even in the foreseeable future, because building homes or commercial buildings on a landfill is not permitted in California. The closest residential area is the family housing to the south at Irvine Boulevard. Although it is highly improbable that future residents would build a home downgradient from the site, off-site hypothetical residents living at the edge of Site 2 were identified as potential receptors.

Individuals engaged in "as-needed" repair of underground utility lines buried on the landfill boundary were also selected as representative receptors. However, older c~~C~~hildren playing on the site and people building homes near the site were considered more of a possibility than someone repairing underground utilities. Exposure to children playing at the site over time is assessed as being greater than exposure to someone repairing underground utilities over a short time. Repair work would be infrequent and it can probably be completed within a few days. ~~-~~Furthermore, excavation activities would be covered by regulations promulgated by the California Occupational Safety and Health Administration. Thus, incidental exposure to chemicals in the subsurface is unlikely. Therefore, risks to the recreational older child and the hypothetical off-site resident were quantified, and the risks to the utility maintenance worker were qualitatively assessed~~.~~

6.2.2 Exposure Pathways

Exposure pathways are the means by which a receptor can come into contact with the COPCs. Exposure pathways are identified by analyzing the distribution of the COPCs in the environment and the physical and chemical properties of the COPCs (Figure 6-1). For a pathway to be complete, all of the following elements must be present: a mechanism for COPC release, an environmental transport medium, an exposure point, and an exposure route.

Elementary/high school-age children playing in the~~-~~ natural resource conservation area ~~nature conservancy~~ could be exposed to COPCs via the following exposure pathways:

- ingestion of soil,
- dermal contact with soil,
- inhalation of vapors and airborne particulates, and
- dermal contact with surface water in the seep~~s~~

Ingestion of seep water is unlikely. The seep is a shallow pond with a dense mat of algae that is several inches thick, rendering it unattractive for swimming, an activity in which incidental swallowing of water often occurs. A more likely scenario is children wading in the pond to catch aquatic life and wetting their hands, arms, and legs in the process. Inhalation of volatiles was not evaluated, because the few VOCs (acetone, biphenyl, and carbon disulfide) identified in the seep water are present at low concentrations.

Hypothetical c~~C~~hildren and adult residents living adjacent to Site 2 were assumed to draw water for domestic use from a private well screened in the shallow~~contaminated~~ aquifer downgradient of the site. Exposure to COPCs in the groundwater could occur via the following pathways:

- ingestion of groundwater,
- dermal contact with groundwater, and
- inhalation of volatiles from groundwater during household water use.

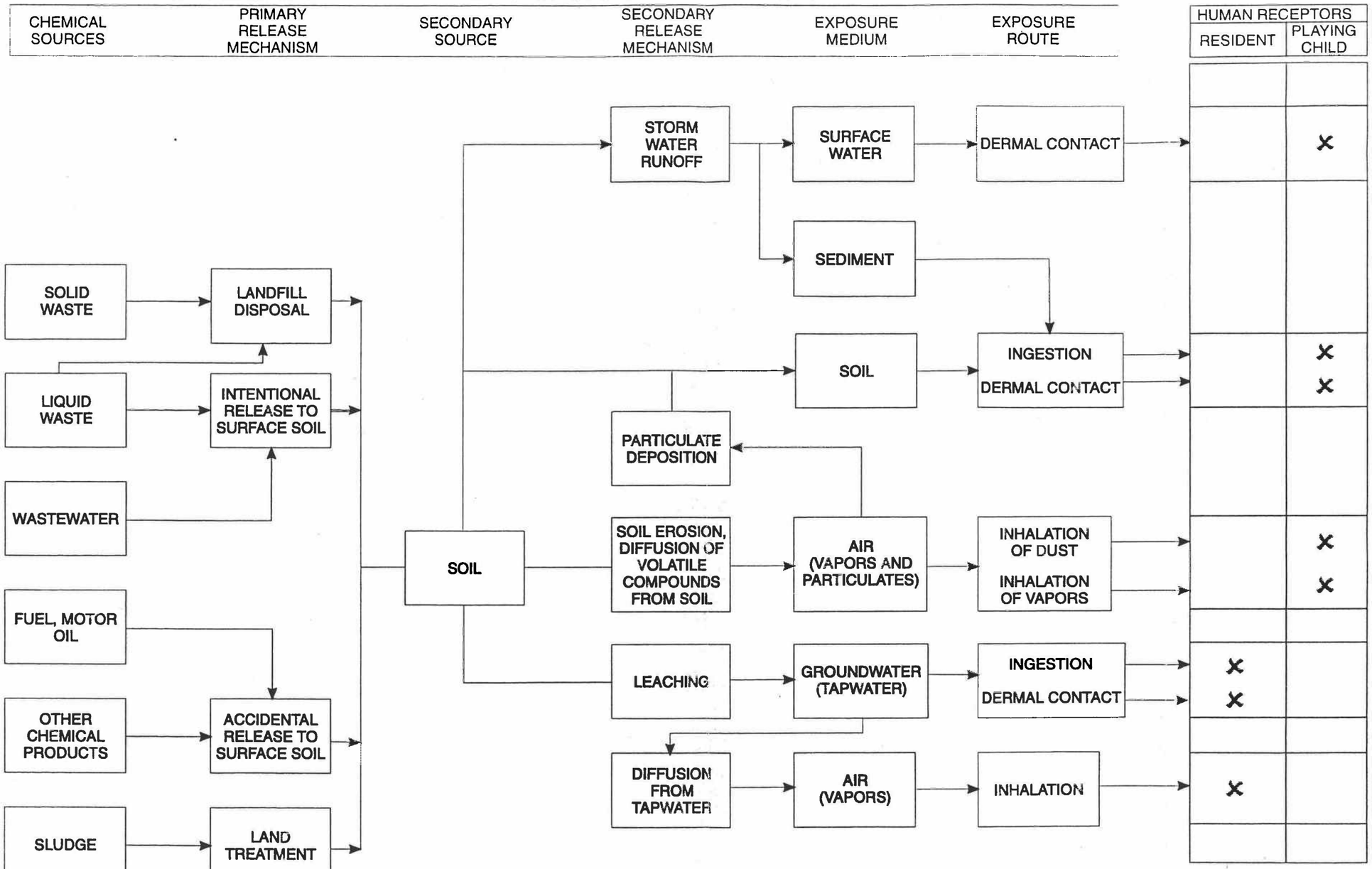
Consideration was also given to assessing exposure of the off-site resident from airborne COPCs originating from the site. This pathway was not quantitatively evaluated, because on-site inhalation risks were estimated to be insignificant (see Section 6.4). Since off-site COPC concentrations in air are inversely proportional to the distance from the site, off~~Off~~-site inhalation risks are expected to be lower than ~~probably will be well below~~ this already insignificant risk level.

The ~~two~~ four monitoring wells immediately downgradient of Site 2 were used as a conservative estimate of groundwater exposure. It is highly unlikely that any future residents would build this close to the landfill as a result of regulatory limitations. Construction on the landfill is neither permitted nor will it be feasible. The health risk for drinking water in the wells~~two~~ immediately downgradient from Site 2~~wells~~ is considered a conservative ~~or protective of~~ estimate of groundwater farther downgradient.

Although risks to an utility maintenance worker were not quantitatively assessed, potential pathways of exposure were identified for the qualitative risk evaluation. ~~Potential pathways of e~~Exposure pathways for the utility maintenance worker are:

- ingestion of contaminated soil,
- dermal contact with contaminated soil,
- inhalation of vapors released from contaminated soil, and
- inhalation of contaminated airborne soil (dust).

The water table at the site ranges from 20 to 60 feet, whereas the depth of utility lines running along the site is believed to be no deeper than about 10 feet. Utility maintenance worker exposure to groundwater contaminants is, therefore, highly unlikely; thus, the risk associated with such exposure was not assessed.



Remedial Investigation
Figure 6-1
Human Health Exposure Routes and Receptors
Site 2 - Magazine Road Landfill

MCAS, El Toro, California

CLEAN II Program

Date: 3/6/96
File No. 076C0551
Job No. 22214-076

6.2.3 Exposure-Point Concentration

An exposure-point concentration is the concentration of a chemical in the contaminated medium (e.g., soil, water, air) at the point of contact with a receptor (e.g., recreational child). Under RME conditions, ~~To obtain estimates of reasonably maximum risk,~~ U.S. EPA specifies using the 95-percent upper confidence limit (UCL) of the average measured chemical concentration. ~~when estimating reasonably maximum exposure~~. The first step in calculating the UCLs was to determine the distribution of the data. The Site 2 data were tested for normality and lognormality and the 95-percent UCL was calculated according to the distribution of each chemical. A nonparametric approach was used to calculate the UCL for sets of data that failed the normal and lognormal tests. It should be noted that the maximum concentration was used as the exposure-point concentration instead of the 95-percent UCLs under the following conditions:

- the 95-percent UCL of a chemical exceeds its highest measured concentration; or
- there are fewer than four detected samples for a chemical.

~~However, under various conditions, listed in Appendix S, the maximum concentration is used as the exposure-point concentration instead of the 95 percent UCL.~~ Following the criteria described above, both 95-percent UCLs and maximum concentrations were used as exposure-point concentrations for the COPCs in surface soil and groundwater (e.g., the maximum soil concentration was used for dibenzo(a,h)anthracene, identified in 2 of 39 samples). The exposure-point concentrations for ~~the~~ COPCs in ~~groundwater,~~ seep water~~,~~ and air were maximum concentrations. Appendix S, Part I describes the procedures used to calculate the 95-percent UCLs, ~~and~~ identifies the statistical~~statitical~~ distribution of each chemical, and tabulates the exposure-point concentrations for the COPCs at Site 2.

Some of the Site 2 chemicals identified as COPCs; metals~~COPCs;metals~~, pesticides and polynuclear aromatic hydrocarbons (PAHs), were also detected in background or reference samples. Metals are natural components of the earth crust. Pesticides, such as DDT, DDE, and DDD are found throughout the United States because of their widespread uses. PAHs are encountered in the soils of industrial areas and their presence has been reported in surface soils in the vicinity of vehicular traffic.

For the soil medium, ~~Appendix N presents~~ the pesticides and metal reference levels study identified ~~at the background~~ locations and their measured concentrations (BNI 1996b). The PAH reference-level study performed for soils at MCAS El Toro (BNI 1996c) was used to identify reference concentrations for the PAH COPCs. Similarly~~Similalry~~, several COPCs (i.e., metals) detected at the seep and groundwater downgradient from Site 2 were also identified in the background samples. For these chemicals, a comparison between their on-site and background levels provides additional information to be used by risk managers in reaching site-specific decisions. Appendix S presents the exposure point concentrations for background metals, pesticides, and PAHs. The 95-percent UCL or the maximum concentration, as appropriate, was used as the exposure-point concentration for pesticide and PAH COPCs measured in soil background. The

exposure-point concentrations for metal COPCs in the groundwater upgradient to Site 2 were maximum concentrations.

6.2.4 Estimation of Dose Rate

Dose rate is the amount of chemical to which a receptor is exposed per unit body weight and time. Dose rates were estimated by integrating intake variables such as ingestion rate, body weight, and exposure duration with the contaminant concentration. The combination of all intake variables results in an estimate of exposure for each pathway. Dose may be expressed as rate of application (applied dose) or as a rate of absorption (absorbed dose). Equations in U.S. EPA guidance documents (U.S. EPA 1989a, 1991b) calculate applied dose when exposure occurs by ingestion and inhalation, and absorbed dose when exposure occurs by dermal contact.

The specific equations for each exposure scenario and the values assigned to the equation parameters are provided in Appendix S. The general equation for calculating dose is shown below.

$$D = (C \times CR \times EF \times ED) / (BW \times AT)$$

where:

D = daily dose averaged over the exposure period (mg/kg-day)

C = chemical concentration in the exposure medium (mg/kg)

CR = contact rate with the exposure medium (kg/day)

EF = exposure frequency (day/year)

ED = exposure duration (year)

BW = body weight of the exposed individual (kg)

AT = averaging time (day)

6.2.4.1 EXPOSURE ASSUMPTIONS

Exposure assumptions describe the rate of contact that the receptors could have with the soil, water, or air. U.S. EPA guidelines on upperbound exposure assumptions are designed to address the behavior or activity patterns more conservatively than 90 to 95 percent of the receptor populations. The intent is to estimate an RME ~~reasonable maximum exposure~~.

The ~~exposure~~ assumptions representing best professional judgment of upper bound estimates of exposure for the elementary/high school-age~~elementary /high school age~~ child (9 to 16 years) playing at Site 2 are as follows.

- The child will use the landfill area for recreational purposes for 2 hours at a time, 350 days a year.

- The child weighs 46 kilograms (101 pounds) and plays at the landfill for a 7-year period.
- Twenty-five percent of the child's skin (3,000 square centimeters) is in contact with soil/sediment.
- Thirty-five percent of the child's skin (5,000 square centimeters) is wet while playing in the seep water.

The exposure assumptions for ~~the~~ hypothetical adults and child residents ~~children~~ exposed to groundwater at the four downgradient wells ~~edge~~ of the landfill are the following standard U.S. EPA default assumptions.

- Two liters of water a day was assumed or a 70-kilogram adult and 1 liter a day for a 15-kilogram child (age 1-6 years).
- For dermal exposure during showering, whole-body exposure (7,000 square centimeters for children and 19,000 square centimeters for adults) was assumed to occur for 0.25 hours a day, 350 days a year.
- Inhalation of volatiles during household water use was assumed to occur for 24 hours a day, 350 days a year.
- Adult exposure was assumed for a total of 30 years, 6 years as a child and 24 years as an adult (child exposure was assumed to be 6 years).

Risks to the utility maintenance worker were qualitatively assessed. Therefore, no exposure assumptions were made for the utility maintenance worker.

6.3 TOXICITY ASSESSMENT

This section presents the toxicity assessment for the COPCs identified for Site 2 at MCAS El Toro. The objective of the toxicity assessment is to determine the relationship between dose and toxic response for each COPC. From the relationship, an estimate of toxic potency is developed for use in characterizing risk. The toxicity assessment identifies toxicity criteria (values) for each of the chemicals chosen for inclusion in the risk assessment and the kinds of effects each of the chemicals are capable of producing. Toxicological chemical effects fall into two categories: those that could potentially cause cancer (carcinogens) and those that cause other types of health effects (e.g., liver damage [noncarcinogens]).

Each of the toxicological chemical effects is described by assigning a toxicity factor. Toxicity factors are numbers that indicate the toxicity of the chemicals. The toxicity factor for carcinogenic effects is called a cancer slope factor (CSF) and the toxicity factor for noncarcinogenic effects is called a reference dose (RfD). Both ~~types of~~ factors are further detailed in Appendix S~~the following two sections~~. Chemicals that show a potential for both carcinogenic and noncarcinogenic health effects are assigned both slope factors and reference doses. Toxicity factors for COPCs are listed in Appendix S. The toxicity factors are combined with the chronic daily dose to calculate a numerical estimate of risk (Section 6.4).

~~6.3.1 Toxicity Factors for Carcinogens~~

~~The toxicity factor for carcinogens is known as the CSF. CSFs express the dose-response relationship for chemicals exhibiting carcinogenic effects. CSFs are expressed in (mg/kg of body weight per day)$^{-1}$. CSFs are developed by U.S. EPA with a mathematical model that uses data from the results of human epidemiological studies or chronic animal bioassays to predict potential increases in cancer in humans. The use of animal data to predict cancer in people represents an uncertainty in risk assessment. The laboratory animals are exposed to the maximum dose that they can tolerate for relatively short periods in the laboratory, but humans receptors would be exposed to very low levels over long periods.~~

~~To account for the uncertainty in calculating CSFs, U.S. EPA raises the CSF using a safety factor in the form of upperbound confidence intervals. The upperbound confidence interval indicates that there is a 95 percent probability that the actual risk will be less than that predicted by the model.~~

~~Another consideration in evaluating potential carcinogens is the "weight of evidence" that the chemical will cause cancer in people. The U.S. EPA assigns every carcinogen to a group according to the quality and quantity of evidence for the carcinogenicity of that chemical in humans and animals. The weight of evidence reflects the degree of confidence in the data that the chemical is a human carcinogen. The table of toxicity values in Appendix S contains weight-of-evidence codes for each of the carcinogens.~~

~~6.3.2 Toxicity Factors for Noncarcinogenic Effects~~

~~The potential for noncarcinogenic health effects is estimated using a toxicity value known as RfD. Each RfD is associated with a specific health effect (e.g., central nervous system damage), also referred to as a toxicity endpoint.~~

~~The current scientific view assumes that for noncarcinogenic effects, there is a concentration below which there is little potential for adverse health effects over the exposure period. That concentration is referred to as threshold concentration. RfDs are derived from either human (occupational exposure) or animal studies and are adjusted using uncertainty factors. The RfD is calculated from the highest chronic (long-term) exposure level that did not cause adverse effects in the population (human or laboratory animal) studied. A safety factor is applied to this level to allow for any uncertainty, such as using data on animals to predict effects on humans. These factors range up to 10,000, based on the confidence level associated with the data. The resulting RfD, in units of mg/kg of body weight per day, is used to characterize the risk.~~

6.3.1~~3~~ Source of Toxicity Criteria

The toxicity values used in this risk assessment were obtained from the September 1995 table of PRGs published by U.S. EPA Region IX (U.S. EPA 1995a) and were confirmed by a review of the U.S. EPA Integrated Risk Information System (IRIS) database and the U.S. EPA Health Effects Assessment Summary Tables [HEAST] (U.S. EPA 1995c and

U.S.-EPA 1995d, respectively). The IRIS database and HEAST were also searched for toxicity criteria for chemicals not listed in the table of PRGs. The review of the IRIS database revealed changes in the RfDs for manganese, endosulfan, and carbon disulfide. The respective RfDs are now 0.023, 0.006, and 0.2 mg/kg/day, respectively. They were formerly 0.005, 0.00005, and 0.0029 mg/kg/day, respectively. The new RfD for manganese was not used in this risk assessment because it has not been accepted by U.S.-EPA Region IX.

6.3.2 Application of Cal-EPA Toxicity Criteria for Carcinogens

Toxicity values developed by Cal-EPA for cadmium, hexavalent chromium, chrysene, benzo(a)pyrene, benzo(k)fluoranthene, nickel, and tetrachloroethene were obtained from the 1994 updated table of cancer potency factors developed by Cal-EPA, Office of Environmental Health Hazard Assessment (Cal-EPA 1994a). Those chemicals are part of a group of eight carcinogens whose risk estimates are much larger when based on Cal-EPA than on U.S. EPA slope factors. It is DON policy to use U.S. EPA and Cal-EPA slope factors in estimating the risk from~~presented by~~ those chemicals when present.

6.3.3 Toxicity Criteria for Polynuclear Aromatic Hydrocarbons

Benzo(a)pyrene is the only carcinogenic PAH with oral and inhalation CSFs based on a carcinogenicity assay. The CSFs for the other carcinogenic PAHs are derived by multiplying the CSFs for benzo(a)pyrene by a toxicity equivalency factor (TEF). The TEFs are based on the potency of each PAH relative to that of benzo(a)pyrene. The TEF-derived CSFs for the carcinogenic PAHs were obtained from the U.S. EPA Region IX table of PRGs (U.S. EPA 1995a).

6.3.4 Toxicity Criteria for Dermal Exposure

Agency-developed CSFs and RfDs were developed specifically to estimate risk associated with ingestion and inhalation of chemical substances and are, with few exceptions, based upon administered doses. CSFs or RfDs have not been developed specifically for dermal exposure. The standard U.S. EPA dermal dose equation produces an absorbed dose. Theoretically, equivalent doses must be used to achieve a meaningful comparison between the dermal dose estimates and the toxicity criteria. The Risk Assessment Guidance for Superfund (U.S. EPA 1989a) recommends adjusting the oral RfDs and CSFs for gastrointestinal absorption so that they represent absorbed doses, and using the adjusted toxicity value to estimate dermal risk. Using the oral toxicity criteria without adjustment should theoretically underestimate dermal risk. However, when used with adjustment, oral toxicity criteria causes the dermal risk to exceed the oral risk by a considerable margin for some substances. ~~Toxicologically, this is rarely possible and suggests that the standard procedure for estimating dermal risk needs further refinement.~~ Therefore, in the risk assessment, oral toxicity criteria were used to estimate dermal risk without adjustment.

6.3.5 Toxicity Criteria for COPCs Without Assigned Criteria

When no oral or inhalation RfD was available for a chemical, the chemical was assigned the oral and inhalation RfD of another chemical of similar structure or chemical class (i.e., surrogates). Similarly, when a CSF was not available for a carcinogenic chemical, the chemical was assigned the CSF of a structural analogue. Appendix S identifies the chemicals without toxicity criteria and their chemical surrogates. No toxicity criteria were identified for dichloroprop.

~~The planned approach to assessing the risk presented by lead consisted of comparing the blood lead concentration to the acceptable concentration of 10 micrograms per deciliter (µg/dL). Instead, the concentration of lead in soil, (the only medium in which lead was a COPC) was compared to the Cal-EPA PRG of 130 mg/kg. That PRG is lower and, therefore, more stringent than the U.S. EPA PRG for lead in residential soil.~~

6.3.6 Toxicity Criteria for Chromium

Chromium, identified as a groundwater COPC downgradient from Site 2, was measured as total chromium. A CSF toxicity value for total chromium was obtained from the September 1995 table of PRGs (U.S. EPA 1995a). In the absence of an RfD for total chromium, the hexavalent chromium RfD was used. As described above, Cal-EPA developed additional toxicological criteria for eight chemicals, including hexavalent chromium. Because the chromium species at the site was not determined, chromium was also evaluated as hexavalent chromium by the use of the Cal-EPA toxicity criteria. Use of the hexavalent chromium RfD and Cal-EPA toxicity criteria will provide a very conservative risk estimate for chromium, because, as presented in Section 5, hexavalent chromium in groundwater can be easily reduced to trivalent chromium.

6.3.7~~6~~ Toxicological Characteristics of Risk Drivers

Upon completion of a risk assessment, it is not uncommon to find that only a small percentage of the chemicals evaluated contribute appreciably to total risk. Those chemicals are conventionally called risk drivers. In this risk assessment, risk drivers are defined as COPCs that account for more than 90 percent of the total risk. ~~Some of t~~The groundwater risk drivers include arsenic, chromium, and~~heptachlor,~~ fluoride~~,~~, B~~b~~enzo(a)pyrene, dibenzo(a)anthracene, and MCPP are identified as the soil risk drivers. Appendix S presents the IRIS files for the COPCs identified as risk drivers. Information about the ~~medium in which the risk drivers were found and the~~ receptors and pathways via which the risk drivers ~~they~~ posed the highest risk are presented in the next section.

6.4 RISK CHARACTERIZATION

The final step in any risk assessment is the characterization of risk in which the exposure and toxicity information generated in previous sections are integrated to evaluate the potential health risks. Cancer and noncancer risk are quantified separately. The following text presents the methods used in the estimation of risk and provides the

resultant risks. The calculations for each pathway are presented in Appendix S. A summary of the resultant risk estimates is presented in Tables 6-3~~2~~ and 6-4~~3~~ for the recreational and the residential receptor, respectively. Because of differences between U.S. EPA and Cal-EPA CSFs, risk was estimated by using both U.S. EPA CSFs and Cal-EPA CSFs for certain chemicals.

6.4.1 Cancer Risk

The equation specified in the U.S. EPA Risk Assessment Guidance for Superfund (U.S.-EPA 1989a) for estimating cancer risk is:

cancer risk = CSF × estimated dose rate

Cancer risk is an upperbound estimate of individual excess probability of increased cancer incidence resulting from exposure to a potential carcinogen. The cancer risk presented by different carcinogens is~~are~~ added across all of the exposure pathways and intake routes to obtain an estimate of overall risk.

A cancer risk probability of 1×10^{-6} means that the estimated increase in an individual normal or baseline cancer risk is no greater than 1 in 1,000,000 for a lifetime of exposure, and it may be considerably less.

The results are discussed in the context of which pathway and which chemical constitute the majority of the risk.

6.4.1.1 ON-SITE RECREATIONAL USE

The excess lifetime cancer risk for an elementary/high school-age~~elementary /high-school age~~ child playing at Site 2 for 2 hours a day, 350 days a year, was estimated at 6.6×10^{-6} ~~8.1×10^{-6}~~ and 9.0×10^{-6} ~~1.2×10^{-5}~~ by use of ~~ing~~ U.S. EPA and Cal-EPA toxicity criteria, respectively (Table 6-3~~2~~). ~~-~~The risk, U.S. EPA and Cal-EPA, was primarily associated with dermal exposures to the soil medium (0 to 2 ft bgs) with two PAHs, benzo(a)pyrene and dibenz(a,h)anthracene, contributing approximately 36 percent and 30 percent, respectively, of the soil risk.~~greater than 70 percent of the soil risk.~~ Benzo(a)pyrene and dibenz(a,h)anthracene are classified by the U.S. EPA as probable human carcinogens (Group B2), which means that there is sufficient evidence that both are carcinogenic in laboratory animals, but there is insufficient evidence of carcinogenicity in humans. ~~aA~~ Figure 6-2 presents cancer risk estimates for Site 2 by media. Figure 6-3 illustrates the risk associated with each on-site exposure pathway. Figure 6-4 identifies the Site 2 COPCs identified as risk drivers. Appendix S presents the contribution of each chemical to the total cancer risk. ~~Dermal contact with the soil/sediment was the dominant risk pathway. A background cancer risk of 1.4×10^{-7} was estimated for the soil medium for the same type of exposures.~~

Table 6-3
Summary of Cancer Risk and Chronic Hazard Index
Recreational Use by a Child for Site 2 and Background

Exposure Pathway	Cancer Risk U.S. EPA[a,b]	Cancer Risk California State[b]	Hazard Index
SITE 2			
Vapors			
Vapor inhalation	1.0E-11	1.0E-11	6.3E-07
Soil			
Incidental dermal contact	5.9E-06	8.2E-06	0.92
Dust inhalation	2.8E-09	2.4E-09	0.00063
Incidental ingestion	2.6E-07	3.7E-07	0.060
Soil subtotal	6.2E-06	8.6E-06	0.98
Seep water			
Incidental dermal contact	4.0E-07	4.0E-07	0.0095
Site 2 total	**6.6E-06[c]**	**9.0E-06[d]**	**0.99[e]**
BACKGROUND[f]			
Soil			
Incidental dermal contact	3.1E-07	4.6E-07	0.005
Dust inhalation	1.5E-10	1.0E-10	0.000024
Incidental ingestion	1.4E-08	2.1E-08	0.00022
Soil subtotal	**3.3E-07**	**4.8E-07**	**0.0053**
Seep water			
Incidental dermal contact	NA	NA	0.00037
Background total[f]	**3.3E-07[g]**	**4.8E-07[h]**	**0.0056[i]**

Notes:
[a] U.S. EPA – United States Environmental Protection Agency
[b] risk was calculated by using U.S. EPA or California Environmental Protection Agency toxicity values
[c] the U.S. EPA Site 2 risk is due to dermal contact with soil benzo(a)pyrene (36 percent) and dibenzo(a,h)anthracene (30 percent)a
[d] the Cal-EPA Site 2 risk is due to dermal contact with soil benzo(a)pyrene (43 percent) and dibenzo(a,h)anthracene (22 percent)a
[e] the hazard index is due to dermal contact with soil MCPP (92 percent)
[f] the background risk was estimated only for the PAHs and pesticides detected at background, and which were identified as COPCs at Site 2
[g] the U.S. EPA background cancer risk is due to dermal contact with soil benzo(a)pyrene(57 percent) and dibenzo(a,h)anthracene(17 percent)
[h] the Cal-EPA background cancer risk is due to dermal contact with soil benzo(a)pyrene(66 percent) and dibenzo(a,h)anthracene(12 percent)
[i] the background hazard index was estimated exclusively for the PAHs and pesticides identified as COPCs at Site 2

Table 6-4
Summary of Cancer Risk and Chronic Hazard Index
Site 2 Downgradient Residential Groundwater Use by an Adult and a Child

Exposure Pathway	Cancer Risk U.S. EPA[a,b]	Cancer Risk California State[b]	Hazard Index
RESIDENT ADULT			
Downgradient			
Dermal contact	8.3E-07	2.0E-07	0.0076
Ingestion (drinking water)	2.9E-04	5.6E-04	2.7
Vapor inhalation	3.0E-06	5.8E-06	0.077
Downgradient resident adult total	**2.9E-04[c]**	**5.7E-04[d]**	**2.8[e]**
Upgradient[f]			
Dermal contact	1.4E-07	8.1E-07	0.0021
Ingestion (drinking water)	6.7E-05	2.2E-04	0.9
Upgradient resident adult total[f]	**6.7E-05[g]**	**2.2E-04[h]**	**0.9[i]**
RESIDENT CHILD			
Downgradient			
Dermal contact	2.5E-07	6.0E-07	0.013
Ingestion (drinking water)	1.1E-04	2.1E-04	6.4
Vapor inhalation	1.1E-06	2.2E-06	0.18
Downgradient resident child total	**1.1E-04[c]**	**2.1E-04[d]**	**6.6[e]**
Upgradient[f]			
Dermal contact	4.3E-08	2.4E-07	0.0037
Ingestion (drinking water)	2.5E-05	8.2E-05	2.1
Upgradient resident child total[f]	**2.5E-05[g]**	**8.2E-05[h]**	**2.1[i]**

Notes:
[a] U.S. EPA – United States Environmental Protection Agency
[b] risk was calculated by using U.S. EPA or California Environmental Protection Agency toxicity values
[c] the U.S. EPA downgradient groundwater risk is solely due to ingestion of arsenic
[d] the Cal-EPA downgradient groundwater risk is due to ingestion of arsenic (52 percent) and chromium, as hexavalent chromium (48 percent)
[e] arsenic (42 percent), fluoride (20 percent), manganese (12 percent), chromium, as hexavalent chromium (8 percent), and nickel (7 percent) are the major contributors to the downgradient hazard index
[f] the background risk was estimated only for the metals detected upgradient, and which were identified as COPCs at Site 2. The only pesticide identified as a COPC at the site, heptachlor, was not detected at the background locations.
[g] the U.S. EPA upgradient groundwater cancer risk is solely due to ingestion of arsenic. Arsenic is the only metal with a U.S. EPA cancer toxicity criteria.

(table continues)

Table 6-4 (continued)

[h] the Cal-EPA upgradient groundwater cancer risk is due to ingestion of chromium, evaluated as hexavalent chromium (70 percent). Arsenic and chromium (hexavalent) are the only metals with cancer toxicity criteria.

[i] the upgradient hazard index was estimated exclusively for metals detected at background locations which were identified as groundwater COPCs at Site 2: aluminum, arsenic, chromium, manganese, nickel, vanadium and zinc. Arsenic (30 percent), manganese (29 percent), chromium, as hexavalent chromium (16 percent), and nickel (16 percent) are the major contributors to the upgradient hazard index.

To place the risk estimates in proper perspective, the inherent uncertainties in the numerical results must be evaluated. The frequency of detection (number of measurable detections/number of samples analyzed) was generally low to moderately low for the organic COPCs and high for the inorganic COPCs in soil. Of particular interest are the organic risk drivers, benzo(a)pyrene and dibenzo(a,h)anthracene. Benzo(a)pyrene was detected at Site 2 surface soils in 4 of 39 samples at a maximum concentration of 0.9 mg/kg. Dibenzo(a,h)anthracene was identified in 2 of 39 surface soil samples at a maximum detection level of 0.28 J mg/kg. Maximum detected values for these risk drivers were collected at sampling station 02BS15 on November 1995. The low frequency for benzo(a)pyrene indicates that the mean concentration and the 95-percent UCL was based mostly on concentrations equal to one-half of the detection limit, which are estimates rather than actual concentrations. For dibenzo(a,h)anthracene, the low frequency of detection did not permit the use of an statistically derived exposure point concentration. The maximum detected concentration was used instead as the exposure point concentration for these analytes. Similarly, several other COPCs were evaluated on the basis of highest measured concentrations. It is important to note that the assumption of long-term contact with the maximum concentration is conservative, and the use of maximum concentrations in the risk assessment results in overestimates of exposures and risks.

The qualifiers associated with benzo(a)pyrene and dibenzo(a,h)anthracene~~a~~ detected concentrations indicate uncertainty in the reported values. The majority of detects for these PAHs are qualified as "J" by the data validators. Concentrations indicated by the "J" qualifier are estimated quantities and below the detection limit. Therefore, the risk results presented for Site 2 should not be taken as a characterization of absolute risk. Conclusions by risk managers about the significance of the risk will need to integrate the uncertainties affecting the risk estimates.

~~PAH are found throughout the United States in urban and rural settings because these chemicals are products of combustion and are also associated with heavy petroleum products, such as asphalt on roads. PAH was not included in the analyses of background samples, and the background risks for these chemicals are unknown at this time. It is not clear that PAH is elevated above background at Site 2. Dibenzo(a,h)anthracene was detected in 2 of 16 samples at Site 2. Benzo(a)pyrene was identified in 4 of 16 samples at a maximum concentration of 0.9 mg/kg. Literature values for background levels of benz(a)pyrene in rural, agricultural, and urban soil range from 0.002 to 1.3 mg/kg (ATSDR 1990).~~

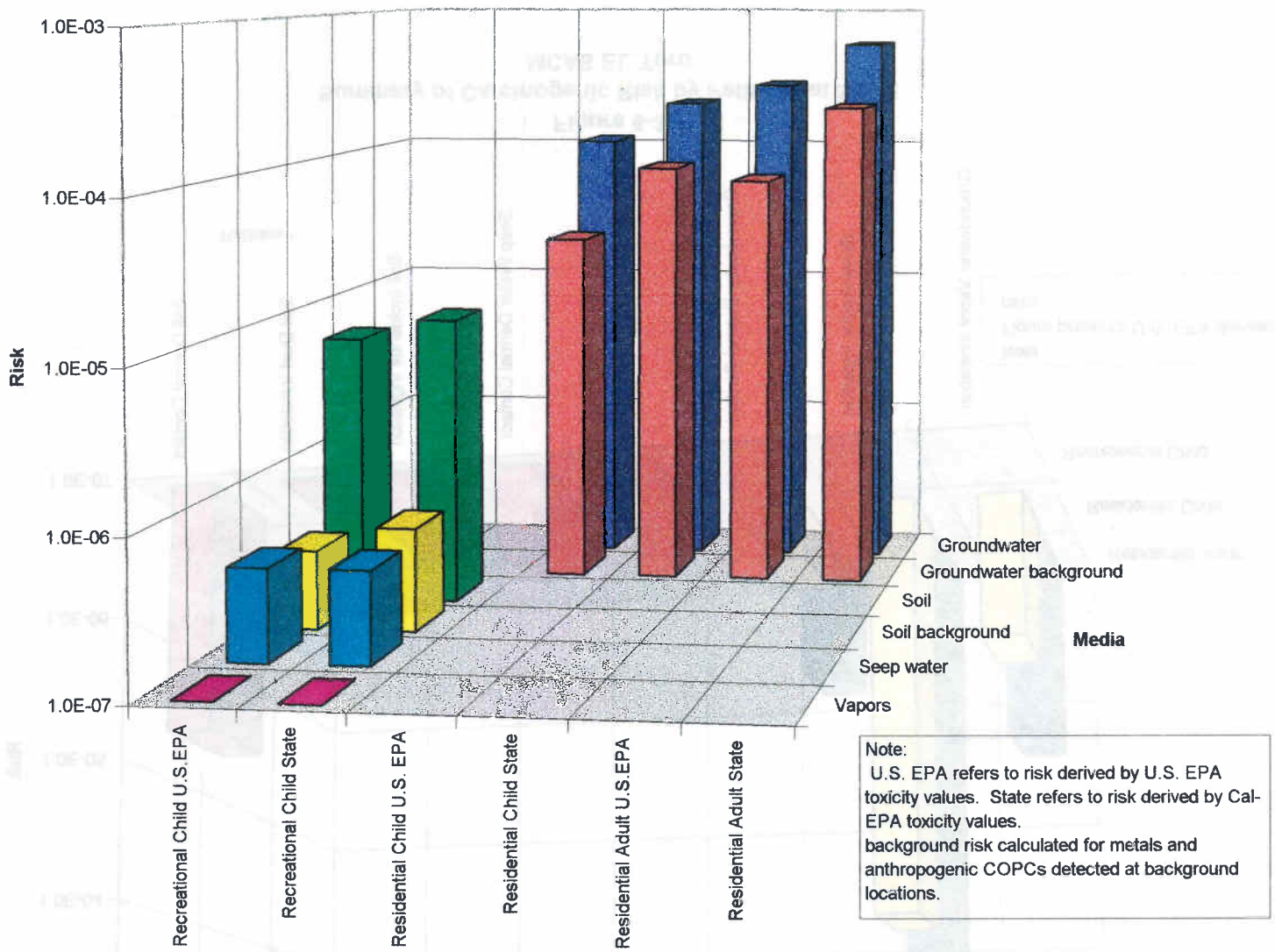


Figure 6-2
Summary of Lifetime Cancer Risk Estimates by Media at Site 2
MCAS El Toro

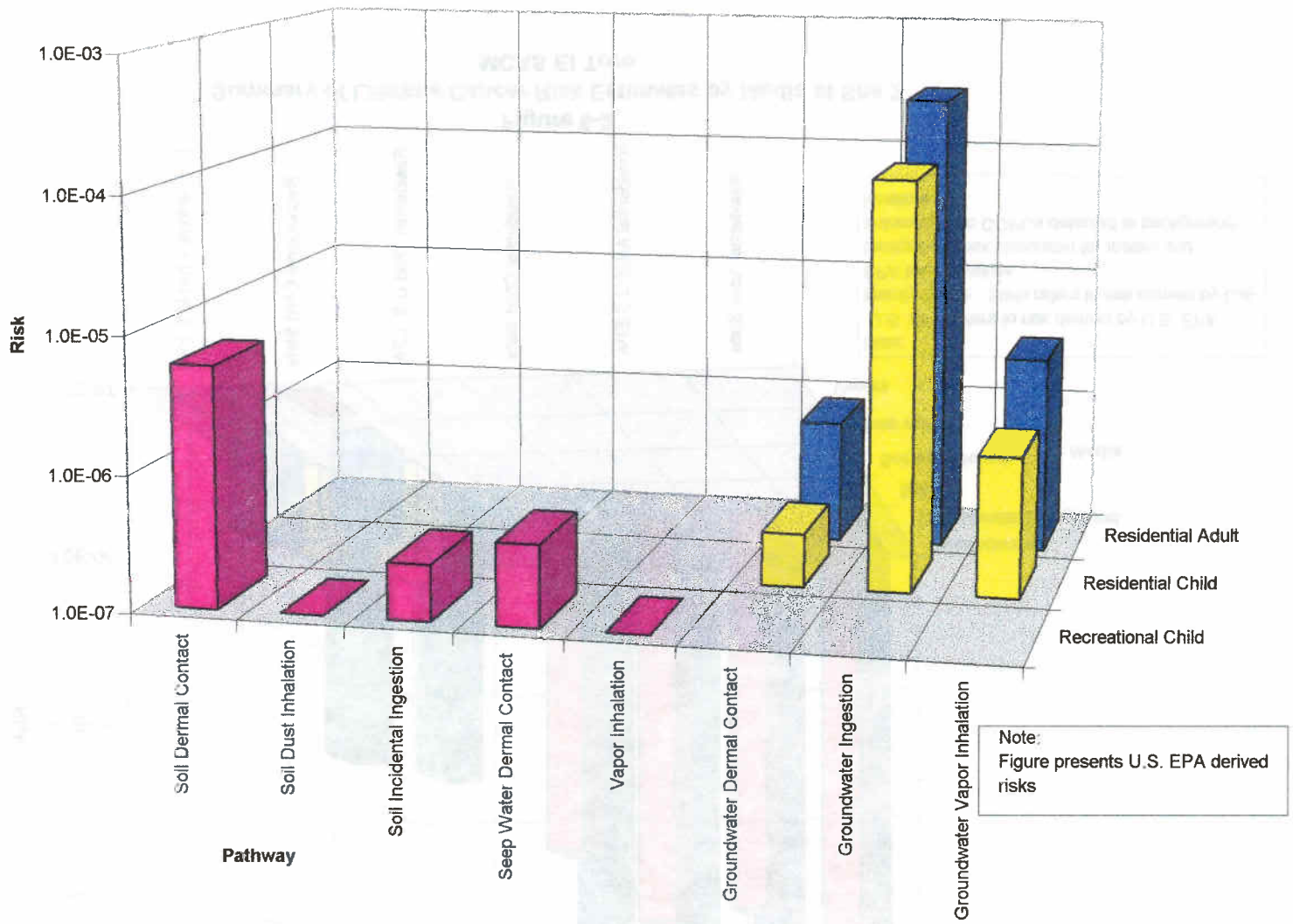


Figure 6-3
Summary of Carcinogenic Risk by Pathway at Site 2
MCAS EL Toro

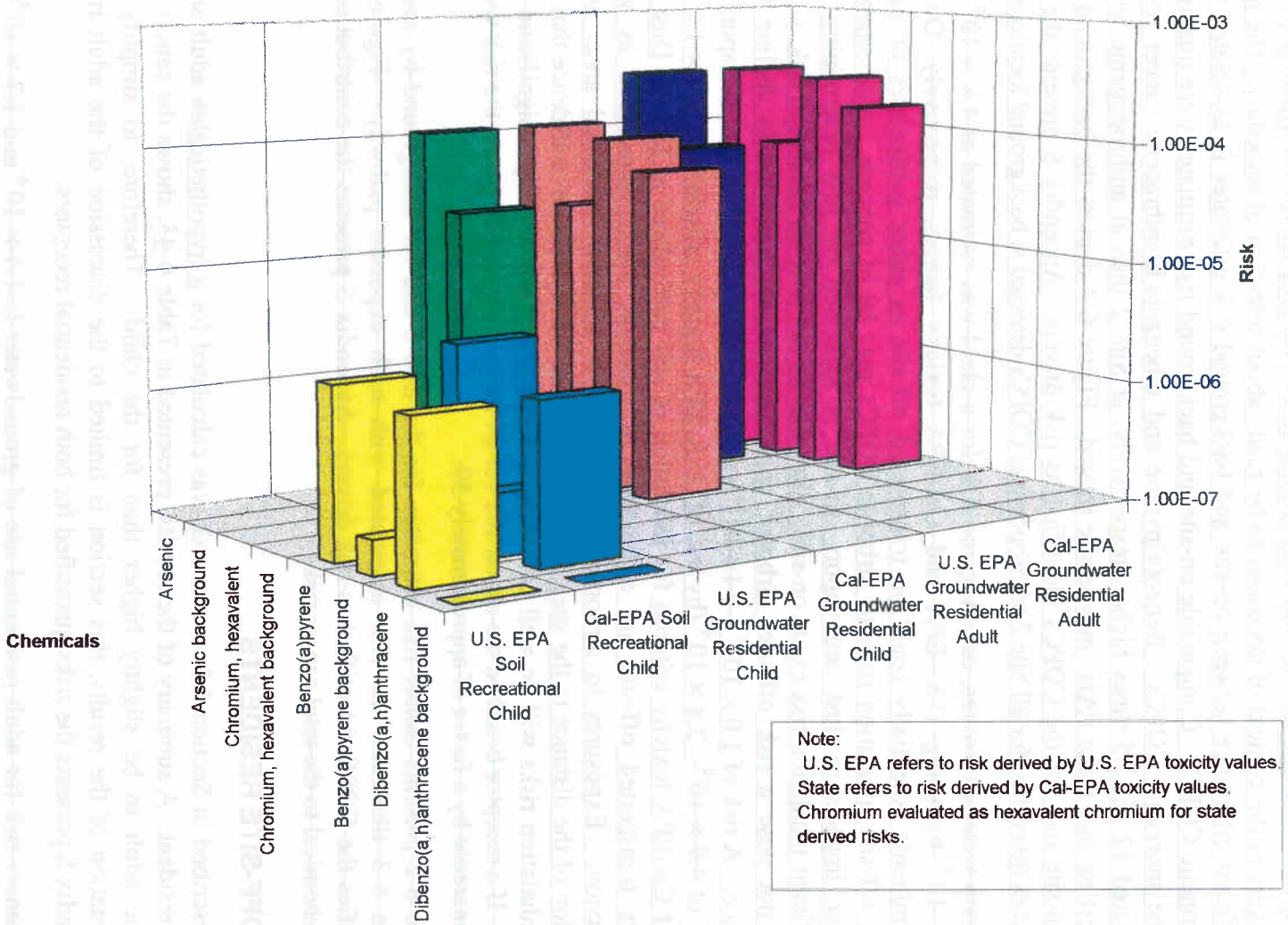


Figure 6-4
Lifetime Cancer Risks of the Risk Drivers for Soils and Groundwater at Site 2
MCAS El Toro

For additional perspective, a background cancer risk was also estimated for the anthropogenic chemicals (i.e., PAHs and pesticides) identified as Site 2 COPCs. A comparison between on-site and background risks provides useful information to risk managers in the context of decisions to be made about selection of remedies. The more significant difference between on-site and background risk estimates is associated with the organic COPCs. Comparable on-site and background risk estimates were quantified for the inorganic COPCs. Benzo(a)pyrene and dibenzo(a,h)anthracene cancer risk is estimated 12 and 35 times higher, respectively, at Site 2 than at anthropogenic levels, suggesting that these PAHs maybe site related. Figure 6-4 depicts the background and the on-site risk for the COPCs identified as risk drivers. Appendix S presents the risk estimates quantified for all Site 2 anthropogenic COPCs detected at background locations.

~~For seep water exposures, carcinogenic risk for a child was estimated at 4.8×10^{-7} and 5.1×10^{-7} by using U.S. EPA and Cal-EPA toxicity factors, respectively.~~ On-site contaminants potentially could be transported off-site as either particulates or gases. Thus, off-site inhalation risks to airborne COPCs may be of concern. Assessment of adverse impacts to dust and vapors off-site is addressed by first determining if a significant inhalation risk exists on-site. Sites that do not pose an inhalation risk will, in turn, not pose a risk off-site; airborne concentrations are predicted to decline with distance. -A risk of 1.0×10^{-11} ~~$1.0 1\times 10^{-11}$~~ was quantified for the inhalation of vapors and a risk of ~~4.9×10^{-9}~~- 2.8×10^{-9} (by use of U.S. EPA toxicity criteria) and 2.4×10^{-9} (by use of Cal-EPA toxicity criteria) for inhalation of soil particulates at Site 2. Dust and vapors transported off-site are a function of transport mechanisms such as wind dispersion. Exposures to airborne contaminants at adjacent residential areas are a function of the distance to the site. As a result, t~~T~~here is reasonable confidence that off-site inhalation risks will be well below on-site risk levels.~~this already insignificant risk level. If a receptor breathed the air on-site for 24 hours a day for 30 years, the risk would only increase by a factor of approximately 50.~~

~~Figure 6-2 presents cancer risk estimates for the Site 2 and for background by media. Figure 6-3 illustrates the risk associated with each exposure pathway. Figure 6-4 identifies the COPCs identified as risk drivers. Appendix S presents the contribution of each chemical to the total cancer risk.~~

6.4.1.2 OFF-SITE RESIDENTS

As described in Section 6.3, cancer risk was calculated for a hypothetical~~an~~ adult and a child resident. A summary of the results, presented in Table 6-4~~3~~, shows the cancer risk for the adult to be slightly higher than for the child. Therefore, to simplify the presentation of the results, this section is limited to the discussion of the adult risks. Appendix S presents the risks quantified for both residential receptors.

~~The cancer risk for adult residential use of groundwater is 1.4×10^{-5} and 1.7×10^{-5} for U.S. EPA and Cal-EPA cancer toxicity factors, respectively. Groundwater ingestion was the dominant risk pathway. Greater than 60 percent of the groundwater ingestion risk, when based on U.S. EPA toxicity values, is due to heptachlor (identified in two of three~~

~~samples). Heptachlor is classified by the U.S. EPA as a probable human carcinogen (Group B2).~~ The cancer risk for adult residential use of groundwater downgradient from Site 2 is 2.9×10^{-4} and 5.7×10^{-4} for U.S. EPA and Cal-EPA cancer toxicity factors, respectively. Groundwater ingestion is the dominant risk pathway. When based on U.S. EPA toxicity values, arsenic, is the sole contributor to the total groundwater risk. This metal is classified by the U.S. EPA as a human carcinogen (Group A), which means that there is sufficient evidence to show that it causes cancer in humans. In addition to arsenic, chromium, evaluated as hexavalent chromium, is identified as a primary risk contributor subsequent to the replacement of U.S. EPA CSFs with Cal-EPA CSFs (Cal-EPA derived risk). Hexavalent chromium is classified as a human carcinogen (Group A). Use of the hexavalent chromium toxicity criteria results in an overestimation of the groundwater risks, since, as presented in Section 5, under the redox-pH range for groundwater conditions at the site, the most probable species for chromium is trivalent chromium, which is not carcinogenic. Risk derived by use of U.S. EPA toxicity values evaluated chromium as total chromium. Figure 6-2 presents the cancer risk estimates for groundwater downgradient of Site 2. Figure 6-3 illustrates the risk associated with each exposure pathway. Figure 6-4 identifies the groundwater COPCs identified as risk drivers. Appendix S presents the contribution of each chemical to the total cancer risk.

Groundwater risks downgradient of Site 2 were based on data collected from one sampling event from four monitoring wells. Exposure point concentrations were based on either the 95 percent UCL or the maximum detected value, as appropriate (see Appendix S). Groundwater risks for arsenic and chromium were estimated by use of the highest measured concentration as the exposure point concentration. Highest values for these metal COPCs, 0.128 mg/L for arsenic and 0.0435 mg/L for chromium, were detected in monitoring well 02NEW12. Section 6.4 presents the principal uncertainties associated with the use of the maximum concentration in the risk assessment.

For perspective, an upgradient groundwater (background) cancer risk was also estimated for the carcinogenic COPC metals and anthropogenic chemicals. To simplify the on-site-background comparison, this discussion is limited to the groundwater risk drivers, arsenic and chromium. Risk from exposure to arsenic in the downgradient groundwater ~~,an of 0.003 mg/L,~~was estimated ~4 times higher than the risk for arsenic upgradient from Site 2.

Risk from exposure to downgradient chromium~~measured at 0.025 mg/L~~, as hexavalent chromium when based on the Cal-EPA cancer toxicity factor, is approximately 2 times higher than risk for chromium in the upgradient locations. Although risk estimates suggest that arsenic and chromium maybe not be result of site-specific releases or contamination, there is some uncertainty whether the downgradient and the background assessments address the full magnitude of potential risks because those results are based on a small sample population (4 samples on-site; 2 samples at background). Figure 6-4 presents the upgradient and the downgradient cancer risk for the groundwater COPCs identified as risk drivers. Appendix S presents the risks quantified for the Site 2 metal COPCs detected at background locations.

~~as~~In the analysis of the above groundwater risk results, ~~i~~ the risks were estimated for a hypothetical resident. It is highly improbable that future residents would build a home immediately downgradient from the landfill. The characterization thus includes a bias in the association between risk and the likelihood or probability of occurrence~~occurance~~. Understanding the impacts of this uncertainty will help risk managers to make more informed and reasoned risk-based decisions.~~.~~

~~Risk from exposure to chemical vapors released from groundwater during domestic use was estimated at 5.1×10^{-6} and 8.0×10^{-6} by using U.S. EPA and Cal EPA toxicity criteria, respectively. Benzene contributes more than 40 percent of the risk when U.S. EPA toxicity values were used. PCE and benzene are the major contributors to the Cal EPA cancer risk. PCE is a probable human carcinogen. Benzene is classified by the U.S. EPA as a human carcinogen (Group A), which means that sufficient evidence shows it causes cancer in humans. The groundwater dermal contact pathway was quantified at 3.5×10^{-7} for U.S. EPA and Cal EPA cancer toxicity factors.~~

~~Figure 6-2 presents cancer risk estimates for each media at Site 2. Figure 6-3 illustrates the risk associated with each groundwater exposure pathway. Figure 6-4 identifies the COPCs identified as risk drivers. Appendix S presents the contribution of each chemical to the total cancer risk.~~

6.4.2 Noncancer Health Effects

The equation specified for estimating noncancer risk (U.S. EPA 1989a) is:

noncancer risk = estimated dose rate/RfD

This ratio of dose to nontoxic dose is called a hazard quotient. The hazard quotient is a measure of whether or not the estimated dose of a chemical exceeds the highest toxic dose (i.e., the RfD). Therefore, nontoxic effects are considered likely to occur when the hazard quotient exceeds 1.0. The likelihood of effects increases as the ratio increases above 1.0. A conservative estimate of the hazard associated with exposure to all chemicals by a specific pathway, such as the inhalation pathway, is obtained by summing the hazard quotients of the chemicals associated with the pathway. The sum of hazard quotients is called a hazard index.

Hazard indices are not probabilities. A hazard index is a ratio of an exposure level to a nontoxic level. Because a hazard index value of 1 indicates that lifetime exposure has limited potential for causing an adverse effect in sensitive populations, values of less than-_1 can generally be considered acceptable. Values greater than 1 are usually given closer attention.

6.4.2.1 ON-SITE RECREATIONAL USE

The hazard index for recreational use by children at Site 2 is estimated at 0.99~~ and at 0.015 in background~~. On-site, dermal contact with MCPP in ~~the~~surface soil (0 to 2 ft bgs) is responsible for greater than 90 percent of the hazard index. MCPP was identified in 2 of 24~~21~~ samples with a maximum measured value of 140 mg/kg detected in sampling

station 02 WF2 (collected August 1992 under the Phase I investigation). The high number of nondetects for MCPP rendered the statistical derivation of the 95 percent UCL inappropriate and prompted the use of the highest detected concentration as the exposure point concentration. However, the assumption of long-term contact with the maximum concentration is conservative, and the use of maximum concentrations in the risk assessment results in overestimates of exposures and risks. MCPP was not detected at background locations. Little is known about the toxicity of MCPP. There is some evidence that it affects kidney function.

~~For seep water exposures, the hazard index for a child was estimated at 0.011.~~ The hazard index associated with inhalation of vapors and soil particulates to a child playing at Site 2 is 6.3×10^{-7} ~~0.00000063~~ and 0.00063~~0.00066~~, respectively~~.~~. ~~Off-site inhalation risks probably will be well below this insignificant risk level.~~ This indicates that airborne vapors and particulates at Site 2 do not cause systemic toxicity. The off-site inhalation risk posed by potential contaminant migration from Site 2 probably will be significantly below the on-site risk level. Contaminants are potentially transported as either gases or as air particulates; however, concentrations are predicted to decline as a result of dispersion. ~~If a receptor breathed the air on site for 24 hours a day, the risk would only increase by a factor of approximately 12.~~

~~The risk for lead is considered negligible based on a comparison of the U.S. EPA Region IX residential PRG for lead and the maximum concentration of lead at Site 2. The maximum concentration at Site 2 of 121 mg/kg is below the residential PRG for lead of 130 mg/kg. The residential PRG represents the highest safe level under residential conditions and affords an even greater protection under the recreational exposure conditions assumed in their assessment.~~

Figure 6-5 presents the hazard index for ~~the~~ Site 2 and for background by media. Figure 6-6 illustrates the hazard index associated with each on-site exposure pathway. Figure 6-7 identifies the Site 2 COPCs identified as risk drivers. Appendix S presents the contribution of each chemical to the total hazard index.

6.4.2.2 OFF-SITE RESIDENTS

The hazard index for hypothetical child~~ren~~ and adult~~s~~ residents exposed to groundwater immediately downgradient of Site 2 is 6.6~~3.5~~ and 2.8~~1.5~~, respectively. Groundwater ingestion was the dominant risk pathway. Greater than 42~~35~~ percent of both the child and the adult hazard ind~~i~~ex~~ees~~ is due to arsenic, measured at a maximum detected value of 0.128 mg/L. Additional contributors to the hazard index include fluoride, manganese, chromium, as hexavalent chromium, and nickel (see Table 6-4). Four monitoring wells downgradient from the site were used to represent the downgradient groundwater conditions. For most of the COPCs (arsenic, fluoride, chromium and manganese) responsible for the groundwater systemic toxicity, maximum concentrations detected at monitoring well 02NEW12 were used as the exposure point concentrations. The 95 percent UCL was used in the estimation of risk for nickel. Section 6.4 presents the major uncertainties associated with the use of the maximum concentration in the risk assessment.

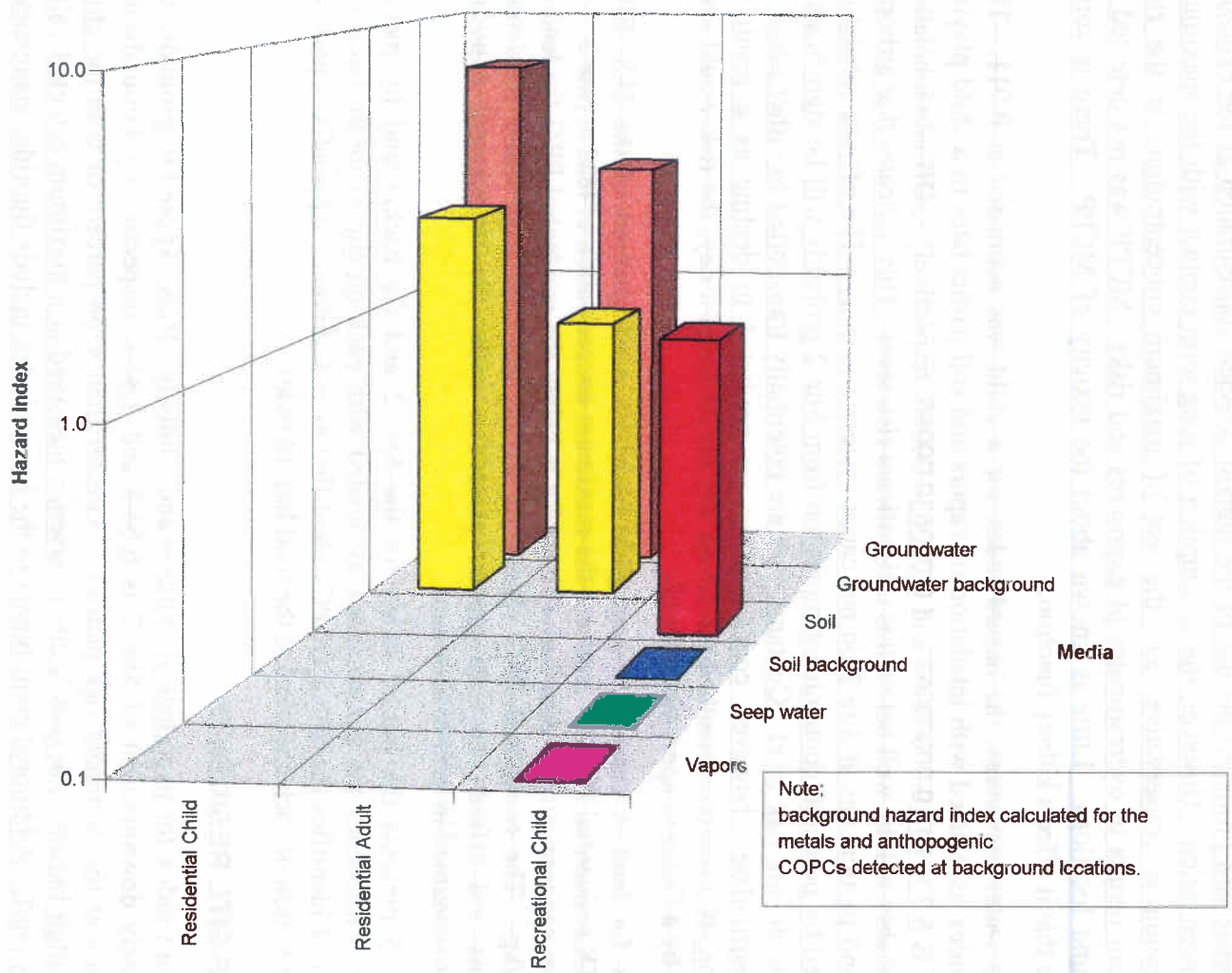


Figure 6-5
Chronic Hazard Index by Media at Site 2
MCAS El Toro

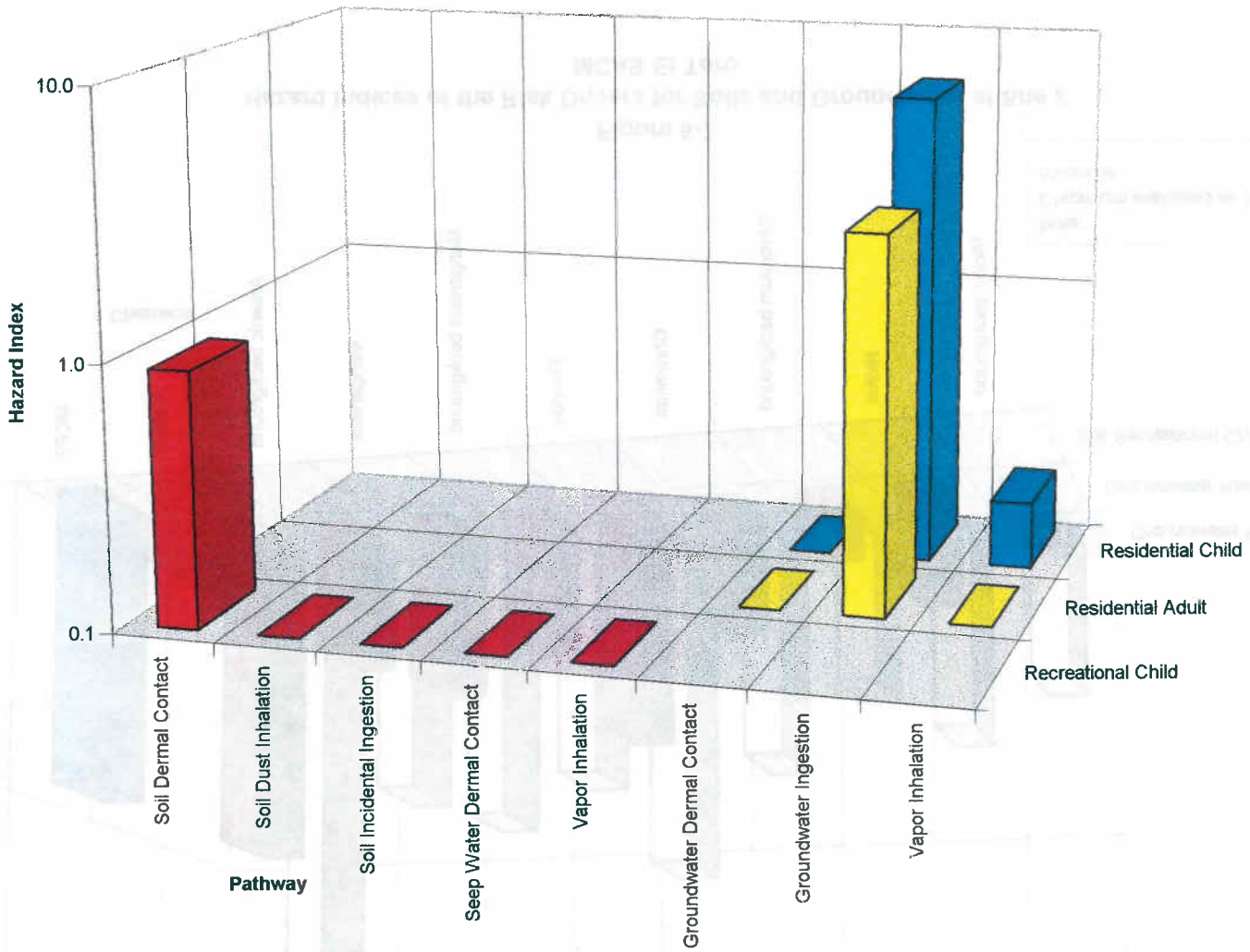


Figure 6-6
Chronic Hazard Index by Pathway at Site 2
MCAS El Toro

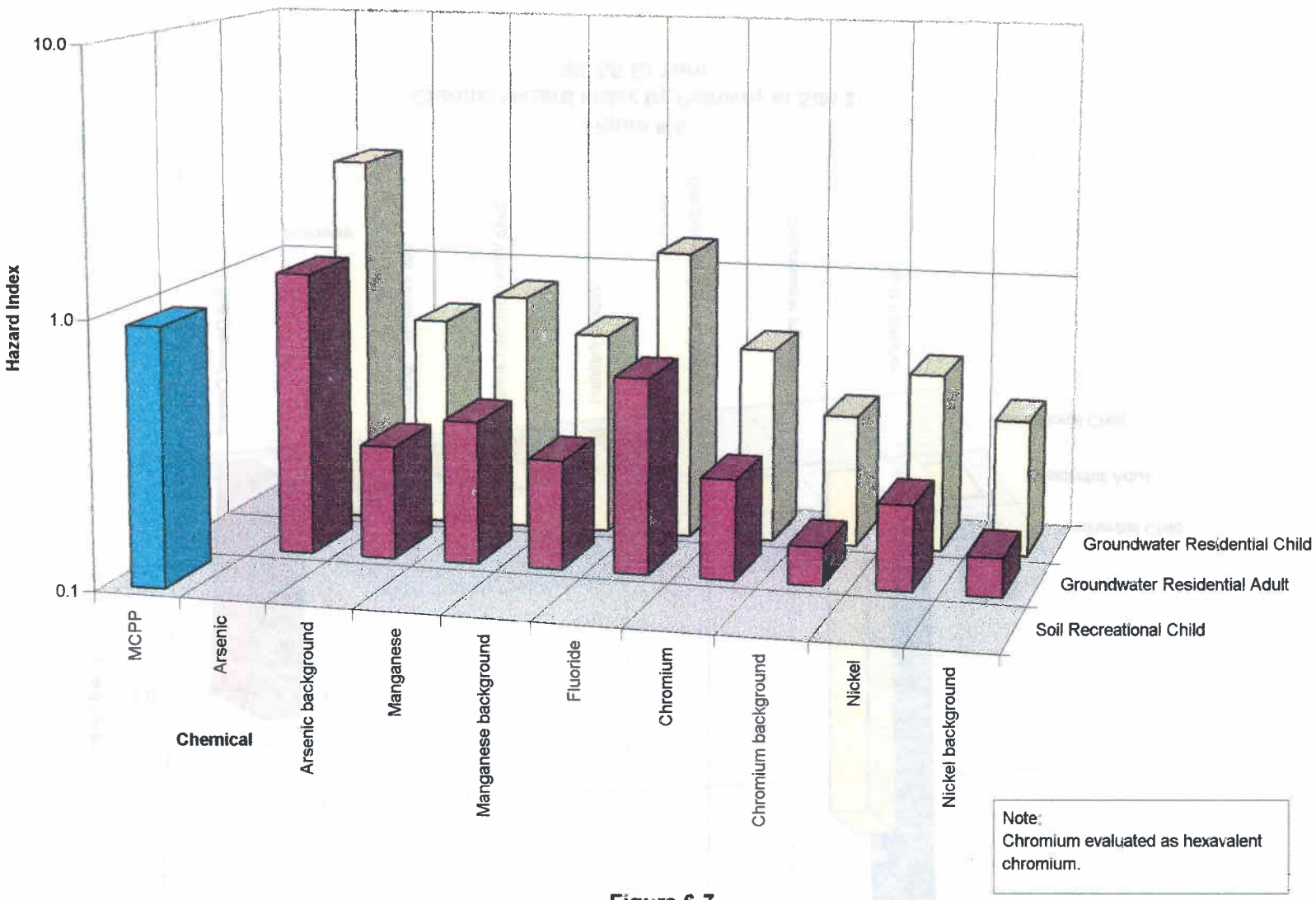


Figure 6-7
Hazard Indices of the Risk Drivers for Soils and Groundwater at Site 2
MCAS El Toro

Figure 6-5 presents the hazard index for the groundwater downgradient of Site 2. Figure 6-6 illustrates the hazard index associated with each exposure pathway. Figure 6-7 identifies the groundwater COPCs identified as risk drivers. Appendix S presents the contribution of each chemical to the total hazard index.

For perspective, an upgradient (background) groundwater hazard index was also estimated for the metals contributing to the hazard index. Systemic toxicity from exposure to arsenic in the downgradient groundwater is approximately four times higher than in the groundwater upgradient from Site 2. The hazard quotients for manganese, chromium (as hexavalent chromium) and nickel in the downgradient groundwater are approximately two times higher than in the upgradient groundwater. The upgradient hazard quotient for fluoride was not quantifiable; fluoride was not detected at the upgradient locations. Risk estimates suggest that these metals may not reflect site-specific releases or contamination, however, there is some uncertainty whether the full magnitude of potential risks are addressed as results are based a small sample population (four samples on-site; two background samples). Appendix S presents the risks quantified for the Site 2 metal COPCs detected at background locations.

Health Effects

This section presents representative health effects associated with each of the risk drivers identified above. This discussion is not intended to be all-inclusive, but provides a summary of chemical toxicity. The IRIS profiles presented in Appendix S furnish additional information.

The toxicity of inorganic arsenic depends on its valence state as well as on the physical and chemical properties of the compound in which it occurs. Symptoms of acute inorganic arsenic poisoning in humans include nausea, epigastric and abdominal pain, cardiac abnormalities, hepatoxicity, and hematological~~hematologic~~ abnormalities. The acute lethal dose to humans has been estimated to be about 0.6 mg-kg/day (ATSDR 1991a). The most characteristic effect of chronic oral exposure to inorganic arsenic in humans is a darkening (hyperpigmentation) and thickening (hyperkeratosis) of the skin. Nervous system and vascular system disorders have also been reported. Occupational exposure studies have shown a clear correlation between exposure to arsenic and lung cancer mortality~~mortatility~~. Epidemiological studies revealed an association between arsenic concentrations in drinking water and increased incidence of skin cancers, as well as cancers of the liver, bladder, and respiratory and gastrointestinal tracts.

~~fluoride. Although fluoride protects against tooth decay, it can cause the color of the teeth to darken and a condition (osteofluorosis) that can mimic arthritis if the dose is high enough. It is important to note that the maximum concentration of fluoride measure in the groundwater of 1.2 mg/L is less than half the drinking water standard of 4 mg/L.~~

~~Additional contributors to the hazard index include manganese (23 percent), nickel (14 percent), and vanadium (11 percent).~~Chronic ingestion of fluoride affects bone health, kidney function, and possibly muscle and nerve function. The condition occurs

after years of daily exposures of 20 to 80 mg of fluorine. Although fluoride protects against tooth decay, mottling of the teeth in children has been observed at 2 to 8 mg/kg (NRC 1971).

Chromium, as trivalent chromium is poorly absorbed, regardless of the route of exposure, whereas hexavalent chromium is more readily absorbed by the gastrointestinal tract and skin. In sufficient quantities, it can be irritating and can cause kidney damage when swallowed. Chronic inhalation of chromium compounds may cause severe irritation of the respiratory tract, skin ulceration, perforation of the nasal septum, dental erosion and discoloration, chronic rhinitis and bronchitis, asthma, and liver and kidney damage. Inhalation of chromium compounds has been associated with the development of cancer. In the absence of toxicological criteria (i.e., RfD) for total chromium, the hexavalent chromium toxicological criterion was used. Use of hexavalent chromium RfD provides a highly conservative risk estimate because hexavalent chromium is not considered –the most probable chromium species in groundwater downgradient of Site 2 (see Section 5).

Manganese exhibits very low acute toxicity. Prolonged exposure to elevated concentrations either orally or by inhalation elicits disturbances on the central nervous system. Symptoms progress from headache, insomnia and memory loss to symptoms similar to those of Parkinson's disease. Effects on reproduction have been observed in humans after inhalation exposure and in animals after oral exposure.~~Symptoms of manganese exposure in drinking water include weakness, fatigue, and tremors~~.

The physicochemical forms of nickel define its ability to be absorbed, water-soluble nickel is the most readily absorbed. The primary target organs for nickel-induced systemic toxicity are the lungs and the upper respiratory tract for inhalation exposure and the kidneys for oral exposure (ATSDR 1991b). Other target organs include the cardiovascular system, immune system, and blood. Nickel contact with the skin causes "nickel itch," which is a type of sensitization dermatitis with symptoms including a burning, itching sensation progressing to ulceration of the skin. Ingestion of nickel can also cause nickel itch. Nickel in drinking water has been reported to cause birth defects in laboratory animals and an increase in the incidence of spontaneous abortions. Epidemiological studies have shown that occupational exposure to nickel dust has resulted in increased incidence of pulmonary and nasal cancer.~~Acute oral poisoning with vanadium results in central nervous system effects.~~

~~It is important ot note that four monitoring wells downgradient from the site were used to represent the downgradient groundwater conditions. However, maximum concentrations, detected at monitoring well 02NEW12 were used as the exposure point concentrations for most of the COPCs (arsenic, fluoride, chromium and manganese) responsible for systemic toxicity. The 95 percent UCL was used in the estimation of risk for nickel. In addition, with the exception of fluoride, the primary contributors to the hazard index were frequently detected.~~

~~Fluoride was not detected in the groundwater upgrdient from the Site. . Figure 6-5 presents the hazard index for the Site 2 and for background by media. Figure 6-6 illustrates the hazard index associated with each exposure pathway. Figure 6-7 identifies~~

~~the COPCs identified as risk drivers. Appendix S presents the contribution of each chemical to the total hazard index.~~

6.4.3 Risk to Utility Maintenance Worker

Wastes suspected of having been disposed at the Site 2 landfill include batteries, waste oils, hydraulic fluids, paint residues, transformers, and waste solvents. Those wastes typically contain a variety of chemicals that could present a risk to workers engaged in the repair of utility lines running along the boundary of the landfill. Some of the chemicals were found in samples of soil covering the landfill.

Underground utility lines seldom need attention. It is unlikely that repair would be needed more than once a year. Except for complete replacement of a utility line, repair operations can probably be completed in a few days (perhaps less than one work week); therefore, the exposure time associated with typical repairs is usually short and infrequent. With short exposure times, acute systemic toxicity is more of a concern than chronic toxicity, including cancer. The chemical concentrations in the surface soil are not high enough to cause acute systemic toxicity (they cause chronic systemic toxicity in the recreational child). Risk to a 70 kg maintenance/utility worker exposed to surface soils would be quantified approximately 46 times less than the risk to the playing child (with an exposed skin surface area of 5000 cm^2, a soil ingestion rate of 480 mg/day, an exposure duration of 1 year, and an exposure frequency of 10 days [2 workweeks]). Because the chemical concentrations in the subsurface are not known, it would be prudent to require a worker to wear protective equipment and to monitor chemical concentration in the air if subsurface work is attempted. Monitoring should include combustible gases (e.g., methane).

6.5 UNCERTAINTY ANALYSES

This section discusses uncertainties associated with this risk assessment. The estimated cancer risks and noncancer hazard indices presented in this risk assessment are based on numerous assumptions, most of which are considered conservative.

As a result of the cumulative effect of these conservative assumptions, the estimated risks are thought to substantially overestimate actual risks. Regulatory decisions depend not only on the calculated risk estimates but also on the uncertainties and assumptions incorporated into the risk estimates. Accordingly, a discussion of some of the more important uncertainties is provided.

6.5.1 Data Evaluation

Uncertainties are associated with the collection, analysis, and evaluation of environmental data regarding the COPCs selected for use in the risk assessment. Principal factors that may introduce uncertainty into the site environmental data include sample collection methods; characterization of area geology and hydrology; representativeness and completeness of data; adequacy of data to describe site conditions; and analytical methods, detection limits, and QA/QC procedures.

Sampling programs are necessarily limited in space and time. Selecting representative sampling locations and collecting a sufficient number of samples determines the success of characterizing risk at a contaminated site. Because sampling under the RI was designed to evaluate presumptive remedies and not to fully characterize the site, uncertainty contributions due to variability from the sampling process are likely. Environmental sampling may or may not have accurately characterized concentrations of chemicals.

~~Factors that may introduce uncertainty into site environmental data include:~~

- ~~sample collection methods;~~
- ~~characterization of area geology and hydrology;~~
- ~~representativeness and completeness of data;~~
- ~~adequacy of data to describe site conditions; and~~
- ~~analytical methods, detection limits, and QA/QC procedures.~~

~~Uncertainties are associated with the collection, analysis, and evaluation of environmental data regarding the COPCs selected for use in the risk assessment. Sampling programs are necessarily limited in space and time. Environmental sampling may or may not have accurately characterized concentrations of chemicals.~~

Comparing duplicate samples collected in the field is a method used to evaluate variability in sampling. If the duplicates are similar in chemical concentrations, then the uncertainty associated with sampling is reduced. Data from duplicate samples showed a high percentage of matching concentrations.

The procedures used to analyze chemicals in environmental media may have introduced errors. A series of laboratory blank samples and other samples are designed to detect errors introduced in this manner. All data used in this assessment were evaluated and found to be of acceptable quality.

~~Data evaluation involves using statistics to summarize the data, comparing summary data to background concentrations, and selecting COPCs. The 95 percent UCL is the maximum concentration used as the exposure point concentration of each chemical. The chemical was assumed to be present at one half the detection limit in samples where no chemical was identified. Thus, no "zero" values were used. It should be noted that the assumption of long term contact with the maximum concentration is conservative, and the use of maximum concentration in the risk assessment results in overestimates of exposures and risks.~~

TICs reported to be in samples of soil and groundwater from the sites consisted almost entirely of petroleum hydrocarbons, compounds that are typical constituent of motor fuels, lubricating oils, and grease. Analyses for the most toxic of the petroleum hydrocarbons in motor fuels, lubricating oils, and grease (i.e., benzene, ethylbenzene, toluene, xylene, and carcinogenic PAH) were performed and those hydrocarbons were

found in many samples. The hydrocarbons reported as TICs are of lower toxicity than those reported as positively identified. ~~-~~The TICs could contribute some risk, but the contribution to total risk is believed to be insignificant.

Naturally occurring inorganics were selected as COPCs based on a comparison of on-site concentrations to site-specific background concentrations. The use of statistics in the selection process can result in Type I (i.e.~~i.e~~, wrongly deciding a metal is a COPC) and Type II errors (i.e., eliminating a metal as a COPC). For the soil medium, the statistical tests performed are intended to make uniform decisions that control the rate of occurrence of these errors to an acceptable level; a 0.05 significance level was used. For groundwater, a sufficient number of samples was not available for conducting a statistical analysis with appropriate power.

6.5.2 Exposure Assessment

The principal uncertainties associated with the exposure assessment are categorized by scenario assumptions and quantification of exposure point concentrations. These sources of uncertainty are discussed in the following subsections.

6.5.2.1 UNCERTAINTIES ASSOCIATED WITH THE EXPOSURE SCENARIOS

~~The chemical concentrations were assumed to remain constant for the entire exposure duration. It is highly unlikely that the organic chemical concentrations will remain constant, particularly in soil. Benzo(a)pyrene, dibenzo(a,h)anthracene, and MCPP in soil were the risk drivers for the recreational child. Both of these compounds are biodegradable. Under aerobic conditions, the half-lives of benzo(a)pyrene and dibenzo(a,h)anthracene in soil have been estimated to be 1.45 and 2.6 years, respectively, with 0.16 and 1 year possible under ideal conditions (Howard et al. 1991). The estimated half-life for MCPP ranges from 168 to 240 hours.~~

An~~other~~ area of uncertainty in the exposure assessment is the prediction of human activities that lead to contact with environmental media and exposure to chemicals. Activities that differ from those used in the exposure assumptions could lead to higher or lower risks than those estimated. To compensate for this uncertainty, conservative estimates of exposure were used.

If some of the activities do not occur or if they occur for shorter periods of time than the estimates used in this assessment, the risks presented here would be higher than "true" risks. ~~In addition, it is assumed that all exposures occur concurrently. These assumptions are conservative, and could result in overestimates of exposures and risks.~~ It was assumed that an elementary/high school child would engage regularly in recreational activities that would result in exposures to COPCs; however, such activities could occur only occasionally and the receptor would not necessarily experience an exposure. For recreational use of the site, an exposure frequency of 350 days each year was used. This value represents a conservative limit because it is highly unlikely a child would use the landfill 350 days a year for 7 years. ~~In addition, the assumption that all exposures occur concurrently introduces an uncertainty into the resulting risk estimates. To compensate~~

~~for this uncertainty, conservative estimates of exposure were used~~ Similarly, the assumption of a residential setting required the assessment of unlikely~~highly~~ exposure pathways since it is highly improbable that future residents would build a home immediately downgradient from the landfill (redevelopment of landfills are regulated). The use of a hypothetical residential setting is likely to produce a highly conservative or even an unrealistic risk, and can represent one of the major sources of uncertainty in the assessment of the groundwater media.

In the exposure evaluation, the primary routes of potential exposure were evaluated, as well as the potential magnitude, duration, and/or frequency of contact. A source of uncertainty in estimating exposures is the assumption that all individuals within a particular receptor group will receive the same dose. Biological variability in absorption, ingestion rates, breathing rates, frequency, and duration will exist, even in a narrowly defined age group or sensitive population group.

The evaluated exposure pathways are considered to be the primary pathways of exposure. Minor or secondary pathways often cannot be estimated from available data and were eliminated from consideration in exposure calculations. The contribution of secondary models to the overall risk is not likely to be significant. It is expected that the pathways evaluated in this risk assessment consider the majority of the health risks from site chemicals.

6.5.2.2 EXPOSURE POINT CONCENTRATIONS

For several soil COPCs and for most groundwater COPCs, ~~a or~~ a low frequency of detection rendered the use of the statistically derived 95-percent UCL inapplicable and of the maximum detected chemical value as the appropriate estimator for the exposure point concentration. For seep water at Site 2, maximum detected chemical values were used for exposure point concentrations; the procedure for calculating an exposure point concentration tends to use the maximum detected concentration in cases of relatively few samples (only two seep water samples were collected). ~~-~~The assumption of long-term contact with the maximum concentration is conservative, and the use of maximum concentrations in the risk assessment results in overestimates of exposures and risks. However, there is some uncertainty whether risk assessments address the full magnitude of potential risks associated with results from a small sample population. Hence, this risk assessment intentionally used maximum concentrations in the estimation of risk for the seep~~-~~. Whether or not this actually represents an upper-bound estimate could only be determined by additional sampling and analyses.

Furthermore, in evaluating data, several assumptions were made that result in uncertainty in the risk estimate. For estimating means and 95-percent UCLs on the mean, one-half the detection limit was used for results reported as undetected. Hence, the exposure point concentrations for analytes characterized by a large number of nondetects are largely based on estimates rather than actual concentrations.~~-~~ J-qualified data were used quantitatively in the baseline human health risk assessment and "lose" the meaning of their qualifier (i.e., the value is estimated [U.S. EPA 1989a]). The majority of detects for

the organic chemicals are qualified as "J" -indicating uncertainty in the reported values. Therefore, the risk results presented for Site 2 should not be taken as a characterization of absolute risk.

The chemical concentrations were assumed to remain constant for the entire exposure duration. It is highly unlikely that organic chemical concentrations will remain constant, particularly in soil; contaminant mass is lost when organic chemicals degrade. Factors to correct for chemical mass lost by degradation, derived by first-order kinetics, were not used in the risk assessment. Correction factors range from greater than one to several orders of magnitude. The major risk drivers in soil for the recreational child, benzo(a)pyrene, dibenzo(a,h)anthracene, and MCPP are biodegradable. Under aerobic conditions, the half-lives of benzo(a)pyrene and dibenzo(a,h)anthracene in soil have been estimated to be 1.45 and 2.6 years, respectively, with 0.16 and 1 year possible under ideal conditions (Howard et al. 1991). The estimated half-life for MCPP is exceptionally short, ranging from 168 to 240 hours. Since these organic chemicals are characterized by relatively short half-lives, their contribution to the total risk is therefore overstated. Actual risks would reflect the degradable contaminant mass over the exposure period, not an infinite contaminant concentration, which is physically impossible.

6.5.3 Toxicity Assessment

Use of cancer slope factors and reference doses are subject to several types of uncertainties. Typically, the studies from which these values are derived involve conditions that are not identical to the types of exposures of interest involving chemicals in the environment. Extrapolations from animal experiments are frequently required to derive a toxicity value for use in risk assessments.

In addition, the actual mechanism of toxic action in laboratory animals of some chemicals may not be the same as in humans. For example, TCE is known to be metabolized to carcinogenic chemicals in the liver of laboratory animals, but such metabolites are not produced at the same rates in humans. Slope factors are calculated assuming that humans are equally sensitive to the carcinogenic effects of chemicals as laboratory animals. This represents a large source of uncertainty.

The information on animal responses to carcinogens is constantly changing. U.S. EPA revises its official list of carcinogens frequently. New chemicals are added to the U.S. EPA carcinogen database as new information becomes available. Sometimes new information also causes a chemical to be removed from the list. Often, chemicals appearing on the list are removed for further consideration.

The methods used to derive CSFs and RfDs are intended to be conservative in recognition of these types of uncertainties. For noncarcinogens, uncertainty factors are applied to either the no-observable-adverse-effect levels (NOAELs) or even the lowest-observable-adverse-effect levels (LOAEL) to obtain a RfD. For carcinogens, a slope factor at the estimated 95-percent UCL is used. Carcinogenic slope factors assume no threshold for effects; if there are thresholds for carcinogenicity, the slope factor could be altered considerably.

The overall quality of the toxicology database contains numerous uncertainties, including lack of consistency between different experimental studies; small numbers of studies; lack of available information on multiple species and multiple routes of administration; lack of a demonstration of a clear dose-response relationship; lack of plausible biological mechanisms of action; and lack of direct evidence of effects in humans.

For ingestion exposures, the availability of chemicals in the body is assumed to be the same as that in the studies from which toxicity factors were developed. Most toxicity parameter values are calculated to be used with administered doses rather than absorbed doses, but the values still reflect the bioavailability in the as-administered form. The risks are likely to be overestimated if bioavailability from media is less than from the form of administered doses in toxicological studies.

The recommended process for estimating dermal exposure is questionable. The ~~Human~~ skin is a semipermeable organ that minimizes the amount of chemical passing through ~~it~~. In the estimation of dermal dose, the inclusion of the dermal absorption factor accounts for that fact. The rate and extent of chemical absorption via the stomach and intestines are higher than via the skin. Depending upon the relative degree of exposure between the oral and the dermal route, ~~Therefore,~~ the dose and risk associated with ingested chemicals should be higher than those associated with contact of chemicals with the skin. However, in this risk assessment, the calculated dermal dose for organic compounds in soil was higher than the calculated ingested dose. This produced a higher dermal risk. This anomaly is due to two factors: –the soil-to-skin adherence factor and the dermal absorption factor, one or both of which may be too high.

Toxicity of each chemical was assumed to be additive. Interactions between chemicals, synergisms or antagonisms, were not accounted for due to the limited toxicity information on these types of interactions. Interactions could result in over- or underestimation of the risks.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
20	preliminary remediation goals (PRGs)	Section 2.5.1.1	EPA Region 9 PRGs. November 2004.

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG) ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES												CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C	skin abs. soils	CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
8.7E-03	i	4.0E-03	i	8.7E-03	r	4.0E-03	r		0.1	30560-19-1	Acephate	5.6E+01	ca**	2.0E+02	ca*	7.7E-01	ca*	7.7E+00	ca*		
				7.7E-03	i	2.6E-03	i	y		75-07-0	Acetaldehyde	1.1E+01	ca**	2.3E+01	ca**	8.7E-01	ca*	1.7E+00	ca		
		2.0E-02	i			2.0E-02	r		0.1	34256-82-1	Acetochlor	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		9.0E-01	i			9.0E-01	r	y		67-64-1	**Acetone**	1.4E+04	nc	5.4E+04	nc	3.3E+03	nc	5.5E+03	nc	1.6E+01	8.0E-01
		8.0E-04	h			8.0E-04	r		0.1	75-86-5	Acetone cyanohydrin	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
		1.7E-02	r			1.7E-02	i	y		75-05-8	Acetonitrile	4.2E+02	nc	1.8E+03	nc	6.2E+01	nc	1.0E+02	nc		
		5.0E-04	i			5.7E-06	i	y		107-02-8	**Acrolein**	1.0E-01	nc	3.4E-01	nc	2.1E-02	nc	4.2E-02	nc		
4.5E+00	i	2.0E-04	i	4.5E+00	i	2.0E-04	r		0.1	79-06-1	Acrylamide	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
		5.0E-01	i			2.9E-04	i		0.1	79-10-7	Acrylic acid	2.9E+04	nc	1.0E+05	max	1.0E+00	nc	1.8E+04	nc		
5.4E-01	i	1.0E-03	h	2.4E-01	i	5.7E-04	i	y		107-13-1	Acrylonitrile	2.1E-01	ca*	4.9E-01	ca*	2.8E-02	ca*	3.9E-02	ca*		
1.0E+00	r			1.0E+00	c			y			**"CAL-Modified PRG"**	5.5E-02	ca	1.2E-01	ca	6.7E-03	ca	1.1E-02	ca		
8.1E-02	h	1.0E-02	i	8.0E-02	r	1.0E-02	r		0.1	15972-60-8	Alachlor	6.0E+00	ca	2.1E+01	ca	8.4E-02	ca	8.4E-01	ca		
		1.5E-01	i			1.5E-01	r		0.1	1596-84-5	Alar	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		1.0E-03	i			1.0E-03	r		0.1	116-06-3	Aldicarb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	i			1.0E-03	r		0.1	1646-88-4	Aldicarb sulfone	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
1.7E+01	i	3.0E-05	i	1.7E+01	i	3.0E-05	r		0.1	309-00-2	Aldrin	2.9E-02	ca*	1.0E-01	ca	3.9E-04	ca	4.0E-03	ca	5.0E-01	2.0E-02
		2.5E-01	i			2.5E-01	r		0.1	74223-64-6	Ally	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		5.0E-03	i			5.0E-03	r		0.1	107-18-6	Allyl alcohol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.9E-04	r			2.9E-04	i		0.1	107-05-1	**Allyl chloride**	1.7E+01	nc	1.8E+02	nc	1.0E+00	nc	1.0E+01	nc		
		1.0E+00	p			1.4E-03	p			7429-90-5	Aluminum	7.6E+04	nc	1.0E+05	max	5.1E+00	nc	3.6E+04	nc		
		4.0E-04	i							20859-73-8	Aluminum phosphide	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc		
		3.0E-04	i			3.0E-04	r		0.1	67485-29-4	Amdro	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		9.0E-03	i			9.0E-03	r		0.1	834-12-8	Ametryn	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		2.0E-04	n			2.0E-04	r		0.1	1321-12-6	**Aminodinitrotoluene**	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
		7.0E-02	h			7.0E-02	r		0.1	591-27-5	m-Aminophenol	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-05	h			2.0E-05	r		0.1	504-24-5	4-Aminopyridine	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		2.5E-03	i			2.5E-03	r		0.1	33089-61-1	Amitraz	1.5E+02	nc	1.5E+03	nc	9.1E+00	nc	9.1E+01	nc		
						2.9E-02	i			7664-41-7	Ammonia					1.0E+02	nc				
		2.0E-01	i						0.1	7773-06-0	Ammonium sulfamate	1.2E+04	nc	1.0E+05	max			7.3E+03	nc		
5.7E-03	i	7.0E-03	p	5.7E-03	r	2.9E-04	i		0.1	62-53-3	Aniline	8.5E+01	ca**	3.0E+02	ca*	1.0E+00	nc	1.2E+01	ca*		
		4.0E-04	i							7440-36-0	Antimony and compounds	3.1E+01	nc	4.1E+02	nc			1.5E+01	nc	5.0E+00	3.0E-01
		1.3E-02	i			1.3E-02	r		0.1	74115-24-5	Apollo	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
2.5E-02	i	5.0E-02	h	2.5E-02	i	5.0E-02	r		0.1	140-57-8	Aramite	1.9E+01	ca	6.9E+01	ca	2.7E-01	ca	2.7E+00	ca		
1.5E+00	i	3.0E-04	i	1.5E+01	i				0.03	7440-38-2	Arsenic	3.9E-01	ca*	1.6E+00	ca	4.5E-04	ca	4.5E-02	ca	2.9E+01	1.0E+00

9.5E+00	c			1.2E+01	c			0.03		**"CAL-Modified PRG"**	6.2E-02	ca	2.5E-01	ca	5.6E-04	ca	7.1E-03	ca		
						1.4E-05	i		7784-42-1	Arsine (see arsenic for cancer endpoint)					5.2E-02	nc				
		9.0E-03	i			9.0E-03	r	0.1	76578-14-8	Assure	5.5E+02	nc	5.5E+03	nc	3.3E+01	nc	3.3E+02	nc		
		5.0E-02	i			5.0E-02	r	0.1	3337-71-1	Asulam	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
2.2E-01	h	3.5E-02	i	2.2E-01	r	3.5E-02	r	0.1	1912-24-9	Atrazine	2.2E+00	ca	7.8E+00	ca	3.1E-02	ca	3.0E-01	ca		
		4.0E-04	i			4.0E-04	r	0.1	71751-41-2	Avermectin B1	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.1E-01	i			1.1E-01	i			0.1	103-33-3	Azobenzene	4.4E+00	ca	1.6E+01	ca	6.2E-02	ca	6.1E-01	ca		
		7.0E-02	i			1.4E-04	h		7440-39-3	Barium and compounds	5.4E+03	nc	6.7E+04	nc	5.2E-01	nc	2.6E+03	nc	1.6E+03	8.2E+01
		4.0E-03	i			4.0E-03	r	0.1	114-26-1	Baygon	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		3.0E-02	i			3.0E-02	r	0.1	43121-43-3	Bayleton	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		2.5E-02	i			2.5E-02	r	0.1	68359-37-5	Baythroid	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-01	i			3.0E-01	r	0.1	1861-40-1	Benefin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		5.0E-02	i			5.0E-02	r	0.1	17804-35-2	Benomyl	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		3.0E-02	i			3.0E-02	r	0.1	25057-89-0	Bentazon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-01	i			1.0E-01	r	0.1	100-52-7	Benzaldehyde	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
5.5E-02	i	4.0E-03	i	2.7E-02	i	8.6E-03	i	y	71-43-2	**Benzene**	6.4E-01	ca*	1.4E+00	ca*	2.5E-01	ca	3.5E-01	ca	3.0E-02	2.0E-03
2.3E+02	i	3.0E-03	i	2.3E+02	i	3.0E-03	r	0.1	92-87-5	Benzidine	2.1E-03	ca	7.5E-03	ca	2.9E-05	ca	2.9E-04	ca		
		4.0E+00	i			4.0E+00	r	0.1	65-85-0	Benzoic acid	1.0E+05	max	1.0E+05	max	1.5E+04	nc	1.5E+05	nc	4.0E+02	2.0E+01
1.3E+01	i			1.3E+01	r			0.1	98-07-7	Benzotrichloride	3.7E-02	ca	1.3E-01	ca	5.2E-04	ca	5.2E-03	ca		
		3.0E-01	h			3.0E-01	r	0.1	100-51-6	Benzyl alcohol	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
1.7E-01	i	2.9E-03	r	1.7E-01	r	2.9E-03	n	y	100-44-7	Benzyl chloride	8.9E-01	ca*	2.2E+00	ca	4.0E-02	ca	6.6E-02	ca		
		2.0E-03	i	8.4E+00	i	5.7E-06	i		7440-41-7	Beryllium and compounds	1.5E+02	nc	1.9E+03	ca**	8.0E-04	ca*	7.3E+01	nc	6.3E+01	3.0E+00
		1.0E-04	i			1.0E-04	r	0.1	141-66-2	Bidrin	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		1.5E-02	i			1.5E-02	r	0.1	82657-04-3	Biphenthrin (Talstar)	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		5.0E-02	i			5.0E-02	r	y	92-52-4	**1,1-Biphenyl**	3.0E+03	nc	2.3E+04	nc	1.8E+02	nc	3.0E+02	nc		
1.1E+00	i			1.1E+00	i			y	111-44-4	Bis(2-chloroethyl)ether	2.2E-01	ca	5.8E-01	ca	6.1E-03	ca	1.0E-02	ca	4.0E-04	2.0E-05
7.0E-02	x	4.0E-02	i	3.5E-02	x	4.0E-02	r	y	108-60-1	Bis(2-chloroisopropyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
2.2E+02	i			2.2E+02	i			y	542-88-1	Bis(chloromethyl)ether	1.9E-04	ca	4.3E-04	ca	3.1E-05	ca	5.2E-05	ca		
7.0E-02	x	4.0E-02	i	3.5E-02	x	4.0E-02	r	y	108-60-1	Bis(2-chloro-1-methylethyl)ether	2.9E+00	ca	7.4E+00	ca	1.9E-01	ca	2.7E-01	ca		
1.4E-02	i	2.0E-02	i	1.4E-02	r	2.0E-02	r	0.1	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.5E+01	ca*	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.0E-02	i			5.0E-02	r	0.1	80-05-7	Bisphenol A	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.00E-01	i			5.7E-03	h		7440-42-8	Boron	1.6E+04	nc	1.0E+05	max	2.1E+01	nc	7.3E+03	nc		
						2.0E-04	h		7637-07-2	Boron trifluoride					7.3E-01	nc				
7.0E-01	i	4.0E-03	i	7.0E-01	r	4.0E-03	r	0.1	15541-45-4	**Bromate**	6.9E-01	ca	2.5E+00	ca	9.6E-03	ca	9.6E-02	ca		
		2.0E-02	p			2.9E-03	p	y	108-86-1	Bromobenzene	2.8E+01	nc	9.2E+01	nc	1.0E+01	nc	2.0E+01	nc		
6.2E-02	i	2.0E-02	i	6.2E-02	r	2.0E-02	r	y	75-27-4	Bromodichloromethane	8.2E-01	ca	1.8E+00	ca	1.1E-01	ca	1.8E-01	ca	6.0E-01	3.0E-02
7.9E-03	i	2.0E-02	i	3.9E-03	i	2.0E-02	r	0.1	75-25-2	Bromoform (tribromomethane)	6.2E+01	ca*	2.2E+02	ca*	1.7E+00	ca*	8.5E+00	ca*	8.0E-01	4.0E-02
		1.4E-03	i			1.4E-03	i	y	74-83-9	Bromomethane (Methyl bromide)	3.9E+00	nc	1.3E+01	nc	5.2E+00	nc	8.7E+00	nc	2.0E-01	1.0E-02
		5.0E-03	h			5.0E-03	r	0.1	2104-96-3	Bromophos	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	i			2.0E-02	r	0.1	1689-84-5	Bromoxynil	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	i			2.0E-02	r	0.1	1689-99-2	Bromoxynil octanoate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
1.1E-01	r	5.7E-04	r	1.1E-01	i	5.7E-04	i	y	106-99-0	**1,3-Butadiene**	5.8E-02	ca*	1.2E-01	ca*	6.1E-02	ca*	1.0E-01	ca*		

6.0E-01	r	5.7E-03	r	6.0E-01	c	5.7E-03	c	y		106-99-0	**"CAL-Modified PRG"**	1.1E-02	ca	2.3E-02	ca	1.1E-02	ca	1.9E-02	ca		
		1.0E-01	i			2.6E-03	n		0.1	71-36-3	1-Butanol	6.1E+03	nc	6.1E+04	nc	9.5E+00	nc	3.6E+03	nc	1.7E+01	9.0E-01
		5.0E-02	i			5.0E-02	r		0.1	2008-41-5	Butylate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-02	n			4.0E-02	r	y		104-51-8	n-Butylbenzene	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.0E-02	n			4.0E-02	r	y		135-9-88	sec-Butylbenzene	2.2E+02	sat	2.2E+02	sat	1.5E+02	nc	2.4E+02	nc		
		4.0E-02	n			4.0E-02	r	y		98-06-6	tert-Butylbenzene	3.9E+02	sat	3.9E+02	sat	1.5E+02	nc	2.4E+02	nc		
		2.0E-01	i			2.0E-01	r		0.1	85-68-7	Butyl benzyl phthalate	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc	9.3E+02	8.1E+02
		1.0E+00	i			1.0E+00	r		0.1	85-70-1	Butylphthalyl butylglycolate	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		
		5.0E-04	i	6.3E+00	i				0.001	7440-43-9	Cadmium and compounds	3.7E+01	nc	4.5E+02	nc	1.1E-03	ca	1.8E+01	nc	8.0E+00	4.0E-01
		5.0E-01	i			5.0E-01	r		0.1	105-60-2	Caprolactam	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
8.6E-03	h	2.0E-03	i	8.6E-03	r	2.0E-03	r		0.1	2425-06-1	Captafol	5.7E+01	ca**	2.0E+02	ca**	7.8E-01	ca**	7.8E+00	ca**		
3.5E-03	h	1.3E-01	i	3.5E-03	r	1.3E-01	r		0.1	133-06-2	Captan	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
		1.0E-01	i			1.1E-01	r		0.1	63-25-2	Carbaryl	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
2.0E-02	h			2.0E-02	r				0.1	86-74-8	Carbazole	2.4E+01	ca	8.6E+01	ca	3.4E-01	ca	3.4E+00	ca	6.0E-01	3.0E-02
		5.0E-03	i			5.0E-03	r		0.1	1563-66-2	Carbofuran	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		1.0E-01	i			2.0E-01	i	y		75-15-0	Carbon disulfide	3.6E+02	nc	7.2E+02	sat	7.3E+02	nc	1.0E+03	nc	3.2E+01	2.0E+00
1.3E-01	i	7.0E-04	i	5.3E-02	i	7.0E-04	r	y		56-23-5	Carbon tetrachloride	2.5E-01	ca**	5.5E-01	ca*	1.3E-01	ca*	1.7E-01	ca*	7.0E-02	3.0E-03
		1.0E-02	i			1.0E-02	r		0.1	55285-14-8	Carbosulfan	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		1.0E-01	i			1.0E-01	r		0.1	5234-68-4	Carboxin	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		1.5E-02	i			1.5E-02	r		0.1	133-90-4	Chloramben	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
4.0E-01	h			4.0E-01	r				0.1	118-75-2	Chloranil	1.2E+00	ca	4.3E+00	ca	1.7E-02	ca	1.7E-01	ca		
3.5E-01	i	5.0E-04	i	3.5E-01	i	2.0E-04	i		0.04	12789-03-6	Chlordane (technical)	1.6E+00	ca*	6.5E+00	ca*	1.9E-02	ca*	1.9E-01	ca*	1.0E+01	5.0E-01
		2.0E-02	i			2.0E-02	r		0.1	90982-32-4	Chlorimuron-ethyl	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			5.7E-05	n			7782-50-5	Chlorine					2.1E-01	nc				
		3.0E-02	i			5.7E-05	i			10049-04-4	Chlorine dioxide					2.1E-01	nc				
		2.0E-03	h			2.0E-03	r		0.1	79-11-8	Chloroacetic acid	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.6E-06	r			8.6E-06	i	y		532-27-4	2-Chloroacetophenone	3.3E-02	nc	1.1E-01	nc	3.1E-02	nc	5.2E-02	nc		
		4.0E-03	i			4.0E-03	r		0.1	106-47-8	4-Chloroaniline	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc	7.0E-01	3.0E-02
		2.0E-02	i			1.7E-02	n	y		108-90-7	Chlorobenzene	1.5E+02	nc	5.3E+02	nc	6.2E+01	nc	1.1E+02	nc	1.0E+00	7.0E-02
2.7E-01	h	2.0E-02	i	2.7E-01	h	2.0E-02	r		0.1	510-15-6	Chlorobenzilate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-01	h			2.0E-01	r		0.1	74-11-3	p-Chlorobenzoic acid	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	h			2.0E-02	r		0.1	98-56-6	4-Chlorobenzotrifluoride	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	h			2.0E-03	h	y		126-99-8	2-Chloro-1,3-butadiene	3.6E+00	nc	1.2E+01	nc	7.3E+00	nc	1.4E+01	nc		
		4.0E-01	h			4.0E-01	r	y		109-69-3	1-Chlorobutane	4.8E+02	sat	4.8E+02	sat	1.5E+03	nc	2.4E+03	nc		
		1.4E+01	r			1.4E+01	i	y		75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	3.4E+02	sat	3.4E+02	sat	5.2E+04	nc	8.7E+04	nc		
		1.4E+01	r			1.4E+01	i	y		75-45-6	Chlorodifluoromethane	3.4E+02	sat	3.4E+02	sat	5.1E+04	nc	8.5E+04	nc		
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	i	y		75-00-3	Chloroethane	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		1.0E-02	i	8.1E-02	i	1.4E-02	n	y		67-66-3	**Chloroform**	2.2E-01	ca	4.7E-01	ca	8.3E-02	ca	1.7E-01	ca	6.0E-01	3.0E-02
3.1E-02	c			1.9E-02	c			y			"CAL-Modified PRG"	9.4E-01	ca	2.0E+00	ca	3.5E-01	ca	5.3E-01	ca		
		2.6E-02	r			2.6E-02	i	y		74-87-3	**Chloromethane (methyl chloride)**	4.7E+01	nc	1.6E+02	nc	9.5E+01	nc	1.6E+02	nc		
5.8E-01	h			5.8E-01	r				0.1	95-69-2	4-Chloro-2-methylaniline	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca		
4.6E-01	h			4.6E-01	r				0.1	3165-93-3	4-Chloro-2-methylaniline hydrochloride	1.1E+00	ca	3.7E+00	ca	1.5E-02	ca	1.5E-01	ca		

		8.0E-02	i			8.0E-02	r	y		91-58-7	beta-Chloronaphthalene	4.9E+03	nc	2.3E+04	nc	2.9E+02	nc	4.9E+02	nc				
9.7E-03	p	1.0E-03	p	9.7E-03	r	2.0E-05	p	y		88-73-3	o-Chloronitrobenzene	1.4E+00	nc**	4.5E+00	nc**	7.3E-02	nc**	1.5E-01	nc**				
6.7E-03	p	1.0E-03	p	6.7E-03	r	1.7E-04	p	y		100-00-5	p-Chloronitrobenzene	1.0E+01	nc**	3.7E+01	nc**	6.2E-01	nc**	1.2E+00	nc**				
		5.0E-03	i			5.0E-03	r	y		95-57-8	2-Chlorophenol	6.3E+01	nc	2.4E+02	nc	1.8E+01	nc	3.0E+01	nc	4.0E+00	2.0E-01		
		2.9E-02	r			2.9E-02	h	y		75-29-6	2-Chloropropane	1.7E+02	nc	5.9E+02	nc	1.0E+02	nc	1.7E+02	nc				
1.1E-02	h	1.5E-02	i	1.1E-02	r	1.5E-02	r		0.1	1897-45-6	Chlorothalonil	4.4E+01	ca*	1.6E+02	ca*	6.1E-01	ca*	6.1E+00	ca*				
		2.0E-02	i			2.0E-02	r	y		95-49-8	o-Chlorotoluene	1.6E+02	nc	5.6E+02	nc	7.3E+01	nc	1.2E+02	nc				
		2.0E-01	i			2.0E-01	r		0.1	101-21-3	Chlorpropham	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc				
		3.0E-03	i			3.0E-03	r		0.1	2921-88-2	Chlorpyrifos	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc				
		1.0E-02	h			1.0E-02	r		0.1	5598-13-0	Chlorpyrifos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc				
		5.0E-02	i			5.0E-02	r		0.1	64902-72-3	Chlorsulfuron	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc				
		8.0E-04	h			8.0E-04	r		0.1	60238-56-4	Chlorthiophos	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc				
				4.2E+01	i						Total Chromium (1:6 ratio Cr VI:Cr III)+++	2.1E+02	ca	4.5E+02	ca	1.6E-04	ca			3.8E+01	2.0E+00		
		1.5E+00	i							16065-83-1	Chromium III	1.0E+05	max	1.0E+05	max			5.5E+04	nc				
		3.0E-03	i	2.9E+02	i	2.2E-06	i			18540-29-9	Chromium VI+++	3.0E+01	ca**	6.4E+01	ca	2.3E-05	ca	1.1E+02	nc	3.8E+01	2.0E+00		
		2.0E-02	p	9.8E+00	p	5.7E-06	p			7440-48-4	Cobalt	9.0E+02	ca**	1.9E+03	ca*	6.9E-04	ca*	7.3E+02	nc				
				2.2E+00	i					8007-45-2	Coke Oven Emissions					3.1E-03	ca						
		4.0E-02	h							7440-50-8	Copper and compounds	3.1E+03	nc	4.1E+04	nc			1.5E+03	nc				
1.9E+00	h			1.9E+00	r			y		123-73-9	Crotonaldehyde	5.3E-03	ca	1.1E-02	ca	3.5E-03	ca	5.9E-03	ca				
		1.0E-01	i			1.1E-01	i	y		98-82-8	Cumene (isopropylbenzene)	5.7E+02	nc	2.0E+03	nc	4.0E+02	nc	6.6E+02	nc				
8.4E-01	h	2.0E-03	h	8.4E-01	r	2.0E-03	r		0.1	21725-46-2	Cyanazine	5.8E-01	ca	2.1E+00	ca	8.0E-03	ca	8.0E-02	ca				
		2.0E-02	i						0.1	57-12-5	Cyanide (free)	1.2E+03	nc	1.2E+04	nc			7.3E+02	nc				
		2.0E-02	i			8.6E-04	i	y		74-90-8	Cyanide (hydrogen)	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc				
		4.0E-02	i			4.0E-02	r	y		460-19-5	Cyanogen	1.3E+02	nc	4.3E+02	nc	1.5E+02	nc	2.4E+02	nc				
		9.0E-02	i			9.0E-02	r	y		506-68-3	Cyanogen bromide	2.9E+02	nc	9.7E+02	nc	3.3E+02	nc	5.5E+02	nc				
		5.0E-02	i			5.0E-02	r	y		506-77-4	Cyanogen chloride	1.6E+02	nc	5.4E+02	nc	1.8E+02	nc	3.0E+02	nc				
		1.7E+00	r			1.7E+00	i	y		110-82-7	**Cyclohexane**	1.4E+02	sat	1.4E+02	sat	6.2E+03	nc	1.0E+04	nc				
		5.0E+00	i			5.0E+00	r		0.1	108-94-1	Cyclohexanone	1.0E+05	max	1.0E+05	max	1.8E+04	nc	1.8E+05	nc				
		2.0E-01	i			2.0E-01	r		0.1	108-91-8	Cyclohexylamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc				
		5.0E-03	i			5.0E-03	r		0.1	68085-85-8	Cyhalothrin/Karate	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc				
		1.0E-02	i			1.0E-02	r		0.1	52315-07-8	Cypermethrin	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc				
		7.5E-03	i			7.5E-03	r		0.1	66215-27-8	Cyromazine	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc				
		1.0E-02	i			1.0E-02	r		0.1	1861-32-1	Dacthal	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc				
		3.0E-02	i			3.0E-02	r		0.1	75-99-0	Dalapon	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc				
		2.5E-02	i			2.5E-02	r		0.1	39515-41-8	Danitol	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc				
2.4E-01	i			2.4E-01	r				0.03	72-54-8	DDD	2.4E+00	ca	1.0E+01	ca	2.8E-02	ca	2.8E-01	ca	1.6E+01	8.0E-01		
3.4E-01	i			3.4E-01	r				0.03	72-55-9	DDE	1.7E+00	ca	7.0E+00	ca	2.0E-02	ca	2.0E-01	ca	5.4E+01	3.0E+00		
3.4E-01	i	5.0E-04	i	3.4E-01	i	5.0E-04	r		0.03	50-29-3	DDT	1.7E+00	ca*	7.0E+00	ca*	2.0E-02	ca*	2.0E-01	ca*	3.2E+01	2.0E+00		
		1.0E-02	i			1.0E-02	r		0.1	1163-19-5	Decabromodiphenyl ether	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc				
		4.0E-05	i			4.0E-05	r		0.1	8065-48-3	Demeton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc				
6.1E-02	h			6.1E-02	r				0.1	2303-16-4	Diallate	8.0E+00	ca	2.8E+01	ca	1.1E-01	ca	1.1E+00	ca				
		9.0E-04	h			9.0E-04	r		0.1	333-41-5	Diazinon	5.5E+01	nc	5.5E+02	nc	3.3E+00	nc	3.3E+01	nc				

		2.0E-03	n			2.0E-03	r	y		132-64-9	**Dibenzofuran**	1.5E+02	nc	1.6E+03	nc	7.3E+00	nc	1.2E+01	nc		
		1.0E-02	i			1.0E-02	r		0.1	106-37-6	1,4-Dibromobenzene	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
8.4E-02	i	2.0E-02	i	8.4E-02	r	2.0E-02	r	y		124-48-1	Dibromochloromethane	1.1E+00	ca	2.6E+00	ca	8.0E-02	ca	1.3E-01	ca	4.0E-01	2.0E-02
1.4E+00	h	5.7E-05	r	2.4E-03	x	5.7E-05	i	y		96-12-8	**1,2-Dibromo-3-chloropropane (DBCP)**	4.6E-01	ca**	2.0E+00	ca**	2.1E-01	nc	4.8E-02	ca**		
7.0E+00	c			7.0E+00	c			y		96-12-8	**"CAL-Modified PRG"**	3.0E-02	ca	7.6E-02	ca	9.6E-04	ca	1.6E-03	ca		
2.0E+00	i	9.0E-03	i	2.0E+00	i	2.6E-03	i	y		106-93-4	**1,2-Dibromoethane (EDB)**	3.2E-02	ca	7.3E-02	ca	3.4E-03	ca	5.6E-03	ca		
		1.0E-01	i			1.0E-01	r		0.1	84-74-2	Dibutyl phthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.3E+03	2.7E+02
		3.0E-02	i			3.0E-02	r		0.1	1918-00-9	Dicamba	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		9.0E-02	i			5.7E-02	h	y		95-50-1	**1,2-Dichlorobenzene**	6.0E+02	sat	6.0E+02	sat	2.1E+02	nc	3.7E+02	nc	1.7E+01	9.0E-01
		3.0E-02	n			3.0E-02	r	y		541-73-1	**1,3-Dichlorobenzene**	5.3E+02	nc	6.0E+02	sat	1.1E+02	nc	1.8E+02	nc		
2.4E-02	h	3.0E-02	n	2.2E-02	n	2.3E-01	i	y		106-46-7	1,4-Dichlorobenzene	3.4E+00	ca	7.9E+00	ca	3.1E-01	ca	5.0E-01	ca	2.0E+00	1.0E-01
4.5E-01	i			4.5E-01	r				0.1	91-94-1	3,3-Dichlorobenzidine	1.1E+00	ca	3.8E+00	ca	1.5E-02	ca	1.5E-01	ca	7.0E-03	3.0E-04
		3.0E-02	n			3.0E-02	r		0.1	90-98-2	4,4'-Dichlorobenzophenone	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
9.3E+00	r			9.3E+00	h			y		764-41-0	1,4-Dichloro-2-butene	7.9E-03	ca	1.8E-02	ca	7.2E-04	ca	1.2E-03	ca		
		2.0E-01	i			5.7E-02	h	y		75-71-8	Dichlorodifluoromethane	9.4E+01	nc	3.1E+02	nc	2.1E+02	nc	3.9E+02	nc		
		1.0E-01	h			1.4E-01	h	y		75-34-3	1,1-Dichloroethane	5.1E+02	nc	1.7E+03	nc	5.2E+02	nc	8.1E+02	nc	2.3E+01	1.0E+00
5.7E-03	c			5.7E-03	c			y			"CAL-Modified PRG"	2.8E+00	ca	6.0E+00	ca	1.2E+00	ca	2.0E+00	ca		
9.1E-02	i	2.0E-02	n	9.1E-02	i	1.4E-03	n	y		107-06-2	1,2-Dichloroethane (EDC)	2.8E-01	ca*	6.0E-01	ca*	7.4E-02	ca*	1.2E-01	ca*	2.0E-02	1.0E-03
		5.0E-02	i			5.7E-02	i	y		75-35-4	1,1-Dichloroethylene	1.2E+02	nc	4.1E+02	nc	2.1E+02	nc	3.4E+02	nc	6.0E-02	3.0E-03
		1.0E-02	p			1.0E-02	r	y		156-59-2	1,2-Dichloroethylene (cis)	4.3E+01	nc	1.5E+02	nc	3.7E+01	nc	6.1E+01	nc	4.0E-01	2.0E-02
		2.0E-02	i			2.0E-02	r	y		156-60-5	1,2-Dichloroethylene (trans)	6.9E+01	nc	2.3E+02	nc	7.3E+01	nc	1.2E+02	nc	7.0E-01	3.0E-02
		3.0E-03	i			3.0E-03	r		0.1	120-83-2	2,4-Dichlorophenol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc	1.0E+00	5.0E-02
		8.0E-03	i			8.0E-03	r		0.1	94-82-6	4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		1.0E-02	i			1.0E-02	r		0.05	94-75-7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.9E+02	nc	7.7E+03	nc	3.7E+01	nc	3.6E+02	nc		
6.8E-02	h	1.1E-03	r	6.8E-02	r	1.1E-03	i	y		78-87-5	1,2-Dichloropropane	3.4E-01	ca*	7.4E-01	ca*	9.9E-02	ca*	1.6E-01	ca*	3.0E-02	1.0E-03
		2.0E-02	p			2.0E-02	r	y		142-28-9	**1,3-Dichloropropane**	1.0E+02	nc	3.6E+02	nc	7.3E+01	nc	1.2E+02	nc		
1.0E-01	i	3.0E-02	i	1.4E-02	i	5.7E-03	i	y		542-75-6	1,3-Dichloropropene	7.8E-01	ca	1.8E+00	ca	4.8E-01	ca	4.0E-01	ca	4.0E-03	2.0E-04
		3.0E-03	i			3.0E-03	r		0.1	616-23-9	2,3-Dichloropropanol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
2.9E-01	i	5.0E-04	i	2.9E-01	r	1.4E-04	i		0.1	62-73-7	Dichlorvos	1.7E+00	ca*	5.9E+00	ca*	2.3E-02	ca*	2.3E-01	ca*		
4.4E-01	x			4.4E-01	r				0.1	115-32-2	Dicofol	1.1E+00	ca	3.9E+00	ca	1.5E-02	ca	1.5E-01	ca		
		3.0E-02	h			5.7E-05	x	y		77-73-6	Dicyclopentadiene	5.4E-01	nc	1.8E+00	nc	2.1E-01	nc	4.2E-01	nc		
1.6E+01	i	5.0E-05	i	1.6E+01	i	5.0E-05	r		0.1	60-57-1	Dieldrin	3.0E-02	ca	1.1E-01	ca	4.2E-04	ca	4.2E-03	ca	4.0E-03	2.0E-04
		1.0E-02	p			5.7E-03	p		0.1	112-34-5	Diethylene glycol, monobutyl ether	6.1E+02	nc	6.2E+03	nc	2.1E+01	nc	3.6E+02	nc		
		6.0E-02	p			8.6E-04	p		0.1	111-90-0	Diethylene glycol, monoethyl ether	3.7E+03	nc	3.7E+04	nc	3.1E+00	nc	2.2E+03	nc		
		4.0E-04	p			4.0E-04	r		0.1	617-84-5	Diethylformamide	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.2E-03	i	6.0E-01	i	1.2E-03	r	6.0E-01	r		0.1	103-23-1	Di(2-ethylhexyl)adipate	4.1E+02	ca	1.4E+03	ca	5.6E+00	ca	5.6E+01	ca		
		8.0E-01	i			8.0E-01	r		0.1	84-66-2	Diethyl phthalate	4.9E+04	nc	1.0E+05	max	2.9E+03	nc	2.9E+04	nc		
4.7E+03	h			4.7E+03	r				0.1	56-53-1	Diethylstilbestrol	1.0E-04	ca	3.7E-04	ca	1.4E-06	ca	1.4E-05	ca		
		8.0E-02	i			8.0E-02	r		0.1	43222-48-6	Difenzoquat (Avenge)	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r		0.1	35367-38-5	Diflubenzuron	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.1E+01	r			1.1E+01	i	y		75-37-6	1,1-Difluoroethane					4.2E+04	nc	6.9E+04	nc		
		2.0E-02	n			2.0E-02	r		0.1	28553-12-0	Diisononyl phthalate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		

				1.1E-01	p		108-20-3	**Diisopropyl ether**					4.0E+02	nc					
	8.0E-02	i		8.0E-02	r	0.1	1445-75-6	Diisopropyl methylphosphonate	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc			
	2.0E-02	i		2.0E-02	r	0.1	55290-64-7	Dimethipin	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc			
	2.0E-04	i		2.0E-04	r	0.1	60-51-5	Dimethoate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc			
1.4E-02	h		1.4E-02	r		0.1	119-90-4	3,3'-Dimethoxybenzidine	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca			
	5.7E-06	r		5.7E-06	x y		124-40-3	Dimethylamine	6.7E-02	nc	2.5E-01	nc	2.1E-02	nc	3.5E-02	nc			
	2.0E-03	i		2.0E-03	r	0.1	121-69-7	N-N-Dimethylaniline	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc			
7.5E-01	h		7.5E-01	r		0.1	95-68-1	2,4-Dimethylaniline	6.5E-01	ca	2.3E+00	ca	9.0E-03	ca	9.0E-02	ca			
5.8E-01	h		5.8E-01	r		0.1	21436-96-4	2,4-Dimethylaniline hydrochloride	8.4E-01	ca	3.0E+00	ca	1.2E-02	ca	1.2E-01	ca			
2.3E+00	p		2.3E+00	r		0.1	119-93-7	**3,3'-Dimethylbenzidine**	2.1E-01	ca	7.5E-01	ca	2.9E-03	ca	2.9E-02	ca			
2.6E+00	x		3.5E+00	x		0.1	57-14-7	1,1-Dimethylhydrazine	1.9E-01	ca	6.6E-01	ca	1.9E-03	ca	2.6E-02	ca			
3.7E+01	x		3.7E+01	x		0.1	540-73-8	1,2-Dimethylhydrazine	1.3E-02	ca	4.7E-02	ca	1.8E-04	ca	1.8E-03	ca			
	1.0E-01	h		8.6E-03	i	0.1	68-12-2	N,N-Dimethylformamide	6.1E+03	nc	6.2E+04	nc	3.1E+01	nc	3.6E+03	nc			
	1.0E-03	n		1.0E-03	r	0.1	122-09-8	Dimethylphenethylamine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc			
	2.0E-02	i		2.0E-02	r	0.1	105-67-9	2,4-Dimethylphenol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc	9.0E+00	4.0E-01	
	6.0E-04	i		6.0E-04	r	0.1	576-26-1	2,6-Dimethylphenol	3.7E+01	nc	3.7E+02	nc	2.2E+00	nc	2.2E+01	nc			
	1.0E-03	i		1.0E-03	r	0.1	95-65-8	3,4-Dimethylphenol	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc			
	1.0E+01	h		1.0E+01	r	0.1	131-11-3	Dimethyl phthalate	1.0E+05	max	1.0E+05	max	3.7E+04	nc	3.6E+05	nc			
	1.0E-01	i		1.0E-01	r	0.1	120-61-6	Dimethyl terephthalate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc			
	1.0E-04	p		1.0E-04	r	0.1	534-52-1	**4,6-Dinitro-o-cresol**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc			
	2.0E-03	i		2.0E-03	r	0.1	131-89-5	4,6-Dinitro-o-cyclohexyl phenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc			
	1.0E-04	p		1.0E-04	r	0.1	528-29-0	1,2-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc			
	1.0E-04	i		1.0E-04	r	0.1	99-65-0	1,3-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc			
	1.0E-04	p		1.0E-04	r	0.1	100-25-4	1,4-Dinitrobenzene	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc			
	2.0E-03	i		2.0E-03	r	0.1	51-28-5	2,4-Dinitrophenol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	3.0E-01	1.0E-02	
6.8E-01	i		6.8E-01	r		0.1	25321-14-6	Dinitrotoluene mixture	7.2E-01	ca	2.5E+00	ca	9.9E-03	ca	9.9E-02	ca	8.0E-04	4.0E-05	
	2.0E-03	i		2.0E-03	r	0.1	121-14-2	2,4-Dinitrotoluene (also see Dinitrotoluene mixture)	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc	8.0E-04	4.0E-05	
	1.0E-03	h		1.0E-03	r	0.1	606-20-2	2,6-Dinitrotoluene (also see Dinitrotoluene mixture)	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc	7.0E-04	3.0E-05	
	1.0E-03	i		1.0E-03	r	0.1	88-85-7	Dinoseb	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc			
	4.0E-02	p		4.0E-02	r	0.1	117-84-0	di-n-Octyl phthalate	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc	1.0E+04	1.0E+04	
1.1E-02	i		1.1E-02	r		0.1	123-91-1	1,4-Dioxane	4.4E+01	ca	1.6E+02	ca	6.1E-01	ca	6.1E+00	ca			
1.5E+05	h		1.5E+05	h		0.03	1746-01-6	Dioxin (2,3,7,8-TCDD)+++	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca			
	3.0E-02	i		3.0E-02	r	0.1	957-51-7	Diphenamid	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc			
	2.5E-02	i		2.5E-02	r	0.1	122-39-4	Diphenylamine	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc			
	3.0E-04	p		3.0E-04	r	0.1	74-31-7	N,N-Diphenyl-1,4 benzenediamine (DPPD)	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc			
8.0E-01	i		8.0E-01	i		0.1	122-66-7	1,2-Diphenylhydrazine	6.1E-01	ca	2.2E+00	ca	8.4E-03	ca	8.4E-02	ca			
	3.0E-03	p		3.0E-03	r	0.1	127-63-9	Diphenyl sulfone	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc			
	2.2E-03	i		2.2E-03	r	0.1	85-00-7	Diquat	1.3E+02	nc	1.4E+03	nc	8.0E+00	nc	8.0E+01	nc			
8.6E+00	h		8.6E+00	r		0.1	1937-37-7	Direct black 38	5.7E-02	ca	2.0E-01	ca	7.8E-04	ca	7.8E-03	ca			
8.1E+00	h		8.1E+00	r		0.1	2602-46-2	Direct blue 6	6.0E-02	ca	2.1E-01	ca	8.3E-04	ca	8.3E-03	ca			
9.3E+00	h		9.3E+00	r		0.1	16071-86-6	Direct brown 95	5.2E-02	ca	1.9E-01	ca	7.2E-04	ca	7.2E-03	ca			
	4.0E-05	i		4.0E-05	r	0.1	298-04-4	Disulfoton	2.4E+00	nc	2.5E+01	nc	1.5E-01	nc	1.5E+00	nc			

		1.0E-02	i			1.0E-02	r		0.1	505-29-3	1,4-Dithiane	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		2.0E-03	i			2.0E-03	r		0.1	330-54-1	Diuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		4.0E-03	i			4.0E-03	r		0.1	2439-10-3	Dodine	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		1.0E-01	n							7429-91-6	Dysprosium	7.8E+03	nc	1.0E+05	max			3.6E+03	nc		
		6.0E-03	i			6.0E-03	r		0.1	115-29-7	Endosulfan	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc	1.8E+01	9.0E-01
		2.0E-02	i			2.0E-02	r		0.1	145-73-3	Endothall	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	i			3.0E-04	r		0.1	72-20-8	Endrin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc	1.0E+00	5.0E-02
9.9E-03	i	2.0E-03	h	4.2E-03	h	2.9E-04	i	y		106-89-8	Epichlorohydrin	7.6E+00	nc	2.6E+01	nc	1.0E+00	nc	2.0E+00	nc		
8.00E-02	r			8.00E-02	c			y			**"CAL-Modified PRG"**	1.3E+00	nc	2.9E+00	nc	8.4E-02	nc	1.4E-01	nc		
		5.7E-03	r			5.7E-03	i		0.1	106-88-7	1,2-Epoxybutane	3.5E+02	nc	3.5E+03	nc	2.1E+01	nc	2.1E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	759-94-4	EPTC (S-Ethyl dipropylthiocarbamate)	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	16672-87-0	Ethephon (2-chloroethyl phosphonic acid)	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		5.0E-04	i			5.0E-04	r		0.1	563-12-2	Ethion	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		4.0E-01	h			5.7E-02	i		0.1	110-80-5	2-Ethoxyethanol	2.4E+04	nc	1.0E+05	max	2.1E+02	nc	1.5E+04	nc		
		3.0E-01	h			3.0E-01	r		0.1	111-15-9	2-Ethoxyethanol acetate	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		9.0E-01	i			9.0E-01	r	y		141-78-6	Ethyl acetate	1.9E+04	nc	3.7E+04	sat	3.3E+03	nc	5.5E+03	nc		
4.8E-02	h			4.8E-02	r			y		140-88-5	Ethyl acrylate	2.1E-01	ca	4.5E-01	ca	1.4E-01	ca	2.3E-01	ca		
		1.0E-01	i			2.9E-01	i	y		100-41-4	**Ethylbenzene**	4.0E+02	sat	4.0E+02	sat	1.1E+03	nc	1.3E+03	nc	1.3E+01	7.0E-01
2.9E-03	n	4.0E-01	n	2.9E-03	r	2.9E+00	i	y		75-00-3	Ethyl chloride	3.0E+00	ca	6.5E+00	ca	2.3E+00	ca	4.6E+00	ca		
		3.0E-01	h			3.0E-01	r		0.1	109-78-4	Ethylene cyanohydrin	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc		
		9.0E-02	p			9.0E-02	r		0.1	107-15-3	**Ethylene diamine**	5.5E+03	nc	5.5E+04	nc	3.3E+02	nc	3.3E+03	nc		
		2.0E+00	i			2.0E+00	r		0.1	107-21-1	Ethylene glycol	1.0E+05	max	1.0E+05	max	7.3E+03	nc	7.3E+04	nc		
		5.0E-01	i			3.7E+00	i		0.1	111-76-2	Ethylene glycol, monobutyl ether	3.1E+04	nc	1.0E+05	max	1.4E+04	nc	1.8E+04	nc		
1.0E+00	h			3.5E-01	h			y		75-21-8	Ethylene oxide	1.4E-01	ca	3.4E-01	ca	1.9E-02	ca	2.4E-02	ca		
1.1E-01	h	8.0E-05	i	1.1E-01	r	8.0E-05	r		0.1	96-45-7	Ethylene thiourea (ETU)	4.4E+00	ca**	1.6E+01	ca**	6.1E-02	ca**	6.1E-01	ca**		
		2.0E-01	i			2.0E-01	r	y		60-29-7	Ethyl ether	1.8E+03	sat	1.8E+03	sat	7.3E+02	nc	1.2E+03	nc		
		9.0E-02	h			9.0E-02	r	y		97-63-2	Ethyl methacrylate	1.4E+02	sat	1.4E+02	sat	3.3E+02	nc	5.5E+02	nc		
		1.0E-05	i			1.0E-05	r		0.1	2104-64-5	Ethyl p-nitrophenyl phenylphosphorothioate	6.1E-01	nc	6.2E+00	nc	3.7E-02	nc	3.6E-01	nc		
		3.0E+00	i			3.0E+00	r		0.1	84-72-0	Ethylphthalyl ethyl glycolate	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		8.0E-03	i			8.0E-03	r		0.1	101200-48-0	Express	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		2.5E-04	i			2.5E-04	r		0.1	22224-92-6	Fenamiphos	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		1.3E-02	i			1.3E-02	r		0.1	2164-17-2	Fluometuron	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		6.0E-02	i						0.1	16984-48-8	Flourine (soluble flouride)	3.7E+03	nc	3.7E+04	nc			2.2E+03	nc		
		8.0E-02	i			8.0E-02	r		0.1	59756-60-4	Fluoridone	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r		0.1	56425-91-3	Flurprimidol	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-02	i			6.0E-02	r		0.1	66332-96-5	Flutolanil	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-02	i			1.0E-02	r		0.1	69409-94-5	Fluvalinate	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3.5E-03	i	1.0E-01	i	3.5E-03	r	1.0E-01	r		0.1	133-07-3	Folpet	1.4E+02	ca*	4.9E+02	ca	1.9E+00	ca	1.9E+01	ca		
1.9E-01	i			1.9E-01	r				0.1	72178-02-0	Fomesafen	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
		2.0E-03	i			2.0E-03	r		0.1	944-22-9	Fonofos	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.5E-01	i	4.6E-02	i				0.1	50-00-0	Formaldehyde	9.2E+03	nc	1.0E+05	nc	1.5E-01	ca	5.5E+03	nc		
		2.0E+00	h			8.6E-04	p		0.1	64-18-6	**Formic Acid**	1.0E+05	max	1.0E+05	max	3.1E+00	nc	7.3E+04	nc		

		3.0E+00	i			3.0E+00	r		0.1	39148-24-8	Fosetyl-al	1.0E+05	max	1.0E+05	max	1.1E+04	nc	1.1E+05	nc		
		3.0E+01	i			8.6E+00	h	y		76-13-1	Freon 113	5.6E+03	sat	5.6E+03	sat	3.1E+04	nc	5.9E+04	nc		
		1.0E-03	i			1.0E-03	r	y		110-00-9	Furan	2.5E+00	nc	8.5E+00	nc	3.7E+00	nc	6.1E+00	nc		
3.8E+00	h			3.8E+00	r				0.1	67-45-8	Furazolidone	1.3E-01	ca	4.5E-01	ca	1.8E-03	ca	1.8E-02	ca		
		3.0E-03	i			1.4E-02	h		0.1	98-01-1	Furfural	1.8E+02	nc	1.8E+03	nc	5.2E+01	nc	1.1E+02	nc		
5.0E+01	h			5.0E+01	r				0.1	531-82-8	Furium	9.7E-03	ca	3.4E-02	ca	1.3E-04	ca	1.3E-03	ca		
3.0E-02	i			3.0E-02	r				0.1	60568-05-0	Furmecyclox	1.6E+01	ca	5.7E+01	ca	2.2E-01	ca	2.2E+00	ca		
		4.0E-04	i			4.0E-04	r		0.1	77182-82-2	Glufosinate-ammonium	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
		4.0E-04	i			2.9E-04	h		0.1	765-34-4	Glycidaldehyde	2.4E+01	nc	2.5E+02	nc	1.0E+00	nc	1.5E+01	nc		
		1.0E-01	i			1.0E-01	r		0.1	1071-83-6	Glyphosate	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-05	i			5.0E-05	r		0.1	69806-40-2	Haloxyfop-methyl	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		1.3E-02	i			1.3E-02	r		0.1	79277-27-3	Harmony	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
4.5E+00	i	5.0E-04	i	4.6E+00	i	5.0E-04	r		0.1	76-44-8	Heptachlor	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca	2.3E+01	1.0E+00
9.1E+00	i	1.3E-05	i	9.1E+00	i	1.3E-05	r		0.1	1024-57-3	Heptachlor epoxide	5.3E-02	ca*	1.9E-01	ca*	7.4E-04	ca*	7.4E-03	ca*	7.0E-01	3.0E-02
		2.0E-03	i			2.0E-03	r		0.1	87-82-1	Hexabromobenzene	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
1.6E+00	i	8.0E-04	i	1.6E+00	i	8.0E-04	r		0.1	118-74-1	Hexachlorobenzene	3.0E-01	ca	1.1E+00	ca	4.2E-03	ca	4.2E-02	ca	2.0E+00	1.0E-01
7.8E-02	i	3.0E-04	n	7.8E-02	i	3.0E-04	r		0.1	87-68-3	Hexachlorobutadiene	6.2E+00	ca**	2.2E+01	ca**	8.6E-02	ca*	8.6E-01	ca*	2.0E+00	1.0E-01
6.3E+00	i	5.0E-04	n	6.3E+00	i	5.0E-04	r		0.04	319-84-6	HCH (alpha)	9.0E-02	ca	3.6E-01	ca	1.1E-03	ca	1.1E-02	ca	5.0E-04	3.0E-05
1.8E+00	i	2.0E-04	n	1.8E+00	i	2.0E-04	r		0.04	319-85-7	HCH (beta)	3.2E-01	ca	1.3E+00	ca	3.7E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
1.3E+00	h	3.0E-04	i	1.3E+00	r	3.0E-04	r		0.04	58-89-9	HCH (gamma) Lindane	4.4E-01	ca*	1.7E+00	ca	5.2E-03	ca	5.2E-02	ca	9.0E-03	5.0E-04
1.8E+00	i			1.8E+00	i				0.04	608-73-1	HCH-technical	3.2E-01	ca	1.3E+00	ca	3.8E-03	ca	3.7E-02	ca	3.0E-03	1.0E-04
		6.0E-03	i			5.7E-05	i		0.1	77-47-4	Hexachlorocyclopentadiene	3.7E+02	nc	3.7E+03	nc	2.1E-01	nc	2.2E+02	nc	4.0E+02	2.0E+01
1.4E-02	i	1.0E-03	i	1.4E-02	i	1.0E-03	r		0.1	67-72-1	Hexachloroethane	3.5E+01	ca**	1.2E+02	ca**	4.8E-01	ca**	4.8E+00	ca**	5.0E-01	2.0E-02
		3.0E-04	i			3.0E-04	r		0.1	70-30-4	Hexachlorophene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r		0.1	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		2.9E-06	r			2.9E-06	i		0.1	822-06-0	1,6-Hexamethylene diisocyanate	1.7E-01	nc	1.8E+00	nc	1.0E-02	nc	1.0E-01	nc		
		1.1E+01	p			5.7E-02	i	y		110-54-3	**n-Hexane**	1.1E+02	sat	1.1E+02	sat	2.1E+02	nc	4.2E+02	nc		
		3.3E-02	i			3.3E-02	r		0.1	51235-04-2	Hexazinone	2.0E+03	nc	2.0E+04	nc	1.2E+02	nc	1.2E+03	nc		
		5.0E-02	i			5.0E-02	r		0.1	2691-41-0	HMX	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
3.0E+00	i			1.7E+01	i				0.1	302-01-2	Hydrazine, hydrazine sulfate	1.6E-01	ca	5.7E-01	ca	3.9E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.1	60-34-4	Hydrazine, monomethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
3.0E+00	n			1.7E+01	n				0.1	57-14-7	Hydrazine, dimethyl	1.6E-01	ca	5.7E-01	ca	4.0E-04	ca	2.2E-02	ca		
						5.7E-03	i			7647-01-0	Hydrogen chloride					2.1E+01	nc				
		2.0E-02	i			8.6E-04	i	y		74-90-8	Hydrogen cyanide	1.1E+01	nc	3.5E+01	nc	3.1E+00	nc	6.2E+00	nc		
		3.0E-03	i			2.9E-04	i			7783-06-4	Hydrogen sulfide					1.0E+00	nc	1.1E+02	nc		
5.6E-02	p	4.0E-02	p	5.6E-02	r	4.0E-02	r		0.1	123-31-9	**p-Hydroquinone**	8.7E+00	ca	3.1E+01	ca	1.2E-01	ca	1.2E+00	ca		
		1.3E-02	i			1.3E-02	r		0.1	35554-44-0	Imazalil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-01	i			2.5E-01	r		0.1	81335-37-7	Imazaquin	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		4.0E-02	i			4.0E-02	r		0.1	36734-19-7	Iprodione	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		3.0E-01	n							7439-89-6	Iron	2.3E+04	nc	1.0E+05	max			1.1E+04	nc		
		3.0E-01	i			3.0E-01	r	y		78-83-1	Isobutanol	1.3E+04	nc	4.0E+04	sat	1.1E+03	nc	1.8E+03	nc		
9.5E-04	i	2.0E-01	i	9.5E-04	r	2.0E-01	r		0.1	78-59-1	Isophorone	5.1E+02	ca*	5.1E+02	ca*	7.1E+00	ca	7.1E+01	ca	5.0E-01	3.0E-02

		1.5E-02	i			1.5E-02	r		0.1	33820-53-0	Isopropalin	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		1.0E-01	i			1.1E-01	r		0.1	1832-54-8	Isopropyl methyl phosphonic acid	6.1E+03	nc	6.2E+04	nc	4.0E+02	nc	3.6E+03	nc		
		5.0E-02	i			5.0E-02	r		0.1	82558-50-7	Isoxaben	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
8.0E+00	p	2.0E-04	p	8.0E+00	r	2.0E-04	r		0.1	143-50-0	Kepone	6.1E-02	ca	2.2E-01	ca	8.4E-04	ca	8.4E-03	ca		
		2.0E-03	i			2.0E-03	r		0.1	77501-63-4	Lactofen	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
www.epa.gov/superfund/programs/lead/ieubk.htm										7439-92-1	**Lead+++**	4.0E+02	nc	8.0E+02	nc						
www.dtsc.ca.gov/ScienceTechnology/ledspred.html											"CAL-Modified PRG"+++	1.5E+02	nc								
		1.0E-07	i						0.1	78-00-2	Lead (tetraethyl)	6.1E-03	nc	6.2E-02	nc			3.6E-03	nc		
		2.0E-03	i			2.0E-03	r		0.1	330-55-2	Linuron	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	x							7439-93-2	Lithium	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc		
		2.0E-01	i			2.0E-01	r		0.1	83055-99-6	Londax	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
		2.0E-02	i			2.0E-02	r		0.1	121-75-5	Malathion	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.0E-01	i			1.0E-01	r		0.1	108-31-6	Maleic anhydride	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		5.0E-01	i			5.0E-01	r	y		123-33-1	Maleic hydrazide	1.7E+03	nc	2.4E+03	sat	1.8E+03	nc	3.0E+03	nc		
		1.0E-04	p			1.0E-04	r		0.1	109-77-3	**Malononitrile**	6.1E+00	nc	6.2E+01	nc	3.7E-01	nc	3.6E+00	nc		
		3.0E-02	h			3.0E-02	r		0.1	8018-01-7	Mancozeb	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
6.0E-02	o	5.0E-03	i	6.0E-02	r	5.0E-03	r		0.1	12427-38-2	Maneb	8.1E+00	ca*	2.9E+01	ca	1.1E-01	ca	1.1E+00	ca		
		2.4E-02	i			1.4E-05	i			7439-96-5	Manganese and compounds+++	1.8E+03	nc	1.9E+04	nc	5.1E-02	nc	8.8E+02	nc		
		9.0E-05	h			9.0E-05	r		0.1	950-10-7	Mephosfolan	5.5E+00	nc	5.5E+01	nc	3.3E-01	nc	3.3E+00	nc		
		3.0E-02	i			3.0E-02	r		0.1	24307-26-4	Mepiquat chloride	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
2.9E-02	n	1.0E-01	n	2.9E-02	r	1.0E-01	r		0.1	149-30-4	2-Mercaptobenzothiazole	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		3.0E-04	i							7487-94-7	Mercury and compounds	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
						8.6E-05	i			7439-97-6	Mercury (elemental)					3.1E-01	nc				
		1.0E-04	i						0.1	22967-92-6	Mercury (methyl)	6.1E+00	nc	6.2E+01	nc			3.6E+00	nc		
		3.0E-05	i			3.0E-05	r		0.1	150-50-5	Merphos	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		3.0E-05	i			3.0E-05	r		0.1	78-48-8	Merphos oxide	1.8E+00	nc	1.8E+01	nc	1.1E-01	nc	1.1E+00	nc		
		6.0E-02	i			6.0E-02	r		0.1	57837-19-1	Metalaxyl	3.7E+03	nc	3.7E+04	nc	2.2E+02	nc	2.2E+03	nc		
		1.0E-04	i			2.0E-04	h	y		126-98-7	Methacrylonitrile	2.1E+00	nc	8.4E+00	nc	7.3E-01	nc	1.0E+00	nc		
		5.0E-05	i			5.0E-05	r		0.1	10265-92-6	Methamidophos	3.1E+00	nc	3.1E+01	nc	1.8E-01	nc	1.8E+00	nc		
		5.0E-01	i			5.0E-01	r		0.1	67-56-1	Methanol	3.1E+04	nc	1.0E+05	max	1.8E+03	nc	1.8E+04	nc		
		1.0E-03	i			1.0E-03	r		0.1	950-37-8	Methidathion	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	i			2.5E-02	r	y		16752-77-5	Methomyl	4.4E+01	nc	1.5E+02	nc	9.1E+01	nc	1.5E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	72-43-5	Methoxychlor	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc	1.6E+02	8.0E+00
		1.0E-03	h			5.7E-03	i		0.1	109-86-4	2-Methoxyethanol	6.1E+01	nc	6.2E+02	nc	2.1E+01	nc	3.6E+01	nc		
		2.0E-03	h			2.0E-03	r		0.1	110-49-6	2-Methoxyethanol acetate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
4.6E-02	h			4.6E-02	r				0.1	99-59-2	2-Methoxy-5-nitroaniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E+00	h			1.0E+00	r	y		79-20-9	Methyl acetate	2.2E+04	nc	9.2E+04	nc	3.7E+03	nc	6.1E+03	nc		
		3.0E-02	h			3.0E-02	r	y		96-33-3	Methyl acrylate	7.0E+01	nc	2.3E+02	nc	1.1E+02	nc	1.8E+02	nc		
2.4E-01	h			2.4E-01	r				0.1	95-53-4	2-Methylaniline (o-toluidine)	2.0E+00	ca	7.2E+00	ca	2.8E-02	ca	2.8E-01	ca		
1.8E-01	h			1.8E-01	r				0.1	636-21-5	2-Methylaniline hydrochloride	2.7E+00	ca	9.6E+00	ca	3.7E-02	ca	3.7E-01	ca		
		5.0E-04	i			5.0E-04	r		0.1	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
		1.0E-02	i			1.0E-02	r		0.1	94-81-5	4-(2-Methyl-4-chlorophenoxy) butyric acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		

		1.0E-03	i			1.0E-03	r		0.1	93-65-2	2-(2-Methyl-4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		1.0E-03	i			1.0E-03	r		0.1	16484-77-8	2-(2-Methyl-1,4-chlorophenoxy) propionic acid	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		8.6E-01	r			8.6E-01	h	y		108-87-2	Methylcyclohexane	2.6E+03	nc	8.7E+03	nc	3.1E+03	nc	5.2E+03	nc		
2.5E-01	h			2.5E-01	r				0.1	101-77-9	4,4'-Methylenebisbenzeneamine	1.9E+00	ca	6.9E+00	ca	2.7E-02	ca	2.7E-01	ca		
1.3E-01	h	7.0E-04	h	1.3E-01	h	7.0E-04	r		0.1	101-14-4	4,4'-Methylene bis(2-chloroaniline)	3.7E+00	ca*	1.3E+01	ca*	5.2E-02	ca*	5.2E-01	ca*		
4.6E-02	i			4.6E-02	r				0.1	101-61-1	4,4'-Methylene bis(N,N'-dimethyl)aniline	1.1E+01	ca	3.7E+01	ca	1.5E-01	ca	1.5E+00	ca		
		1.0E-02	h			1.0E-02	r	y		74-95-3	Methylene bromide	6.7E+01	nc	2.3E+02	nc	3.7E+01	nc	6.1E+01	nc		
7.5E-03	i	6.0E-02	i	1.6E-03	i	8.6E-01	h	y		75-09-2	Methylene chloride	9.1E+00	ca	2.1E+01	ca	4.1E+00	ca	4.3E+00	ca	2.0E-02	1.0E-03
		1.7E-04	r			1.7E-04	i		0.1	101-68-8	4,4'-Methylene diphenyl diisocyanate	1.0E+01	nc	1.0E+02	nc	6.2E-01	nc	6.2E+00	nc		
		6.0E-01	i			1.4E+00	i	y		78-93-3	**Methyl ethyl ketone (2-Butanone)**	2.2E+04	nc	1.1E+05	nc	5.1E+03	nc	7.0E+03	nc		
		8.0E-02	h			8.6E-01	i	y		108-10-1	**Methyl isobutyl ketone**	5.3E+03	nc	4.7E+04	nc	3.1E+03	nc	2.0E+03	nc		
		5.7E-04	r			5.7E-04	n		0.1	74-93-1	Methyl Mercaptan	3.5E+01	nc	3.5E+02	nc	2.1E+00	nc	2.1E+01	nc		
		1.4E+00	i			2.0E-01	i	y		80-62-6	Methyl methacrylate	2.2E+03	nc	2.7E+03	sat	7.3E+02	nc	1.4E+03	nc		
3.3E-02	h			3.3E-02	r				0.1	99-55-8	2-Methyl-5-nitroaniline	1.5E+01	ca	5.2E+01	ca	2.0E-01	ca	2.0E+00	ca		
		2.5E-04	i			2.5E-04	r		0.1	298-00-0	Methyl parathion	1.5E+01	nc	1.5E+02	nc	9.1E-01	nc	9.1E+00	nc		
		5.0E-02	i			5.0E-02	r		0.1	95-48-7	2-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc	1.5E+01	8.0E-01
		5.0E-02	i			5.0E-02	r		0.1	108-39-4	3-Methylphenol	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	h			5.0E-03	r		0.1	106-44-5	4-Methylphenol	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	p			2.0E-02	r		0.1	993-13-5	Methyl phosphonic acid	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		6.0E-03	h			1.1E-02	h	y		25013-15-4	Methyl styrene (mixture)	1.3E+02	nc	5.4E+02	nc	4.2E+01	nc	6.0E+01	nc		
		7.0E-02	h			7.0E-02	r	y		98-83-9	Methyl styrene (alpha)	6.8E+02	sat	6.8E+02	sat	2.6E+02	nc	4.3E+02	nc		
1.8E-03	c	8.6E-01	r	1.8E-03	c	8.6E-01	i	y		1634-04-4	**Methyl tertbutyl ether (MTBE)**	1.7E+01	ca	3.6E+01	ca	3.7E+00	ca	6.2E+00	ca		
		1.5E-01	i			1.5E-01	r		0.1	51218-45-2	Metolaclor (Dual)	9.2E+03	nc	9.2E+04	nc	5.5E+02	nc	5.5E+03	nc		
		2.5E-02	i			2.5E-02	r		0.1	21087-64-9	Metribuzin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.8E+00	x	2.0E-04	i	1.8E+00	r	2.0E-04	r		0.1	2385-85-5	Mirex	2.7E-01	ca*	9.6E-01	ca	3.7E-03	ca	3.7E-02	ca		
		2.0E-03	i			2.0E-03	r		0.1	2212-67-1	Molinate	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-03	i							7439-98-7	Molybdenum	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc		
		1.0E-01	i			1.0E-01	r		0.1	10599-90-3	Monochloramine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-03	i			2.0E-03	r		0.1	300-76-5	Naled	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		1.0E-01	i			1.0E-01	r		0.1	15299-99-7	Napropamide	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
		2.0E-02	i							7440-02-0	Nickel (soluble salts)	1.6E+03	nc	2.0E+04	nc			7.3E+02	nc	1.3E+02	7.0E+00
				8.4E-01	i						Nickel refinery dust					8.0E-03	ca				
				1.7E+00	i					12035-72-2	Nickel subsulfide			1.1E+04	ca	4.0E-03	ca				
Tap Water PRG Based on Infant NOAEL (see IRIS)										14797-55-8	Nitrate+++							1.0E+04	nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)										14797-65-0	Nitrite+++							1.0E+03	nc		
		3.0E-03	p			3.0E-05	p		0.1	88-74-4	**2-Nitroaniline**	1.8E+02	nc	1.8E+03	nc	1.1E-01	nc	1.1E+02	nc		
2.1E-02	p	3.0E-04	p	2.1E-02	r	3.0E-04	p		0.1	99-09-2	**3-Nitroaniline**	1.8E+01	nc	8.2E+01	ca**	3.2E-01	ca**	3.2E+00	ca**		
2.1E-02	p	3.0E-03	p	2.1E-02	r	1.0E-03	p		0.1	100-01-6	**4-Nitroaniline**	2.3E+01	ca**	8.2E+01	ca*	3.2E-01	ca*	3.2E+00	ca*		
		5.0E-04	i			5.7E-04	h	y		98-95-3	Nitrobenzene	2.0E+01	nc	1.0E+02	nc	2.1E+00	nc	3.4E+00	nc	1.0E-01	7.0E-03
		7.0E-02	h			7.0E-02	r		0.1	67-20-9	Nitrofurantoin	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
1.5E+00	h			1.5E+00	r				0.1	59-87-0	Nitrofurazone	3.2E-01	ca	1.1E+00	ca	4.5E-03	ca	4.5E-02	ca		
1.4E-02	n			1.4E-02	r				0.1	55-63-0	Nitroglycerin	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		

		1.0E-01	i			1.0E-01	r		0.1	556-88-7	Nitroguanidine	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc		
9.4E+00	r	5.7E-03	r	9.4E+00	h	5.7E-03	i	y		79-46-9	2-Nitropropane					7.2E-04	ca	1.2E-03	ca		
5.4E+00	i			5.6E+00	i			y		924-16-3	N-Nitrosodi-n-butylamine	2.4E-02	ca	5.8E-02	ca	1.2E-03	ca	2.0E-03	ca		
2.8E+00	i			2.8E+00	r				0.1	1116-54-7	N-Nitrosodiethanolamine	1.7E-01	ca	6.2E-01	ca	2.4E-03	ca	2.4E-02	ca		
1.5E+02	i			1.5E+02	i				0.1	55-18-5	N-Nitrosodiethylamine	3.2E-03	ca	1.1E-02	ca	4.5E-05	ca	4.5E-04	ca		
5.1E+01	i	8.0E-06	p	4.9E+01	i	8.0E-06	r		0.1	62-75-9	**N-Nitrosodimethylamine**	9.5E-03	ca*	3.4E-02	ca	1.4E-04	ca	1.3E-03	ca		
4.9E-03	i	2.0E-02	p	4.9E-03	r	2.0E-02	r		0.1	86-30-6	**N-Nitrosodiphenylamine**	9.9E+01	ca*	3.5E+02	ca*	1.4E+00	ca*	1.4E+01	ca*	1.0E+00	6.0E-02
7.0E+00	i			7.0E+00	r				0.1	621-64-7	N-Nitroso di-n-propylamine	6.9E-02	ca	2.5E-01	ca	9.6E-04	ca	9.6E-03	ca	5.0E-05	2.0E-06
2.2E+01	i			2.2E+01	r				0.1	10595-95-6	N-Nitroso-N-methylethylamine	2.2E-02	ca	7.8E-02	ca	3.1E-04	ca	3.1E-03	ca		
2.1E+00	i			2.1E+00	i				0.1	930-55-2	N-Nitrosopyrrolidine	2.3E-01	ca	8.2E-01	ca	3.1E-03	ca	3.2E-02	ca		
		2.0E-02	p			2.0E-02	r	y		99-08-1	**m-Nitrotoluene**	7.3E+02	nc	1.0E+03	sat	7.3E+01	nc	1.2E+02	nc		
2.3E-01	p	1.0E-02	h	2.3E-01	r	1.0E-02	r	y		99-08-1	**o-Nitrotoluene**	8.8E-01	ca	2.2E+00	ca	2.9E-02	ca	4.9E-02	ca		
1.7E-02	p	1.0E-02	p	1.7E-02	r	1.0E-02	r	y		99-99-0	**p-Nitrotoluene**	1.2E+01	ca*	3.0E+01	ca*	4.0E-01	ca*	6.6E-01	ca*		
		4.0E-02	i			4.0E-02	r		0.1	27314-13-2	Norflurazon	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
		7.0E-04	i			7.0E-04	r		0.1	85509-19-9	NuStar	4.3E+01	nc	4.3E+02	nc	2.6E+00	nc	2.6E+01	nc		
		3.0E-03	i			3.0E-03	r		0.1	32536-52-0	Octabromodiphenyl ether	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.0E-03	h			2.0E-03	r		0.1	152-16-9	Octamethylpyrophosphoramide	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		5.0E-02	i			5.0E-02	r		0.1	19044-88-3	Oryzalin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		5.0E-03	i			5.0E-03	r		0.1	19666-30-9	Oxadiazon	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	23135-22-0	Oxamyl	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		3.0E-03	i			3.0E-03	r		0.1	42874-03-3	Oxyfluorfen	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	76738-62-0	Paclobutrazol	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		4.5E-03	i			4.5E-03	r		0.1	4685-14-7	Paraquat	2.7E+02	nc	2.8E+03	nc	1.6E+01	nc	1.6E+02	nc		
		6.0E-03	h			6.0E-03	r		0.1	56-38-2	Parathion	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		5.0E-02	h			5.0E-02	r		0.1	1114-71-2	Pebulate	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-02	i			4.0E-02	r		0.1	40487-42-1	Pendimethalin	2.4E+03	nc	2.5E+04	nc	1.5E+02	nc	1.5E+03	nc		
2.3E-02	h			2.3E-02	r				0.1	87-84-3	Pentabromo-6-chloro cyclohexane	2.1E+01	ca	7.5E+01	ca	2.9E-01	ca	2.9E+00	ca		
		2.0E-03	i			2.0E-03	r		0.1	32534-81-9	Pentabromodiphenyl ether	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		8.0E-04	i			8.0E-04	r		0.1	608-93-5	Pentachlorobenzene	4.9E+01	nc	4.9E+02	nc	2.9E+00	nc	2.9E+01	nc		
2.6E-01	h	3.0E-03	i	2.6E-01	r	3.0E-03	r		0.1	82-68-8	Pentachloronitrobenzene	1.9E+00	ca*	6.6E+00	ca	2.6E-02	ca	2.6E-01	ca		
1.2E-01	i	3.0E-02	i	1.2E-01	r	3.0E-02	r		0.25	87-86-5	Pentachlorophenol	3.0E+00	ca	9.0E+00	ca	5.6E-02	ca	5.6E-01	ca	3.0E-02	1.0E-03
		1.0E-04	n							7601-90-3	Perchlorate	7.8E+00	ca/nc	1.0E+02	ca/nc			3.6E+00	ca/nc		
		5.0E-02	i			5.0E-02	r		0.1	52645-53-1	Permethrin	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		2.5E-01	i			2.5E-01	r		0.1	13684-63-4	Phenmedipham	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		3.0E-01	i			3.0E-01	r		0.1	108-95-2	**Phenol**	1.8E+04	nc	1.0E+05	max	1.1E+03	nc	1.1E+04	nc	1.0E+02	5.0E+00
		2.0E-03	n			2.0E-03	r		0.1	92-84-2	Phenothiazine	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		6.0E-03	i			6.0E-03	r		0.1	108-45-2	m-Phenylenediamine	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
4.7E-02	h			4.7E-02	r				0.1	95-54-5	**o-Phenylenediamine**	1.0E+01	ca	3.7E+01	ca	1.4E-01	ca	1.4E+00	ca		
		1.9E-01	h			1.9E-01	r		0.1	106-50-3	p-Phenylenediamine	1.2E+04	nc	1.0E+05	max	6.9E+02	nc	6.9E+03	nc		
		8.0E-05	i			8.0E-05	r		0.1	62-38-4	Phenylmercuric acetate	4.9E+00	nc	4.9E+01	nc	2.9E-01	nc	2.9E+00	nc		
1.9E-03	h			1.9E-03	r				0.1	90-43-7	2-Phenylphenol	2.5E+02	ca	8.9E+02	ca	3.5E+00	ca	3.5E+01	ca		
		2.0E-04	h			2.0E-04	r		0.1	298-02-2	Phorate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		

		2.0E-02	i			2.0E-02	r		0.1	732-11-6	Phosmet	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		3.0E-04	i			8.6E-05	i		0.1	7803-51-2	Phosphine	1.8E+01	nc	1.8E+02	nc	3.1E-01	nc	1.1E+01	nc		
						2.9E-03	i			7664-38-2	Phosphoric acid					1.0E+01	nc				
		2.0E-05	i							7723-14-0	Phosphorus (white)	1.6E+00	nc	2.0E+01	nc			7.3E-01	nc		
		1.0E+00	h			1.0E+00	r		0.1	100-21-0	p-Phthalic acid	6.1E+04	nc	1.0E+05	max	3.7E+03	nc	3.6E+04	nc		
		2.0E+00	i			3.4E-02	h		0.1	85-44-9	Phthalic anhydride	1.0E+05	max	1.0E+05	max	1.2E+02	nc	7.3E+04	nc		
		7.0E-02	i			7.0E-02	r		0.1	1918-02-1	Picloram	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		1.0E-02	i			1.0E-02	r		0.1	29232-93-7	Pirimiphos-methyl	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
8.9E+00	h	7.0E-06	h	8.9E+00	r	7.0E-06	r		0.1		Polybrominated biphenyls	5.5E-02	ca**	1.9E-01	ca*	7.6E-04	ca*	7.6E-03	ca*		
											Polychlorinated biphenyls (PCBs, see IRIS)										
7.0E-02	i	7.0E-05	i	7.0E-02	i	7.0E-05	r		0.14	12674-11-2	PCBs (unspeciated mixture, low risk, e.g. Aroclor 1016)	3.9E+00	nc	2.1E+01	ca**	9.6E-02	ca**	9.6E-01	ca**		
2.0E+00	i	2.0E-05	i	2.0E+00	i	2.0E-05	r		0.14	11097-69-1	PCBs (unspeciated mixture, high risk, e.g. Aroclor 1254)	2.2E-01	ca**	7.4E-01	ca*	3.4E-03	ca*	3.4E-02	ca*		
4.5E+00	n			4.5E+00	r				0.1	61788-33-8	Polychlorinated terphenyls	1.1E-01	ca	3.8E-01	ca	1.5E-03	ca	1.5E-02	ca		
											Polynuclear aromatic hydrocarbons (PAHs)										
		6.0E-02	i			6.0E-02	r	y		83-32-9	Acenaphthene	3.7E+03	nc	2.9E+04	nc	2.2E+02	nc	3.7E+02	nc	5.7E+02	2.9E+01
		3.0E-01	i			3.0E-01	r	y		120-12-7	Anthracene	2.2E+04	nc	1.0E+05	max	1.1E+03	nc	1.8E+03	nc	1.2E+04	5.9E+02
7.3E-01	n			7.3E-01	r				0.13	56-55-3	Benz[a]anthracene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	2.0E+00	8.0E-02
7.3E-01	n			7.3E-01	r				0.13	205-99-2	Benzo[b]fluoranthene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	5.0E+00	2.0E-01
7.3E-02	n			7.3E-02	r				0.13	207-08-9	Benzo[k]fluoranthene	6.2E+00	ca	2.1E+01	ca	9.2E-02	ca	9.2E-01	ca	4.9E+01	2.0E+00
1.2E+00	c			3.9E-01	c				0.13	207-08-9	"CAL-Modified PRG"	3.8E-01	ca	1.3E+00	ca	1.7E-02	ca	5.6E-02	ca		
7.3E+00	i			7.3E+00	r				0.13	50-32-8	Benzo[a]pyrene	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	8.0E+00	4.0E-01
7.3E-03	n			7.3E-03	r				0.13	218-01-9	Chrysene	6.2E+01	ca	2.1E+02	ca	9.2E-01	ca	9.2E+00	ca	1.6E+02	8.0E+00
1.2E-01	c			3.9E-02	c				0.13		"CAL-Modified PRG"	3.8E+00	ca	1.3E+01	ca	1.7E-01	ca	5.6E-01	ca		
7.3E+00	n			7.3E+00	r				0.13	53-70-3	Dibenz[ah]anthracene	6.2E-02	ca	2.1E-01	ca	9.2E-04	ca	9.2E-03	ca	2.0E+00	8.0E-02
		4.0E-02	i			4.0E-02	r		0.13	206-44-0	Fluoranthene	2.3E+03	nc	2.2E+04	nc	1.5E+02	nc	1.5E+03	nc	4.3E+03	2.1E+02
		4.0E-02	i			4.0E-02	r	y		86-73-7	Fluorene	2.7E+03	nc	2.6E+04	nc	1.5E+02	nc	2.4E+02	nc	5.6E+02	2.8E+01
7.3E-01	n			7.3E-01	r				0.13	193-39-5	Indeno[1,2,3-cd]pyrene	6.2E-01	ca	2.1E+00	ca	9.2E-03	ca	9.2E-02	ca	1.4E+01	7.0E-01
		2.0E-02	i			8.6E-04	i	y		91-20-3	Naphthalene	5.6E+01	nc	1.9E+02	nc	3.1E+00	nc	6.2E+00	nc	8.4E+01	4.0E+00
1.2E-01	r			1.2E-01	c						**"CAL-Modified PRG"**	1.7E+00	ca	4.2E+00	ca	5.6E-02	ca	9.3E-02	ca		
		3.0E-02	i			3.0E-02	r	y		129-00-0	Pyrene	2.3E+03	nc	2.9E+04	nc	1.1E+02	nc	1.8E+02	nc	4.2E+03	2.1E+02
1.5E-01	i	9.0E-03	i	1.5E-01	r	9.0E-03	r		0.1	67747-09-5	Prochloraz	3.2E+00	ca	1.1E+01	ca	4.5E-02	ca	4.5E-01	ca		
		6.0E-03	h			6.0E-03	r		0.1	26399-36-0	Profluralin	3.7E+02	nc	3.7E+03	nc	2.2E+01	nc	2.2E+02	nc		
		1.5E-02	i			1.5E-02	r		0.1	1610-18-0	Prometon	9.2E+02	nc	9.2E+03	nc	5.5E+01	nc	5.5E+02	nc		
		4.0E-03	i			4.0E-03	r		0.1	7287-19-6	Prometryn	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		7.5E-02	i			7.5E-02	r		0.1	23950-58-5	Pronamide	4.6E+03	nc	4.6E+04	nc	2.7E+02	nc	2.7E+03	nc		
		1.3E-02	i			1.3E-02	r		0.1	1918-16-7	Propachlor	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	709-98-8	Propanil	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.0E-02	i			2.0E-02	r		0.1	2312-35-8	Propargite	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-03	i			2.0E-03	r		0.1	107-19-7	Propargyl alcohol	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
		2.0E-02	i			2.0E-02	r		0.1	139-40-2	Propazine	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-02	i			2.0E-02	r		0.1	122-42-9	Propham	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	60207-90-1	Propiconazole	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		

		1.0E-01	i			1.1E-01	i	y		98-82-8	Isopropylbenzene (Cumene)	1.6E+02	nc	5.2E+02	nc	4.0E+02	nc	6.6E+02	nc		
		4.0E-02	n			4.0E-02	r	y		103-65-1	n-Propylbenzene	2.4E+02	sat	2.4E+02	sat	1.5E+02	nc	2.4E+02	nc		
		5.0E-01	p			8.6E-04	p		0.1	57-55-6	Propylene glycol	3.0E+04	nc	1.0E+05	max	3.1E+00	nc	1.8E+04	nc		
		7.0E-01	h			7.0E-01	r		0.1	52125-53-8	Propylene glycol, monoethyl ether	4.3E+04	nc	1.0E+05	max	2.6E+03	nc	2.6E+04	nc		
		7.0E-01	h			5.7E-01	i		0.1	107-98-2	Propylene glycol, monomethyl ether	4.3E+04	nc	1.0E+05	max	2.1E+03	nc	2.6E+04	nc		
2.4E-01	i	8.6E-03	r	1.3E-02	i	8.6E-03	i	y		75-56-9	Propylene oxide	1.9E+00	ca*	6.6E+00	ca*	5.2E-01	ca*	2.2E-01	ca		
		2.5E-01	i			2.5E-01	r		0.1	81335-77-5	Pursuit	1.5E+04	nc	1.0E+05	max	9.1E+02	nc	9.1E+03	nc		
		2.5E-02	i			2.5E-02	r		0.1	51630-58-1	Pydrin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		1.0E-03	i			1.0E-03	r		0.1	110-86-1	Pyridine	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		5.0E-04	i			5.0E-04	r		0.1	13593-03-8	Quinalphos	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
3.0E+00	i			3.0E+00	r				0.1	91-22-5	Quinoline	1.6E-01	ca	5.7E-01	ca	2.2E-03	ca	2.2E-02	ca		
1.1E-01	i	3.0E-03	i	1.1E-01	r	3.0E-03	r		0.1	121-82-4	RDX (Cyclonite)	4.4E+00	ca*	1.6E+01	ca	6.1E-02	ca	6.1E-01	ca		
		3.0E-02	i			3.0E-02	r		0.1	10453-86-8	Resmethrin	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		5.0E-02	h			5.0E-02	r		0.1	299-84-3	Ronnel	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		
		4.0E-03	i			4.0E-03	r		0.1	83-79-4	Rotenone	2.4E+02	nc	2.5E+03	nc	1.5E+01	nc	1.5E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	78587-05-0	Savey	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		5.0E-03	i						0.1	7783-00-8	Selenious Acid	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		5.0E-03	i							7782-49-2	Selenium	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	5.0E+00	3.0E-01
		5.0E-03	h						0.1	630-10-4	Selenourea	3.1E+02	nc	3.1E+03	nc			1.8E+02	nc		
		9.0E-02	i			9.0E-02	r		0.1	74051-80-2	Sethoxydim	5.5E+03	nc	5.5E+04	nc	3.3E+02	nc	3.3E+03	nc		
		5.0E-03	i							7440-22-4	Silver and compounds	3.9E+02	nc	5.1E+03	nc			1.8E+02	nc	3.4E+01	2.0E+00
1.2E-01	h	5.0E-03	i	1.2E-01	r	5.00E-03	r		0.1	122-34-9	Simazine	4.1E+00	ca*	1.4E+01	ca	5.6E-02	ca	5.6E-01	ca		
		4.0E-03	i							26628-22-8	Sodium azide										
2.7E-01	h	3.0E-02	i	2.7E-01	r	3.0E-02	r		0.1	148-18-5	Sodium diethyldithiocarbamate	1.8E+00	ca	6.4E+00	ca	2.5E-02	ca	2.5E-01	ca		
		2.0E-05	i			2.0E-05	r		0.1	62-74-8	Sodium fluoroacetate	1.2E+00	nc	1.2E+01	nc	7.3E-02	nc	7.3E-01	nc		
		1.0E-03	h			1.0E-03	r		0.1	13718-26-8	Sodium metavanadate	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		6.0E-01	i							7440-24-6	Strontium, stable	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		3.0E-04	i			3.0E-04	r		0.1	57-24-9	Strychnine	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		2.0E-01	i			2.9E-01	i	y		100-42-5	Styrene	1.7E+03	sat	1.7E+03	sat	1.1E+03	nc	1.6E+03	nc	4.0E+00	2.0E-01
		5.0E-03	p			5.0E-03	r			80-07-9	**1,1'-Sulfonylbis (4-chlorobenzene)**	3.9E+02	nc	5.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		2.5E-02	i			2.5E-02	r		0.1	88671-89-0	Systhane	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
1.5E+05	h			1.5E+05	h				0.03	1746-01-6	2,3,7,8-TCDD (dioxin)	3.9E-06	ca	1.6E-05	ca	4.5E-08	ca	4.5E-07	ca		
		7.0E-02	i			7.0E-02	r		0.1	34014-18-1	Tebuthiuron	4.3E+03	nc	4.3E+04	nc	2.6E+02	nc	2.6E+03	nc		
		2.0E-02	h			2.0E-02	r		0.1	3383-96-8	Temephos	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	5902-51-2	Terbacil	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		2.5E-05	h			2.5E-05	r		0.1	13071-79-9	Terbufos	1.5E+00	nc	1.5E+01	nc	9.1E-02	nc	9.1E-01	nc		
		1.0E-03	i			1.0E-03	r		0.1	886-50-0	Terbutryn	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		3.0E-04	i			3.0E-04	r		0.1	95-94-3	1,2,4,5-Tetrachlorobenzene	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
2.6E-02	i	3.0E-02	i	2.6E-02	i	3.0E-02	r	y		630-20-6	1,1,1,2-Tetrachloroethane	3.2E+00	ca	7.3E+00	ca	2.6E-01	ca	4.3E-01	ca		
2.0E-01	i	6.0E-02	p	2.0E-01	i	6.0E-02	r	y		79-34-5	1,1,2,2-Tetrachloroethane	4.1E-01	ca	9.3E-01	ca	3.3E-02	ca	5.5E-02	ca	3.0E-03	2.0E-04
5.4E-01	c	1.0E-02	i	2.1E-02	c	1.0E-02	c	y		127-18-4	**Tetrachloroethylene (PCE)**	4.8E-01	ca*	1.3E+00	ca	3.2E-01	ca	1.0E-01	ca	6.0E-02	3.0E-03
		3.0E-02	i			3.0E-02	r		0.1	58-90-2	2,3,4,6-Tetrachlorophenol	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		

2.0E+01	h			2.0E+01	r				0.1	5216-25-1	p,a,a,a-Tetrachlorotoluene	2.4E-02	ca	8.6E-02	ca	3.4E-04	ca	3.4E-03	ca		
2.4E-02	h	3.0E-02	i	2.4E-02	r	3.0E-02	r		0.1	961-11-5	Tetrachlorovinphos	2.0E+01	ca*	7.2E+01	ca	2.8E-01	ca	2.8E+00	ca		
		5.0E-04	i			5.0E-04	r		0.1	3689-24-5	Tetraethyldithiopyrophosphate	3.1E+01	nc	3.1E+02	nc	1.8E+00	nc	1.8E+01	nc		
7.6E-03	n	2.1E-01	n	6.8E-03	n	8.6E-02	n	y		109-99-9	Tetrahydrofuran	9.4E+00	ca	2.1E+01	ca	9.9E-01	ca	1.6E+00	ca		
		6.6E-05	i							7440-28-0	Thallium and compounds+++	5.2E+00	nc	6.7E+01	nc			2.4E+00	nc		
		1.0E-02	i			1.0E-02	r		0.1	28249-77-6	Thiobencarb	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-02	n			5.0E-02	r		0.1	N/A	Thiocyanate	3.1E+03	nc	1.0E+05	max	1.8E+02	nc	1.8E+03	nc		
		3.0E-04	h			3.0E-04	r		0.1	39196-18-4	Thiofanox	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		8.0E-02	i			8.0E-02	r		0.1	23564-05-8	Thiophanate-methyl	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		5.0E-03	i			5.0E-03	r		0.1	137-26-8	Thiram	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
		6.0E-01	h							7440-31-5	Tin (inorganic, also see tributyltin oxide)	4.7E+04	nc	1.0E+05	max			2.2E+04	nc		
		4.0E+00	n			8.6E-03	n			7440-32-6	Titanium	1.0E+05	max	1.0E+05	max	3.1E+01	nc	1.5E+05	nc		
		2.0E-01	i			1.1E-01	i	y		108-88-3	Toluene	5.2E+02	sat	5.2E+02	sat	4.0E+02	nc	7.2E+02	nc	1.2E+01	6.0E-01
3.2E+00	h			3.2E+00	r				0.1	95-80-7	Toluene-2,4-diamine	1.5E-01	ca	5.4E-01	ca	2.1E-03	ca	2.1E-02	ca		
		6.0E-01	h			6.0E-01	r		0.1	95-70-5	Toluene-2,5-diamine	3.7E+04	nc	1.0E+05	max	2.2E+03	nc	2.2E+04	nc		
		2.0E-01	h			2.0E-01	r		0.1	823-40-5	Toluene-2,6-diamine	1.2E+04	nc	1.0E+05	max	7.3E+02	nc	7.3E+03	nc		
1.9E-01	i			1.9E-01	r				0.1	106-49-0	p-Toluidine	2.6E+00	ca	9.1E+00	ca	3.5E-02	ca	3.5E-01	ca		
1.1E+00	i			1.1E+00	i				0.1	8001-35-2	Toxaphene	4.4E-01	ca	1.6E+00	ca	6.0E-03	ca	6.1E-02	ca	3.1E+01	2.0E+00
		7.5E-03	i			7.5E-03	r		0.1	66841-25-6	Tralomethrin	4.6E+02	nc	4.6E+03	nc	2.7E+01	nc	2.7E+02	nc		
		1.3E-02	i			1.3E-02	r		0.1	2303-17-5	Triallate	7.9E+02	nc	8.0E+03	nc	4.7E+01	nc	4.7E+02	nc		
		1.0E-02	i			1.0E-02	r		0.1	82097-50-5	Triasulfuron	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		5.0E-03	i			5.0E-03	r		0.1	615-54-3	1,2,4-Tribromobenzene	3.1E+02	nc	3.1E+03	nc	1.8E+01	nc	1.8E+02	nc		
9.2E-03	p	2.0E-01	p	9.2E-03	r	2.0E-01	r		0.1	126-73-8	**Tributyl phosphate**	5.3E+01	ca	1.9E+02	ca	7.3E-01	ca	7.3E+00	ca		
		3.0E-04	i						0.1	56-35-9	Tributyltin oxide (TBTO)	1.8E+01	nc	1.8E+02	nc			1.1E+01	nc		
3.4E-02	h			3.4E-02	r				0.1	634-93-5	2,4,6-Trichloroaniline	1.4E+01	ca	5.1E+01	ca	2.0E-01	ca	2.0E+00	ca		
2.9E-02	h			2.9E-02	r				0.1	33663-50-2	2,4,6-Trichloroaniline hydrochloride	1.7E+01	ca	5.9E+01	ca	2.3E-01	ca	2.3E+00	ca		
		1.0E-02	i			1.0E-03	p	y		120-82-1	**1,2,4-Trichlorobenzene**	6.2E+01	nc	2.2E+02	nc	3.7E+00	nc	7.2E+00	nc	5.0E+00	3.0E-01
		2.8E-01	n			6.3E-01	p	y		71-55-6	1,1,1-Trichloroethane	1.2E+03	sat	1.2E+03	sat	2.3E+03	nc	3.2E+03	nc	2.0E+00	1.0E-01
5.7E-02	i	4.0E-03	i	5.6E-02	i	4.0E-03	r	y		79-00-5	1,1,2-Trichloroethane	7.3E-01	ca*	1.6E+00	ca*	1.2E-01	ca	2.0E-01	ca	2.0E-02	9.0E-04
4.0E-01	n	3.0E-04	n	4.0E-01	n	1.0E-02	n	y		79-01-6	Trichloroethylene (TCE)	5.3E-02	ca	1.1E-01	ca	1.7E-02	ca	2.8E-02	ca	6.0E-02	3.0E-03
1.3E-02	c			7.0E-03	c	1.7E-01	c	y		79-01-6	**"CAL-Modified PRG"**	2.9E+00	ca	6.5E+00	ca	9.6E-01	ca	1.4E+00	ca		
		3.0E-01	i			2.0E-01	h	y		75-69-4	Trichlorofluoromethane	3.9E+02	nc	2.0E+03	sat	7.3E+02	nc	1.3E+03	nc		
		1.0E-01	i			1.0E-01	r		0.1	95-95-4	2,4,5-Trichlorophenol	6.1E+03	nc	6.2E+04	nc	3.7E+02	nc	3.6E+03	nc	2.7E+02	1.4E+01
1.1E-02	i	1.0E-04	n	1.1E-02	i	1.0E-04	r		0.1	88-06-2	2,4,6-Trichlorophenol	6.1E+00	nc**	6.2E+01	nc**	3.7E-01	nc**	3.6E+00	nc**	2.0E-01	8.0E-03
7.0E-02	c			7.0E-02	c				0.1	88-06-2	"CAL-Modified PRG"	6.9E+00	ca	2.5E+01	ca	9.6E-02	ca	9.6E-01	ca		
		1.0E-02	i			1.0E-02	r		0.1	93-76-5	2,4,5-Trichlorophenoxyacetic Acid	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
		8.0E-03	i			8.0E-03	r		0.1	93-72-1	2-(2,4,5-Trichlorophenoxy) propionic acid	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		5.0E-03	i			5.0E-03	r	y		598-77-6	**1,1,2-Trichloropropane**	7.1E+01	nc	2.7E+02	nc	1.8E+01	nc	3.0E+01	nc		
2.0E+00	n	6.0E-03	i	2.0E+00	r	1.4E-03	n	y		96-18-4	**1,2,3-Trichloropropane**	3.4E-02	ca	7.6E-02	ca	3.4E-03	ca	5.6E-03	ca		
		1.0E-02	p			3.0E-04	p	y		96-19-5	**1,2,3-Trichloropropene**	5.2E+00	nc	1.7E+01	nc	1.1E+00	nc	2.2E+00	nc		
		3.0E-03	i			3.0E-03	r		0.1	58138-08-2	Tridiphane	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
		2.0E-03	r			2.0E-03	i	y		121-44-8	Triethylamine	2.3E+01	nc	8.6E+01	nc	7.3E+00	nc	1.2E+01	nc		

7.7E-03	i	7.5E-03	i	7.7E-03	r	7.5E-03	r		0.1	1582-09-8	Trifluralin	6.3E+01	ca**	2.2E+02	ca*	8.7E-01	ca*	8.7E+00	ca*		
		1.4E-04	r			1.4E-04	n		0.1	552-30-7	Trimellitic Anhydride (TMAN)	8.6E+00	nc	8.6E+01	nc	5.1E-01	nc	5.1E+00			
		5.0E-02	p			1.7E-03	p	y		95-63-6	1,2,4-Trimethylbenzene	5.2E+01	nc	1.7E+02	nc	6.2E+00	nc	1.2E+01	nc		
		5.0E-02	p			1.7E-03	p	y		108-67-8	1,3,5-Trimethylbenzene	2.1E+01	nc	7.0E+01	nc	6.2E+00	nc	1.2E+01	nc		
3.7E-02	h			3.7E-02	r				0.1	512-56-1	Trimethyl phosphate	1.3E+01	ca	4.7E+01	ca	1.8E-01	ca	1.8E+00	ca		
		3.0E-02	i			3.0E-02	r		0.1	99-35-4	1,3,5-Trinitrobenzene	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
		1.0E-02	h			1.0E-02	r		0.1	479-45-8	Trinitrophenylmethylnitramine	6.1E+02	nc	6.2E+03	nc	3.7E+01	nc	3.6E+02	nc		
3.0E-02	i	5.0E-04	i	3.0E-02	r	5.0E-04	r		0.1	118-96-7	2,4,6-Trinitrotoluene	1.6E+01	ca**	5.7E+01	ca**	2.2E-01	ca**	2.2E+00	ca**		
		2.0E-02	p			2.0E-02	r		0.1	791-28-6	**Triphenylphosphine oxide**	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
1.4E-02	p	3.1E-01	p	1.4E-02	r	3.1E-01	r		0.1	115-96-8	**Tris(2-chloroethyl) phosphate**	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
3.2E-03	p	1.0E-01	p	3.2E-03	r	1.0E-01	r		0.1	78-42-2	**Tris(2-ethylhexyl) phosphate**	1.5E+02	ca*	5.4E+02	ca	2.1E+00	ca	2.1E+01	ca		
		2.0E-04	n							7440-61-1	Uranium (chemical toxicity only)	1.6E+01	nc	2.0E+02	nc			7.3E+00	nc		
		1.0E-03	n							7440-62-2	Vanadium and compounds	7.8E+01	nc	1.0E+03	nc			3.6E+01	nc	6.0E+03	3.0E+02
		1.0E-03	i			1.0E-03	r		0.1	1929-77-7	Vernam	6.1E+01	nc	6.2E+02	nc	3.7E+00	nc	3.6E+01	nc		
		2.5E-02	i			2.5E-02	r		0.1	50471-44-8	Vinclozolin	1.5E+03	nc	1.5E+04	nc	9.1E+01	nc	9.1E+02	nc		
		1.0E+00	h			5.7E-02	i	y		108-05-4	Vinyl acetate	4.3E+02	nc	1.4E+03	nc	2.1E+02	nc	4.1E+02	nc	1.7E+02	8.0E+00
1.1E-01	r	8.6E-04	r	1.1E-01	h	8.6E-04	i	y		593-60-2	Vinyl bromide (bromoethene)	1.9E-01	ca*	4.2E-01	ca*	6.1E-02	ca*	1.0E-01	ca*		
1.5E+00	i	3.0E-03	i	3.1E-02	i	2.9E-02	i	y		75-01-4	Vinyl chloride (child/adult)+++	7.9E-02	ca			1.1E-01	ca	2.0E-02	ca	1.0E-02	7.0E-04
7.5E-01	i	3.0E-03	i	1.6E-02	i	2.9E-02	i	y		75-01-4	Vinyl chloride (adult)			7.5E-01	ca						
		3.0E-04	i			3.0E-04	r		0.1	81-81-2	Warfarin	1.8E+01	nc	1.8E+02	nc	1.1E+00	nc	1.1E+01	nc		
		2.0E-01	i			2.9E-02	i	y	0.1	1330-20-7	**Xylenes**	2.7E+02	nc	4.2E+02	sat	1.1E+02	nc	2.1E+02	nc	2.1E+02	1.0E+01
		3.0E-01	i							7440-66-6	Zinc	2.3E+04	nc	1.0E+05	max			1.1E+04	nc	1.2E+04	6.2E+02
		3.0E-04	i							1314-84-7	Zinc phosphide	2.3E+01	nc	3.1E+02	nc			1.1E+01	nc		
		5.0E-02	i			5.0E-02	r		0.1	12122-67-7	Zineb	3.1E+03	nc	3.1E+04	nc	1.8E+02	nc	1.8E+03	nc		

PRG TABLE
Version 9
October 2004
Stanford J. Smucker Ph.D., EPA Region IX
Technical Support Section (SFD-8-4)
75 Hawthorne Street, San Francisco, CA 94105-3901

EXPOSURE PARAMETERS

Target cancer risk	1E-06	TR
Target Hazard Quotient	1.0	THQ
Body weight, adult (kg)	70	BW_adult
Body wt, age 1-6 (kg)	15	BW-child
Default skin surface area for soil contact , adult resident (c	5700	SA_adult
Default skin surface area for soil contact , child (cm^2/day)	2800	SA_child
Default skin surface area for soil contact, adult worker (cm	3300	SA_work
Default adherence factor, adult resident (mg/cm^2)	0.07	AF_adult
Default adherence factor, child (mg/cm^2)	0.20	AF_child

Default adherence factor, adult worker (mg/cm^2)	0.20	AF_work
Dermal absorption in soil (non-volatile organics)	0.10	ABS_org
Averaging time (years of life):	70	AT
Air breathed (m3/d)	20	IRA_adult
	10	IRA_child
Drinking water ingestion (L/d)	2	IRW_adult
	1	IRW_child
Volatilization factor - water (L/m^3)	0.5	VF_W
Volatilization factor - soil (m^3/kg)		VF_S
Particulate emission factor (m^3/kg)	1.3E+09	PEF
Soil ingestion - adult resident (mg/d)	100	IRS_adult
Soil ingestion - child age 1-6 (mg/d)	200	IRS_child
Soil ingestion - adult worker (mg/d)	100	IRS_work
Exposure frequency (d/yr)	350	EF_R
Exposure duration, age 1-6 (yr)	6	ED_C
Exposure duration, adult (yr)	30	ED_A
Exposure duration, lifetime (yr)	70	ED_L
Residential Age-adjusted factors for carcinogens only		
Ingestion factor for soils ([mg*yr]/[kg*d]) See text.	114	IFS_adj
Skin contact factor for soils ([mg*yr]/[kg*d]) See text.	361	SFS_adj
Inhalation factor ([m^3*yr]/[kg-d]) See text.	11	InhF_adj
Ingestion factor for water ([L*yr]/[kg-d]) See text	1.1	IFW_adj
Exposure frequency, adult worker (d/yr)	250	EF_work
Exposure duration, adult worker (yr)	25	ED_work

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
21	FS	Section 2.5.2.1	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix C. AECOM. April 2011.

1. Vapor Intrusion Risk Evaluation

Volatilization of volatile organic compounds (VOCs) present in groundwater and subsequent mass transport of these vapors into indoor spaces constitutes a potentially complete inhalation exposure pathway for potential future receptors at the Installation Restoration Program (IRP) Site 2, former Marine Corps Air Station (MCAS) El Toro, California.

A screening-level assessment of risks due to vapor intrusion into indoor air at IRP Site 2 was performed in accordance with the general framework presented in the Department of Defense (DoD) Vapor Intrusion Handbook (TSERAWG 2009) and the California Department of Toxic Substances Control (DTSC) Vapor Intrusion Guidance Document (DTSC 2004). The DoD Vapor Intrusion Handbook has been developed with consideration of the EPA's 2002 draft guidance on vapor intrusion (U.S. EPA 2002) and portions of the guidance are cited in this Handbook as providing useful information in evaluating potential vapor intrusion pathways. The DoD Handbook also incorporates several other relevant vapor intrusion documents, including the following:

- Guide for the Assessment of the Vapor Intrusion Pathway. U.S. Air Force, Air Force Institute for Operational Health. February 2006.
- Draft Navy Guidance for Evaluating the Vapor Intrusion Pathway. Naval Facilities Engineering Command. 15 November 2007.
- Navy/Marine Corps Policy on Vapor Intrusion, 29 April 2008.
- Interim Vapor Intrusion Policy for Environmental Response Actions, Department of the Army, Office of the Assistant Secretary (Installations and Environment). 6 November 2006.
- Vapor Intrusion Pathway: A Practical Guide. Interstate Technology and Regulatory Council (ITRC). January 2007.

In accordance with the DoD Vapor Intrusion Handbook, the screening-level evaluation of vapor-intrusion pathway for IRP Site 2 groundwater included the following:

- *Initial Steps of the Screening Assessment:* This included confirmation that chemicals with sufficient volatility and toxicity have been detected in IRP Site 2 groundwater and that a potentially complete human exposure pathway exists or may exist in future.
- *Review of Conceptual Site Model:* The conceptual site model summarized in Section 3 of the main text was reviewed.
- Assessment of the quality of existing data used in the screening-level assessment
- Identification of chemicals of potential concern (COPCs) for vapor intrusion assessment
- Quantification of vapor intrusion risk

1.1 Initial Steps of Screening Assessment

The initial steps of the screening assessment are conducted to evaluate if OU-2A is a candidate for vapor intrusion.

1.1.1 Confirmation of Detection of Chemicals with Sufficient Volatility and Toxicity

The chemicals reported in IRP Site 2 groundwater during the groundwater monitoring events from December 1995 to March 2009 (as reported in the *2009 Annual Groundwater Monitoring*

Report [Trevet 2009]) and pre-baseline sampling conducted as part of pilot study in June 2009 (AECOM and ECS 2010) were compared to the following lists to evaluate if they are sufficiently volatile and toxic to present potential vapor intrusion risk:

- Table A-1 in Appendix A of the DoD Vapor Intrusion Handbook (TSERAWG 2009). This table was developed using an approach similar to the method used to develop the table documented in Appendix D of U.S. EPA's 2002 Draft Vapor Intrusion Guidance (U.S. EPA 2002).
- Table 1 of the DTSC Vapor Intrusion Guidance Document (DTSC 2004). This table was generated from the chemicals listed in the U.S. EPA's 2002 Draft Vapor Intrusion Guidance (U.S. EPA 2002) with addition of fuel oxygenates and two PCB congeners.

Based on the above comparison, it was confirmed that chemicals with sufficient volatility and toxicity have been detected in IRP Site 2 groundwater that may contribute to potential indoor air risks when complete exposure pathways exist. These chemicals are listed by site in Table 1.

1.1.2 Existence of Current or Potential Future Receptors

Currently there are no buildings at IRP Site 2; therefore, no further consideration of the vapor intrusion pathway is required under the current use scenario. The vapor intrusion risk evaluation is being conducted to evaluate risk should the site be used for habitable buildings in future.

1.2 Review of Conceptual Site Model

The CSM for IRP Site 2 groundwater is summarized in Section 3 of the main text. This CSM presents the location and nature of source of volatile chemicals, nature and extent of contamination, geology and hydrogeology, fate and transport, and potential exposure pathways. Based on the review of the CSM, the following information was used in the vapor intrusion risk evaluation:

- Groundwater VOC data reported in the *2009 Annual Groundwater Monitoring Report* (Trevet 2009), and pre-baseline sampling conducted as part of the pilot study (AECOM and ECS 2010) (see Section 1.3).
- Geotechnical data collected during the design of the IRP Site 2 landfill cap to determine the input parameters for the Johnson and Ettinger (J&E) Model (see Section 1.5).

1.3 Data Used in Screening-Level Assessment

Various investigations have been conducted at IRP Site 2 to delineate the nature and extent of impacted groundwater at OU-2A. The data used for assessment of risks due to vapor intrusion pathway included the groundwater monitoring results from December 1995 to March 2009 reported in the *2009 Annual Groundwater Monitoring Report* (Trevet 2009), and pre-baseline sampling conducted as part of pilot study in June 2009 (AECOM and ECS 2010).

1.4 General Data Screening and Identification of Vapor Intrusion COPCs

The maximum detected concentrations of chemicals listed in Table 1 were compared to the generic screening levels presented in Table 2c of the U.S. EPA's 2002 draft guidance on vapor intrusion (U.S. EPA 2002). The chemicals exceeding these screening levels were identified as vapor intrusion COPCs and were carried forward to site-specific screening-level evaluation of the vapor intrusion risk (see Table 2).

1.5 QUANTIFICATION OF VAPOR INTRUSION RISK

The site-specific screening evaluation of vapor intrusion risks was performed using the U.S.EPA's J&E Model. A residential land-use was assumed for vapor intrusion risk evaluation for conservative estimation of risks.

A summary of site-specific parameters used in the J&E Model along with the basis for each is presented in Table 3. The toxicity values for the COCs used in the J&E Model were consistent with toxicity values used by the U.S. EPA Region 9 in development of 2009 Regional Screening Levels (RSLs) (U.S. EPA 2009).

The cancer and non-cancer risks associated with each COPC using are presented in Table 4. The incremental lifetime cancer risk (ILCR) due to vapor intrusion into indoor air at maximum detected concentrations in groundwater at IRP Site 2 is within the NCP-defined risk management range of 10^{-6} to 10^{-4}. The risks that fall within the NCP-defined risk management range of 10^{-6} to 10^{-4} may be acceptable depending on site-specific and other factors considered appropriate for risk point of departure analysis (per NCP Preamble). The majority of cancer risk (53 percent) at IRP Site 2 is attributable to TCE.

The non-cancer risk or hazard index calculated due to vapor intrusion into indoor air at maximum detected concentrations in groundwater at IRP Site 2 is estimated to be less than 1. The non-cancer hazard index value of less than 1 indicates little potential for adverse non-cancer health effects to develop. Consequently, the modeled non-cancer risks associated with the indoor air inhalation pathway at IRP Site 2 are acceptable.

1.6 UNCERTAINTY DISCUSSION

The risks from inhalation of indoor air at IRP Site 2 are estimated values and subject to factors that contribute varying degrees of uncertainty to their determination. Uncertainties in the risk assessment process could result in an overestimation or underestimation of risks, and the risk estimates should not be taken as absolute indicators of whether adverse health effects could occur. The more important uncertainties associated with indoor air risk evaluation are:

1. Maximum concentrations of COPCs in groundwater were used to estimate chemical concentrations in indoor air using J&E Model. These maximum detected concentrations do not accurately reflect the concentrations present across the entire site. The maximum concentration of the major cancer risk driver i.e. TCE of 110 μg/L is significantly higher than TCE concentrations typically present in groundwater (see Figure 3-8 in the main text).
2. The model assumes homogeneity of soil within a horizon. Therefore, selected site-specific values for various soil parameters may fail to provide an accurate measure of the soil variability.
3. The model evaluates building characteristics that, while remaining mostly constant, makes assumptions about the design of a building (e.g., height of the room, air-exchange rate) that is not yet planned for the site.
4. In general, the values used in the J&E Model were selected to provide a health-protective assessment in the event that site-specific values are not available. This is especially true for the use of the value for volumetric flow rate of subsurface vapor into the building living space (Qsoil), which is critical to the model. The model uses a default value of 5 liters per minute (L/min) which was selected to represent the midpoint of the range which was supposed to be typical for the situation in which advection constituted the primary

influx mechanism at buildings constructed using coarse foundation underlayment and was derived from measurements made from a very small number of buildings. Due to the fact that it is extremely difficult to obtain a site-specific value for Qsoil, the use of 5 L/min is generally required as a health-protective feature, and thus is likely to over-estimate the rate of vapor entry into many buildings; especially new construction.

5. Another basic model assumption representing a significant source of uncertainty is the assumption that the driving force for subsurface vapor intrusion is advection. Specifically, the model assumes that a building, for one reason or another, generates a negative pressure relative to the subsurface soil, and thus VOCs are drawn into the building at a rate that is a direct function of that pressure difference. However, many new residential constructions in Southern California typically are characterized as having positive pressures generated by their heating and cooling air handling systems (U.S EPA 1992). Under these circumstances, the J&E model is likely to significantly over-estimate potential indoor air concentrations and their subsequent risks.

1.7 CONCLUSIONS AND RECOMMENDATIONS

Based on the risk evaluation results, IRP Site 2 groundwater does not pose unacceptable risks to human health via an indoor air inhalation exposure pathway because risks are acceptable or may be acceptable depending on site-specific and other factors considered appropriate for risk point of departure analysis per the NCP. Therefore, no action is required and no restrictions on reuse are necessary corresponding to vapor intrusion pathway at IRP Site 2. Factors that support this recommendation include the following:

- The incremental lifetime cancer risk (ILCR) due to vapor intrusion into indoor air at maximum detected concentrations in groundwater at IRP Site 2 is within the NCP-defined risk management range of 10^{-6} to 10^{-4}.
- Maximum concentrations of COPCs in groundwater were used to estimate chemical concentrations in indoor air. These maximum detected concentrations do not accurately reflect the concentrations present across the entire site. Therefore, the use of maximum concentrations to estimate chemical concentrations in indoor air is likely to be conservative and may contribute to overestimation of risks.
- The J&E model cannot assess the likelihood that a building will be constructed at all on the site, or the likelihood that it will be constructed atop or near the area of contamination.
- The J&E model is sensitive to the values for the soil parameters, and the use of site-specific soil property values for risk assessment is expected to reduce the uncertaintly. However, as described in Section 1.6, the assumptions and values used in the J&E Model were selected to provide a health-protective assessment in the event that site-specific values/information were not available. These assumptions and values are likely to over-estimate potential indoor air concentrations and their subsequent risks.
- Hazard index estimated for IRP Site 2 for residential scenario is less than 1, indicating little potential for adverse non-cancer health effects via indoor air inhalation pathway.

2. References

AECOM Technical Services, Inc, and Enviro Compliance Solutions (AECOM and ECS). 2010. *Draft Technical Memorandum, In-Situ Bioremediation Pilot Study, Installation Restoration Program Site 1, Explosive Ordnance Disposal Training Range, Former Marine Corps Air Station El Toro, California.* June 2010.

Department of Toxic Substances Control, California Environmental Protection Agency (DTSC). 2004. *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air.* December.

Earth Tech, Inc. (Earth Tech). 2005. *Final Design Submittal, Remedial Action, Operable Unit – 2B, Landfill Sites 2 and 17, Former Marine Corps Air Station, El Toro, California.* November.

The Tri-Service Environmental Risk Assessment Workgroup (TSERAWG). 2009. *Department of Defense (DoD) Vapor Intrusion Handbook.* January.

Trevet. 2010. *2009 Annual Groundwater Monitoring Report, Anomaly Area 3 and IRP Sites 1 and 2, Former MCAS El Toro.*

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United States Environmental Protection Agency (U.S. EPA). 2002. *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. EPA530-D-02-004. November.

United States Environmental Protection Agency, Region 9 (U. S. EPA). 2009. *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites.* April.

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Tables

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Table 1: List of Detected Chemicals in IRP Site 2 Groundwater with Sufficient Volatility and Toxicity to Present Potential Vapor Intrusion Risk

Analyte	Basis
1,1,2-Trichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2,3-Trichloropropane[b]	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloroethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
1,2-Dichloropropane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
2-Butanone (MEK)	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Acetone	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Benzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromomethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009)
Bromodichloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Bromoform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chlorobenzene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chlorodibromomethane	Table 1 of DTSC Guidance (DTSC 2004)
Chloroethane	Table 1 of DTSC Guidance (DTSC 2004)
Chloroform	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Chloromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Dichlorodifluoromethane	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Freon-113	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methylene Chloride	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Methyl-tertiary-butyl-ether	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Styrene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Tetrachloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Toluene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Trichloroethene	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)
Xylenes (Total)	Table A-1 of the DoD Vapor Intrusion Handbook (TSERAWG 2009) Table 1 of DTSC Guidance (DTSC 2004)

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Table 2: General Data Screening and Identification of Vapor Intrusion COPCs

Analyte	Max. Detected Concentration (μg/L)[a]	EPA Screening Level (μg/L) [b]	Max Conc. > EPA Screening Level
VOCs			
1,1,2-Trichloroethane	3.7	5	No
1,2,3-Trichloropropane	5.4	290	No
1,2-Dichloroethane	1.3	5	No
1,2-Dichloroethene (total)[c]	7.5	180	No
cis-1,2-Dichloroethene	6.2	210	No
trans-1,2-Dichloroethene	1.1	180	No
1,2-Dichloropropane	3	35	No
2-Butanone	0.95	440000	No
Acetone	17	220000	No
Benzene	0.14	5	No
Bromomethane	1	20	No
Bromodichloromethane	5	2.1	**Yes**
Bromoform	0.7	0.0083	**Yes**
Chlorobenzene	0.4	390	No
Chlorodibromomethane	4	3.2	**Yes**
Chloroethane	1.4	28000	No
Chloroform	13	80	No
Chloromethane	1.6	6.7	No
Dichlorodifluoromethane	1.1	14	No
Freon-113	0.8	1,500	No
Methyl Tert-Butyl Ether	0.3	120000	No
Methylene chloride	1	58	No
Styrene	0.43	8900	No
Tetrachloroethene	19	5	**Yes**
Toluene	0.4	1500	No
Trichloroethene	110	5	**Yes**
Xylenes (total)	0.3	78000	No

Notes:

[a] Based on the data collected from December 1995 to March 2009 and as reported in the 2009 Annual Groundwater Monitoring Report (Trevet 2009), and pre-baseline sampling conducted as part of pilot study in June 2009.

[b] Table 2c of the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) (U.S. EPA 2002)

[c] The screening values for total 1,2-dichloroethene does not exist; therefore comparison was conducted with screening values for trans-1,2-dichlorothene.

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Table 3: Summary of J&E Vapor Intrusion Model Input Parameters

Parameter[a]	Input Value - Residential	Basis
Soil Parameters		
Average soil/groundwater temperature (degrees C)	20	Average value based on the groundwater temperature data for IRP Site 2 reported in the 2009 Annual Groundwater Monitoring Report (Trevet 2010). The data reported in this report is from 1996 to 2009.
Depth below grade to bottom of enclosed space floor (cm)	15	Default value for slab-on-grade construction presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Depth below grade to water table (cm and feet)	1889.76 cm (62 feet)	Average value based on the groundwater depth for IRP Site 2 reported in the 2009 Annual Groundwater Monitoring Report (Trevet 2010). The data reported in this report is from 1996 to 2009.
Soil stratum	A	One soil stratum was assumed between the soil surface and the top of contamination or groundwater table.
Thickness of soil stratum A (cm)	1889.76	Thickness of stratum A was set to be equal to the depth below grade to groundwater table.
SCS soil type directly above water table/ Soil stratum A SCS soil type	Sandy Loam (SL)	Based on the grain-size analysis data reported in the Final Design Submittal for IRP Sites 2 and 17 Landfills (Earth Tech 2005) and Table 11 of the U.S. EPA Guidance (U.S. EPA 2004). The U.S. EPA Guidance (U.S. EPA 2004) recommends that texture classification for soil with approximately 20 percent to 50 percent fines (smaller than 0.075 mm in size) should be "Sandy Loam." Based on the sieve analysis data reported in the Final Design Submittal for IRP Sites 2 and 17 Landfills (Earth Tech 2005), the percentage of fines in ten soil samples collected from 1 to 9 feet below ground surface at IRP Site 2 ranged from 22 percent to 52 percent.
Stratum A soil dry bulk density (g/cm^3)	1.634	Average value of dry density based on the geotechnical data reported in the Final Design Submittal for IRP Sites 2 and 17 Landfills (Earth Tech 2005). The dry density value used is the average value from five samples collected from IRP Site 2.
Stratum A soil total porosity	0.387	Calculated using the following formula per the U.S. EPA Guidance (U.S. EPA 2004): 1 - (Soil dry bulk density – Soil particle density). Soil particle density was estimated to be 2.666 grams per cubic centimeter based on the specific gravity data reported in the Final Design Submittal for IRP Sites 2 and 17 Landfills (Earth Tech 2005) for five samples collected from IRP Site 2.
Stratum A soil water-filled porosity	0.13	Calculated using the dry density and total porosity values reported above. The moisture content value (7.96 percent) used in the calculation was the average value for eleven samples collected from IRP Site 2 reported in the Final Design Submittal for IRP Sites 2 and 17 Landfills (Earth Tech 2005) for eleven samples collected from IRP Site 2.
Building Parameters		
Enclosed space floor thickness (cm)	15	Equal to the value of the parameters depth below grade to bottom of enclosed space floor, specified above.
Soil-bldg. pressure differential (g/cm-sec^2)	40	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space floor length (cm)	1000	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space floor width (cm)	1000	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Enclosed space height (cm)	244	Default value for a single storey house without a basement in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Floor-wall seam crack width (cm)	0.1	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Indoor air exchange rate (1/hour)	0.5	Based on the recommended air exchange rates in DTSC guidance document (DTSC 2005).
Average vapor flow rate into building (liters per minute)	5	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Exposure Parameters		
Averaging time for carcinogens (years)	70	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).
Averaging time for noncarcinogens (years)	30	Per the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004), averaging time for noncarcinogens was set equal to the exposure duration.
Exposure duration (years)	30	Default value for residential exposure presented in the U.S. EPA guidance documents (U.S. EPA 1991 and U.S. EPA 2004).
Exposure frequency (days)	350	Default value for residential exposure presented in the U.S. EPA guidance documents (U.S. EPA 1991 and U.S. EPA 2004).
Target risk for carcinogens	1.0E-06	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004). Lower end of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)-defined cancer risk range.
Target hazard quotient for non-carcinogens	1	Default value presented in the User's Guide for Subsurface Vapor Intrusion into Buildings (U.S. EPA 2004).

Note:
[a] Values calculated by the model are not listed.

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Table 4: Cancer Risks and Non-Cancer Hazards Associated with Potential Vapor Intrusion of Groundwater COPCs at Maximum Detected Concentrations in IRP Site 2

CAS NO.	Analyte	Maximum Detected Concentration (µg/L)[a]	Risk/HQ at Maximum Detected Concentration RESIDENTIAL USE		
			Incremental Lifetime Cancer Risk - Vapor Intrusion	Percent Contribution to Cumulative Cancer Risk	HQ
75274	Bromodichloromethane	5	1.2E-07	4%	1.1E-04
75252	Bromoform	0.7	1.4E-10	0%	4.2E-06
124481	Chlorodibromomethane	4	3.3E-08	1%	4.1E-05
127184	Tetrachloroethene	19	1.3E-06	42%	1.5E-02
79016	Trichloroethene	110	1.6E-06	53%	3.2E-03
		Cumulative Risk	**3E-06**		**0.02**

Notes:

[a] Based on the data collected from December 1995 to March 2009 and as reported in the 2009 Annual Groundwater Monitoring Report (Trevet 2009), and pre-baseline sampling conducted as part of pilot study in June 2009.

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Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
22	2009 Annual Groundwater Monitoring Report	Section 2.5.2.3	2009 Annual Groundwater Monitoring Report, Marine Corps Air Station, El Toro, California. Table 7, pages 8 of 15 through 15 of 15. Trevet Environmental Consultants. 2009.

Table 7 - Summary of Historical and Current VOC Analyses

Site	Well Identification	Screen Interval (feet bgs)	Sample Date	TCE		PCE		CCl_4		1,1-DCE		1,2-DCE (Total[a])		Chloroform		Benzene		Other Compounds Detected		
				Concentrations in µg/L																
				Primary MCL (state) = 5		Primary MCL (state) = 5		Primary MCL (state) = 0.5		Primary MCL (state) = 6		Primary MCL (state) = 6/10[f]		Primary MCL (state) = 80		Primary MCL (state) = 1			Result	
IRP 2	02_NEW08A	84-104	25-Sep-01	0.5	J	**5**		1	U	1	U	1	U	0.8	J	1	U			
			7-Mar-02	1		3		0.5	U	1	U	1	U	1		1	U			
			23-Sep-02	2		3		0.5	U	1	U	1	U	2		1	U			
			23-Sep-03	0.4	J	3		0.5	U	1	U	1	U	1	U	1	U			
			18-Mar-04	1	U	3		0.5	U	1	U	1	U	1	U	1	U	Methyl-tertiary-butyl-ether	0.3	J
			20-Sep-04	0.3	J	2		0.5	U	1	U	2	U	1	U	1	U			
			16-Mar-05	1	U	**8**		0.5	U	1	U	2	U	0.3	J	1	U	Acetone	3	J
			20-Sep-05	1	U	**6**		0.5	U	1	U	2	U	1	U	1	U			
			16-Mar-06	1	U	**8**		0.5	U	1	U	2	U	1	U	1	U			
			1-Nov-06	0.5	U	**8.8**		0.5	U	0.5	U	1	U	0.5	U	0.5	U			
			4-Dec-07	1	U	4.7		0.5	U	1	U	1	U	1	U	1	U			
			1-Apr-08	1	U	3.7		0.5	U	1	U	1	U	1	U	1	U			
			5-Dec-08	0.35	J	3.7		0.5	U	1	U	1	U	0.38	J	1	U			
			25-Mar-09	1	U	4.3		0.5	U	1	U	2	U	1	U	1	U			
			8-Dec-09	0.73	J	2.5		0.5	U	1	U	1	U	0.85	J	1	U	Methylene chloride	0.98	J
IRP 2	02_NEW11	45-65	21-Dec-95	1	U	2		1	U	1	U	1	U	1	U	1	U			
			12-Nov-96	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			25-Mar-97	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			8-Jul-97	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			23-Oct-97	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			14-Oct-98	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			21-Jan-99	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			26-Apr-99	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			15-Jul-99	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			22-Jun-00	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			25-Sep-01	1	U	1	U	1	U	1	U	1	U	4		1	U	Bromodichloromethane	5	J
																		Bromoform	0.7	J
																		Chlorodibromomethane	4	J
			14-Mar-02	1	U	1	U	0.5	UJ	1	U	1	U	3		1	U	Bromodichloromethane	4	
																		Chlorodibromomethane	3	
			23-Sep-02	1	U	1	U	0.5	U	1	U	1	U	2		1	U	Acetone	1	J
																		Bromodichloromethane	2	
																		Chlorodibromomethane	1	
			22-Sep-03	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			18-Mar-04	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			20-Sep-04	1	U	1	U	0.5	U	1	U	2	U	1	U	1	U			
			29-Mar-05	1	U	1	U	0.5	U	1	U	2	U	1	U	1	U			
			20-Sep-05	1	U	1	U	0.5	U	1	U	2	U	1	U	1	U			
			21-Mar-06	1	U	1	U	0.5	U	1	U	2	U	1	U	1	U			
			2-Nov-06	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U			
			6-Dec-07	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			2-Apr-08	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			

Table 7 - Summary of Historical and Current VOC Analyses

Site	Well Identification	Screen Interval (feet bgs)	Sample Date	TCE		PCE		CCl_4		1,1-DCE		1,2-DCE (Total[a])		Chloroform		Benzene		Other Compounds Detected		
				Concentrations in µg/L																
				Primary MCL (state) = 5		Primary MCL (state) = 5		Primary MCL (state) = 0.5		Primary MCL (state) = 6		Primary MCL (state) = 6/10[f]		Primary MCL (state) = 80		Primary MCL (state) = 1			Result	
IRP 2	02_NEW11	45-65	5-Dec-08	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			23-Mar-09[c]	0.16	U	0.15	U	0.10	U	0.30	U	0.35	U	0.07	U	0.16	U	Chloroethane	1.4	
			9-Dec-09	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
IRP 2	02_NEW16	25-65	8-Oct-98	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			26-Jan-99	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			4-May-99	1	U	0.3	J	1	U	1	U	1	U	1	U	1	U			
			21-Jul-99	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			25-Sep-01	1	U	1	U	1	U	1	U	1	U	1	U	1	U			
			14-Mar-02	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			23-Sep-02	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			22-Sep-03	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U	Bromethane	1	
																		Toluene	0.4	J
																		Xylenes (Total)	0.3	J
			18-Mar-04	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			29-Mar-05	1	U	1	U	0.5	U	1	U	2	U	1	U	1	U	Acetone	1	J
			21-Sep-05	1	U	1	U	0.5	U	1	U	2	U	1	U	1	U			
			22-Mar-06	1	U	1	U	0.5	U	1	U	2	U	1	U	1	U			
			1-Nov-06	0.5	U	0.5	U	0.5	U	0.5	U	1	U	0.5	U	0.5	U	Styrene	0.43	J
			3-Dec-07	No sample collected; water level below pump intake.																
			1-Apr-08	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U	Acetone	5.7	J
			1-Apr-08	*1*	*U*	*1*	*U*	*0.5*	*U*	*1*	*U*	*1*	*U*	*1*	*U*	*1*	*U*			
			5-Dec-08	No sample collected; pump was missing from well.																
			24-Mar-09[d]	0.16	U	0.15	U	0.10	U	0.30	U	0.35	U	0.07	U	0.16	U			
			9-Dec-09	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
IRP 2	02_NEW19	86-113	1-Jul-02	**10**		0.5		NR		1	U	1		0.66		NR				
			24-Jul-03	2		0.5	U	NR		1	U	0.3	J	0.1	U	NR				
			18-May-05	1	U	3.2		NR		1	U	0.3	J	0.1	U	NR				
			31-Aug-05	0.7	J	3.2		NR		1	U	0.3	J	0.1	U	NR				
			4-Dec-07	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			2-Apr-08	0.54	J	1	U	0.5	U	1	U	1	U	1	U	1	U	Chloromethane	0.97	J
			5-Dec-08	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U			
			25-Mar-09	2		1	U	0.5	U	1	U	0.22[e]	J	1	U	1	U			
			8-Dec-09	1.6		1	U	0.5	U	1	U	0.23	J	1	U	1	U			
IRP 2	02_NEW26	70-95	7-Sep-04	3.5		0.4	J	NR		1	U	1	U	0.66		NR				
			18-May-05	0.9	J	1	U	NR		1	U	1	U	0.1	U	NR				
			24-Aug-05	4.5		0.4	J	NR		1	U	1	U	0.97		NR				
			5-Dec-07	**16**		1.6		0.5	U	1	U	1		2.6		1	U	1,2,3-Trichloropropane[b]	1.2	
																		1,1,2-Trichloroethane	0.95	J
			5-Dec-07	***17***		*1.7*		*0.5*	*U*	*1*	*U*	*1.1*		*2.9*		*1*	*U*	*1,2,3-Trichloropropane[b]*	*1.5*	
																		1,1,2-Trichloroethane	*1*	

Table 7 - Summary of Historical and Current VOC Analyses

Site	Well Identification	Screen Interval (feet bgs)	Sample Date	TCE	PCE	CCl_4	1,1-DCE	1,2-DCE (Total[a])	Chloroform	Benzene	Other Compounds Detected	
				Concentrations in µg/L								
				Primary MCL (state) = 5	Primary MCL (state) = 5	Primary MCL (state) = 0.5	Primary MCL (state) = 6	Primary MCL (state) = 6/10[f]	Primary MCL (state) = 80	Primary MCL (state) = 1		Result
IRP 2	02_NEW26	70-95	2-Apr-08	**5.4**	0.61 J	0.5 U	1 U	0.32 J	0.87 J	1 U	1,1,2-Trichloroethane	0.27 J
			5-Dec-08	**19**	1.5	0.5 U	1 U	1.3	3	1 U	1,2,3-Trichloropropane[b]	1.8
											1,2-Dichloroethane	0.3 J
											1,1,2-Trichloroethane	1.3
			26-Mar-09	3.5	0.33 J	0.5 U	1 U	2 U	0.51 J	1 U		
			8-Dec-09	**14**	1	0.5 U	1 U	0.98 J	2.2	1 U	1,1,2-Trichloroethane	0.95 J
											1,2,3-Trichloropropane[b]	1.2
IRP 2	02_NEW26	70-95	*8-Dec-09*	***13***	*1*	*0.5 U*	*1 U*	*0.97 J*	*2.1*	*1 U*	1,1,2-Trichloroethane	0.96 J
											1,2,3-Trichloropropane[b]	1
IRP 2	02_NEW28	60-70	20-May-05	**7.4**	0.5 J	NR	1 U	0.5 J	1.8	NR		
			30-Aug-05	**6.9**	0.5 J	NR	1 U	0.4 J	1.5	NR		
			6-Dec-07	**15**	0.88 J	0.5 U	1 U	0.77 J	3.1	1 U	1,2,3-Trichloropropane[b]	2.2 J
											1,1,2-Trichloroethane	1.1
											1,2-Dichloroethane	0.21 J
			1-Apr-08	**17**	0.88 J	0.5 U	1 U	1.2	4.1	1 U	1,1,2-Trichloroethane	1.2
											1,2-Dichloroethane	0.31 J
			5-Dec-08	**29**	1.1	0.5 U	1 U	2.46 J	5.8	1 U	1,1,2-Trichloroethane	2.5
											1,2,3-Trichloropropane[b]	5.4
											1,2-Dichloroethane	0.68
			26-Mar-09	**16**	0.74 J	0.5 U	1 U	2 U	2.5	1 U	1,1,2-Trichloroethane	1.0
											1,2,3-Trichloropropane[b]	1.8
											1,2-Dichloroethane	0.21 J
			9-Dec-09	**16**	0.64 J	0.5 U	1 U	5.7/0.26 J	0.98 J	1 U	1,1,2-Trichloroethane	1.5
											1,2,3-Trichloropropane[b]	**3.6**
											1,2-Dichloroethane	**0.78**
											Acetone	6.3 J
											Carbon Disulfide	0.21 J
											Methylene Chloride	2.2
IRP 2	02_NEW29	47-67	3-Dec-07	**110**	2.9	0.5 U	1 U	**7.5**	13	1 U	1,2,3-Trichloropropane[b]	4.4
											1,1,2-Trichloroethane	3.7
											1,2-Dichloroethane	0.95
			1-Apr-08	**83**	2.1	0.5 U	1 U	**6.75 J**	9.9	1 U	1,1,2-Trichloroethane	3.3
											1,2,3-Trichloropropane[b]	3.9
											Bromoform	0.34 J
			5-Dec-08	**82**	2.4	0.5 U	1 U	**6.5 J**	10	1 U	1,1,2-Trichloroethane	3.1
											1,2,3-Trichloropropane[b]	2.1
											1,2-Dichloroethane	0.91
			25-Mar-09	**61**	2	0.5 U	1 U	4.8 J	8.1	1 U	1,1,2-Trichloroethane	2.7
											1,2-Dichloroethane	0.56

Table 7 - Summary of Historical and Current VOC Analyses

Site	Well Identification	Screen Interval (feet bgs)	Sample Date	TCE	PCE	CCl_4	1,1-DCE	1,2-DCE (Total[a])	Chloroform	Benzene	Other Compounds Detected	
				Concentrations in µg/L								
				Primary MCL (state) = 5	Primary MCL (state) = 5	Primary MCL (state) = 0.5	Primary MCL (state) = 6	Primary MCL (state) = 6/10[f]	Primary MCL (state) = 80	Primary MCL (state) = 1		Result
IRP 2	02_NEW29	47-67	8-Dec-09	**89**	2.8	0.5 U	1 U	5.8/1.1	11	1 U	1,1,2-Trichloroethane	3
											1,2,3-Trichloropropane[b]	**1.9**
											1,2-Dichloroethane	**0.9**
											Methylene Chloride	1.2
IRP 2	02PZ04	60-80	25-Nov-02	**31**	1	NR	1 U	3.3 J	10.4	NR		
			4-Aug-03	**31**	1	NR	1 U	4 J	8.6	NR		
			19-May-05	**23**	1 U	NR	1 U	1 U	6.04	NR		
			20-Jun-05	**28.8**	1.3	NR	0.5 U	2.5	0.5 U	NR		
			30-Aug-05	**32**	1 U	NR	1 U	2.9	8.45	NR		
			4-Dec-07	NA	NA	NA	NA	NA	NA	NA		
			1-Apr-08	NA	NA	NA	NA	NA	NA	NA		
			5-Dec-08	NA	NA	NA	NA	NA	NA	NA		
			25-Mar-09	NA	NA	NA	NA	NA	NA	NA		
			9-Dec-09	NA	NA	NA	NA	NA	NA	NA		
IRP 2	02PZ12	60-80	20-Nov-02	1 U	1 U	NR	1 U	1 U	1 U	NR		
			25-Jul-03	1 U	1 U	NR	1 U	1 U	1 U	NR		
			19-May-05	1 U	1 U	NR	1 U	1 U	1 U	NR		
			20-Jun-05	0.5 U	0.75 U	NR	0.5 U	0.5 U	0.5 U	NR		
			30-Aug-05	1 U	1 U	NR	1 U	1 U	1 U	NR		
			4-Dec-07	1 U	1 U	0.5 U	1 U	1 U	1 U	1 U		
			1-Apr-08	1 U	1 U	0.5 U	1 U	1 U	1 U	1 U	Chloromethane	1.6
			5-Dec-08	1 U	1 U	0.5 U	1 U	1 U	1 U	1 U		
			26-Mar-09	1 U	1 U	0.5 U	1 U	2 U	1 U	1 U		

Table 7 - Summary of Historical and Current VOC Analyses

Site	Well Identification	Screen Interval (feet bgs)	Sample Date	TCE		PCE		CCl_4		1,1-DCE		1,2-DCE (Total[a])		Chloroform		Benzene		Other Compounds Detected		
				Concentrations in µg/L																
				Primary MCL (state) = 5		Primary MCL (state) = 5		Primary MCL (state) = 0.5		Primary MCL (state) = 6		Primary MCL (state) = 6/10[f]		Primary MCL (state) = 80		Primary MCL (state) = 1			Result	
IRP 2	02PZ12	60-80	*26-Mar-09*	*1*	*U*	*1*	*U*	*0.5*	*U*	*1*	*U*	*2*	*U*	*1*	*U*	*1*	*U*			
			8-Dec-09	1	U	1	U	0.5	U	1	U	1	U	1	U	1	U	Methylene Chloride	0.93	J

Notes:

a - 1,2-DCE total results include cis-1,2-DCE and trans-1,2-DCE for either detect or non-detect results. (cis-1,2-DCE/trans-1,2-DCE)

b - Detections of 1,2,3-trichloropropane exceed the California Department of Health Services notification level of 0.005 µg/L.

c - 02_NEW11 was sampled and analyzed during Spring 2009 monitoring round by AECOM on 23 March 2009.

d - 02_NEW16 was sampled and analyzed during Spring 2009 monitoring round by AECOM on 24 March 2009. AECOM conducted all analyses except perchlorate; AECOM delivered a groundwater sample to Jonas for submission to EMAX for perchlorate analysis.

e - 02_NEW19 sample detected cis-1,2-DCE at 0.22J µg/L & trans-1,2-DCE was non-detect at less than 1 µg/L.

f - California Primary MCL for cis-1,2-DCE is 6 µg/L and 10 µg/L for trans-1,2-DCE.

Italicized results are of field duplicates.

Bold and shaded results meet or exceed regulatory standard.

References:

Historical IRP Sites 1 and 2 data presented in this table have been compiled from Rounds 3 through 24 groundwater monitoring reports (CDM 1996b,1997a,b,c, 1998, 2000a,b, 2001a,b, 2002a,b, 2003a,b, 2004a,b,c, 2005, 2006b,c, and 2007b) and from ECS 2006a,b (see Section 5, References).

Historical AA 3 data presented in this table have been compiled from Earth Tech and Barajas 2005 and Earth Tech 2007 (see Section 5, References).

Historical AA 3 and IRP Sites 1 and 2 data presented in this table subsequent to Round 24 have been compiled from CDM 2008, 2009a, 2009b, and Jonas 2009.

Acronyms and Abbreviations:

AA = Anomaly Area
Barajas = Barajas and Associates
bgs = below ground surface
CDM = CDM Federal Programs Corporation
CCl_4 = carbon tetrachloride
DCE = dichloroethene
ECS = Enviro Compliance Solutions, Inc.
Earth Tech = Earth Tech, Inc.
IRP = Installation Restoration Program
Jonas = Jonas and Associates, Inc.
MCL = maximum contaminant level
NA = not analyzed
ND = not detected above laboratory reporting limit
NR = not recorded
PCE = tetrachloroethene
RPM = Remedial Project Manager
TCE = trichloroethene
µg/L = micrograms per liter

Data Qualifiers:

B = reported value is less than contract required detection limit, but greater than instrument detection limit
J = estimated concentration
U = not detected above the level of the associated value

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
23	Final Interim ROD for IRP Sites 2 and 17	Section 2.5.2.3, Table 2-4	Final Interim Record of Decision, Operable Unit 2B, Landfill Sites 2 and 17, Marine Corps Air Station El Toro, California. Table 6-2. Navy. 2000.

Table 6-2
Landfill Sites – Summary of Noncancer Risks (Hazard Index)

			PHASE II RI[a] RISK ASSESSMENT			
Site Number	Site Name	Unit Number	Recreational Soil Exposure Scenario (0 to 2 feet bgs[b])[c]	Recreational Scenario Risk Drivers[d]	Residential Groundwater Use Scenario	Residential Scenario Risk Drivers[d]
2	Magazine Road Landfill	Sitewide	0.99	MCPP[e] (22%)	6.1	arsenic (46%) fluoride (21%) manganese (13%) nickel (8%)
17	Communication Station Landfill	Sitewide	0.14	—	6.1	arsenic (46%) manganese (22%) fluoride (14%) nickel (14%)

Notes:
[a] RI – remedial investigation
[b] bgs – below ground surface
[c] cancer risk results shown are for the hypothetical residential adult; adult cancer risks are higher than the child cancer risks
[d] as determined by human-health risk assessment, number in parentheses is percentage of risk accounted for by the risk driver
[e] MCPP – 2-(2-methyl-4-chlorophenoxy)-propionic acid

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
24	RAOs	Section 2.7	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 4.2. AECOM. April 2011.

4. Identification and Screening of Technologies

4.1 INTRODUCTION

The purpose of this phase of the FS is to identify and screen potentially applicable technologies for development of remedial alternatives to address potential risks to human-health and the environment due to impacted groundwater at IRP Sites 1 and 2. The identification and screening of technologies included:

- Development of RAOs specifying the media of concern (groundwater) for the response action, COCs, and exposure pathways.
- Development of GRAs (e.g., containment, treatment) for the medium of concern (groundwater) that may be taken to satisfy the RAOs.
- Delineation of target remediation zones (volumes or areas of media) to which GRAs might be applied taking into account the requirements for protectiveness as identified in the RAOs and site characteristics.
- Identification and screening of technologies applicable to each GRA to eliminate those that cannot be implemented technically at the site.
- Evaluation of technically implementable technology process options for each GRA on the basis of their effectiveness to achieve the RAOs, technical and administrative implementability, and cost.

Each of these steps is discussed in the following sections.

4.2 REMEDIAL ACTION OBJECTIVES – IRP SITES 1 AND 2

RAOs are medium-specific goals for protecting human-health and the environment. In accordance with the NCP, 40 C.F.R. § 300.430 (e)(2)(i), RAOs for IRP Sites 1 and 2 were developed by specifying COCs, medium of concern (groundwater), potential exposure pathways, and remediation goals.

4.2.1 Media of Concern

4.2.1.1 IRP SITE 1

The medium of concern discussed in this FS is groundwater impacted with perchlorate at and downgradient of IRP Site 1 (also referred to as IRP Site 1 perchlorate-impacted groundwater or perchlorate-impacted groundwater). Other media of concern at IRP Site 1 are addressed in a separate FS Report.

4.2.1.2 IRP SITE 2

The medium of concern discussed in this FS is groundwater impacted with VOCs at and downgradient of IRP Site 2. Other media of concern were addressed in a separate FS Report (BNI 1997).

4.2.2 Chemicals of Concern

All remedial actions at CERCLA sites must be protective of human-health and the environment, and comply with ARARs unless a waiver is justified. Therefore, the selection of COCs for IRP Sites 1 and 2 groundwater was based on human-health risk considerations and ARARs as described below.

The aquifer underlying former MCAS El Toro (Irvine Groundwater Management Zone) is a Class II aquifer pursuant to the U.S. EPA's draft groundwater policy for classification of groundwater systems. Class II consists of groundwater that is currently being used or that might be used as a source of drinking water in the future. Therefore, Federal or more stringent State MCLs constitute potential chemical-specific ARARs for groundwater at IRP Sites 1 and 2, and were used for selection of COCs.

IRP Site 1

Based on the data evaluation and recommendations of the Phase II RI (Earth Tech 2006a), perchlorate was selected as a COC for IRP Site 1 groundwater. Perchlorate exceeded its State MCL consistently at several locations at and downgradient of IRP Site 1.

IRP Site 2

Based on the groundwater sampling and analyses data summarized in Section 3.2, the following analytes exceeded their respective Federal and/or State MCLs in IRP Site 2 groundwater relatively consistently:

- TCE
- PCE
- cis-1,2-DCE
- 1,1,2-TCA
- 1,2-DCA

Therefore, these analytes were selected as COCs for IRP Site 2 groundwater based on the ARARs and human-health risk considerations.

4.2.3 Potential Exposure Pathways

This section presents potential exposure pathways specific to the COCs identified in Section 4.2.2 for IRP Site 1 groundwater and IRP Site 2 groundwater. These exposure pathways are consistent with those assumed during the human-health risk assessment completed as part of the RIs (Earth Tech 2006a and BNI 1996b) and/or this FS

4.2.3.1 IRP SITE 1

Currently, groundwater at and downgradient of IRP Site 1 up to the Station Boundary is not used for drinking water purposes; therefore, no current on-site receptors or exposure pathways have been identified for perchlorate-impacted groundwater. Since the DON intends to transfer IRP Site 1 for like use (i.e., EOD training), no on-site receptors are expected to be exposed to perchlorate-impacted groundwater for the likely future land use at IRP Site 1. However, as discussed in Section 3.1.1.1, it is possible that IRP Site 1 may be used in the future as an open space/wildlife reserve, or for residential or industrial purposes, although such reuse is unlikely. The wildlife reserve worker is not expected to be exposed to perchlorate in groundwater. If domestic groundwater use was assumed, exposure of potential on-site residents and industrial workers to perchlorate in groundwater could occur via the following exposure pathways:

- Ingestion of impacted groundwater
- Dermal contact with impacted groundwater

Perchlorate sampling results at and downgradient of IRP Site 2 have indicated that there is a potential for perchlorate to migrate off-Station at concentrations exceeding its California MCL of 6 μg/L. Therefore, to protect human-health and the environment, potential off-Station hypothetical residents were identified as potential receptors for perchlorate-impacted groundwater. The exposure pathways for potential off-Station residents to perchlorate-impacted groundwater are the same as those identified for on-site residents.

4.2.3.2 IRP SITE 2

Based on the current and potential land use, and existing site conditions, only off-site hypothetical residents living at the boundary of IRP Site 2 are considered as potential receptors in this FS. The exposure of off-site hypothetical residents to COCs in groundwater is assumed to occur via the following pathways:

- Ingestion of impacted groundwater
- Dermal contact with impacted groundwater
- Inhalation of volatiles from groundwater during household water use

Currently, groundwater at IRP Site 2 is not used for drinking water purposes. In a scenario where ICs will restrict domestic use of groundwater, and structures are built over the IRP Site 2 VOC-impacted groundwater, the exposure of potential on-site receptors may occur through vapor intrusion of VOCs into indoor air.

4.2.4 Applicable or Relevant and Appropriate Requirements

This section discusses the potential Federal and State of California ARARs affecting the development of RAOs for remediation of perchlorate-impacted groundwater at IRP Site 1 and VOC-impacted groundwater at IRP Site 2. A detailed discussion of ARARs is presented in Appendix A of this document.

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

As the lead Federal agency, the DON has primary responsibility for identifying Federal ARARs at former MCAS El Toro. Identification of potential State ARARs was initiated through DON requests that the Cal/EPA DTSC identify potential State ARARs. The solicitation of state ARARs is discussed in more detail in Attachment 1 of Appendix A.

Pursuant to the EPA guidance (U.S. EPA 1988a), ARARs are generally divided into three categories: chemical-specific, location-specific, and action-specific requirements. Chemical-specific ARARs are generally health- or risk-based numerical values or methodologies applied to site-specific conditions that result in the establishment of a cleanup level. Location-specific ARARs are restrictions placed on the concentrations of COPCs or conduct of certain activities solely because they are in specific locations. Action-specific ARARs are usually technology- and activity-based requirements or limitations on actions taken to remediate a site.

Potential ARARs have been identified for IRP Sites 1 and 2 in Appendix A for each medium, location, and response action alternative. The following sections present a summary of these potential ARARs.

4.2.4.1 IRP SITE 1

General Approach to Resource Conservation and Recovery Act (RCRA) Requirements

The State of California (DTSC) and the DON maintain different positions with regard to activities conducted within former EOD Training Range and their regulation under Resource Conservation and Recovery Act (RCRA). These differing positions are discussed in detail in Section A1.3.2 of Appendix A. The State of California (DTSC) maintains that the DON operated an open burn/open detonation (OB/OD) facility within the IRP Site 1 investigation area and, RCRA closure and post-closure requirements specified in Chapter 6.5 of the California Health and Safety Code and California Code of Regulations (CCR), title (tit.) 22 § 66265.112 apply to the OB/OD unit. DON used munitions at the former EOD Training Range for their intended purpose, including the training of military personnel, and explosives and emergency response specialists, and such training is neither waste treatment nor disposal. Therefore, the DON maintains that activities conducted at the former EOD Training Range were not regulated under the RCRA.

Both the DON's and the DTSC positions regarding the applicability of RCRA requirements have been documented in the Phase II RI Work Plan and Phase II RI for IRP Site 1. To facilitate resolution of the differing positions, the DON indicated that it would incorporate the substantive provisions of the State's RCRA closure and post-closure requirements into the CERCLA related documentation for IRP Site 1. This position was acknowledged by the DTSC in a letter dated 19 March 2001. In accordance with this resolution, this FS evaluates RCRA closure and post-closure requirements identified by the State in letters dated 19 March 2001 and 21 June 2006, as potential "relevant and appropriate" ARARs.

Potential Chemical-Specific Applicable or Relevant and Appropriate Requirements

The soil cuttings and well development water at IRP Site 1 would not be classified as RCRA-listed hazardous wastes. The hazardous waste characteristics determination would be made at the time the waste is generated. The substantive provisions of CCR tit. 22, § 66261.21, § 66261.22(a)(1), § 66261.23, § 66261.24(a)(1), and § 66261.100 are potential Federal ARARs for determining whether the waste generated during the remedial action is a RCRA hazardous waste. The substantial provisions of CCR tit. 22, § 66261.24(a)(2) are potential State ARARs for determining whether the waste exhibits the characteristics of the California-regulated, non-RCRA hazardous waste.

The substantive provisions of the following requirements would constitute potential Federal and State chemical-specific ARARs for IRP Site 1 groundwater remediation:

- The substantive provisions in Chapters 3 and 4 of the Basin Plan for Santa Ana River Basin (RWQCB 24 January 1995, updated February 2008), including beneficial use, water quality objectives (WQOs), and waste discharge limitations are potential State ARARs.
- The State primary MCL for perchlorate at CCR tit. 22, 64431§ is a potentially relevant and appropriate State ARAR.
- Substantive provisions in RCRA groundwater protection standards in CCR tit. 22, §66264.94(a)(1), (a)(3), (c), (d), and (e) are potentially relevant and appropriate Federal ARARs.

Potential Location-Specific Applicable or Relevant and Appropriate Requirements

Wetlands protection, floodplain management, and biological resources are the resource categories relating to location-specific requirements potentially affected by the IRP Site 1 response actions. Therefore, substantive requirements at 40 C.F.R. § 6.302 (a) and 40 C.F.R. pt. 6, app. A, § 6(a)(1), (3), and (5) (at the end of § 6.1007) are potentially relevant and appropriate for protection of

wetlands. The substantive requirements of 40 C.F.R. § 6.302(b) and 40 C.F.R. pt. 6 Appendix A, § 6(a)(1), (3), and (5) (at the end of § 6.1007), are potential ARARs for IRP Site 1 groundwater remedial activities in the floodplain. Since IRP Site 1 may have protected species and migratory birds, the remedial action for IRP Site 1 would need to comply with the substantive provisions of the Endangered Species Act and Migratory Bird Treaty Act.

Potential Action-Specific Applicable or Relevant and Appropriate Requirements

For the groundwater remedial alternatives involving reinjection of the treated groundwater, the underground injection control (UIC) regulations established pursuant to the Safe Drinking Water Act (SDWA) constitute potential Federal ARARs. The reinjection wells for treated groundwater would be designated as Class V wells per 40 C.F.R. § 144.6(e). The extracted groundwater would be treated so that the concentrations of COCs do not exceed the MCLs, before reinjection into the aquifer.

During remedial action implementation for IRP Site 1 perchlorate-impacted groundwater, discharge of fill material (as defined in 40 C.F.R. § 232.2) may occur to the waters of the U.S. Therefore, the discharge of fill material will comply with substantive provisions of 40 C.F.R §§ 230.10 (a), (c), and (d); and 33 C.F.R §§ 323.3(a) and (b); and 330.1(b) and (c) by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers (USACE). CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).

The DTSC identified California Civil Code (Cal. Civ. Code) § 1471; Cal. Health & Safety Code §§ 25202.5, 25222.1, 25233(c), 25234, and 25355.5(a)(1)(c); and CCR tit. 22, § 67391.1. as potential ARARs for the IRP Site 1 remedial action. The substantive provisions of these regulations are potential ARARs only if IRP Site 1 property or property overlying perchlorate-impacted groundwater is transferred to a non-Federal entity.

Implementation of Alternative G1-6; and Alternatives G1-3, G1-4, and G1-5 (only if groundwater recirculation system is implemented as a remedy) may lead to extraction of TCE-impacted groundwater associated with IRP Site 2. Therefore, Alternatives G1-3, G1-4, G1-5, and G1-6 may need to comply with substantive provisions of the South Coast Air Quality Management District (SCAQMD) Rule 1401 for VOCs air emissions.

4.2.4.2 IRP SITE 2

Potential Chemical-Specific Applicable or Relevant and Appropriate Requirements

The soil cuttings and well development water at IRP Site 2 would not be classified as RCRA-listed hazardous wastes. The hazardous waste characteristics determination would be made at the time the waste is generated. The substantive provisions of CCR tit. 22, § 66261.21, § 66261.22(a)(1), § 66261.23, § 66261.24(a)(1), and § 66261.100 are potential Federal ARARs for determining whether the waste generated during the remedial action is a RCRA hazardous waste. The substantial provisions of CCR tit. 22, § 66261.24(a)(2) are potential State ARARs for determining whether the waste exhibits the characteristics of the California-regulated, non-RCRA hazardous waste.

The substantive provisions of the following requirements would constitute potential Federal and State chemical-specific ARARs for IRP Site 2 groundwater remediation:

- The substantive provisions in Chapters 3 and 4 of the Basin Plan for Santa Ana River Basin (RWQCB 24 January 1995, updated February 2008), including beneficial use, WQOs, and waste discharge limitations are potential State ARARs.
- Federal MCLs for TCE and PCE at 40 C.F.R. § 141.61(a), and nonzero maximum contaminant level goal (MCLG) for 1,1,2-TCA at 40 C.F.R. § 141.50(b) are potentially relevant and appropriate Federal ARARs.

- The State primary MCLs for cis-1,2-DCE, and 1,2-DCA at CCR tit. 22, § 64444 are potentially relevant and appropriate State ARARs since they are more stringent than the corresponding Federal MCLs.
- Substantive provisions in RCRA groundwater protection standards in CCR tit. 22, §66264.94(a)(1), (a)(3), (c), (d), and (e) are potentially relevant and appropriate Federal ARARs.

Potential Location-Specific Applicable or Relevant and Appropriate Requirements

Floodplain management and biological resources are the resource categories relating to location-specific requirements potentially affected by IRP Site 2 groundwater remedial actions. IRP Site 2 is within the 100-year flood plain. Therefore, the substantive requirements at 40 C.F.R. § 6.302(b) and 40 C.F.R. part 6 Appendix A, § 6(a)(1), (3), and (5) (at the end of § 6.1007), are potentially relevant and appropriate. Since IRP Site 2 may have protected species and migratory birds, the remedial action for IRP Site 2 would need to comply with the substantive provisions of the Endangered Species Act and Migratory Bird Treaty Act.

Potential Action-Specific Applicable or Relevant and Appropriate Requirements

For the groundwater remedial alternatives involving reinjection of the treated groundwater, the UIC regulations established pursuant to the SDWA constitute potential Federal ARARs. The reinjection wells for treated groundwater would be designated as Class V wells per 40 C.F.R. § 144.6(e). The extracted groundwater would be treated so that the concentrations of COCs do not exceed the MCLs, before reinjection into the aquifer.

During remedial action implementation for IRP Site 2 VOC-impacted groundwater, discharge of fill material (as defined in 40 C.F.R. § 232.2) may occur to the waters of the U.S. Therefore, the discharge of fill material will comply with substantive provisions of 40 C.F.R §§ 230.10 (a), (c), and (d); and 33 C.F.R §§ 323.3(a) and (b); and 330.1(b) and (c) by complying with substantive provisions of the Nationwide Permit 38 issued by the USACE. CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).

The substantive provisions of Cal. Civ. Code § 1471; CCR tit. 22, § 67391.1; and California Health & Safety Code §§ 25202.5, 25222.1, 25233[c], 25234, and 25355.5[a][1][C]) are potential ARARs for implementation of ICs.

Implementation of Alternative G2-4; and Alternative G2-3 (only if groundwater recirculation system is implemented as a remedy) may lead to extraction of VOC-impacted groundwater associated with IRP Site 2. Therefore, Alternatives G2-3 and G2-4 would need to comply with substantive provisions of the SCAQMD Rule 1401 for VOC air emissions.

4.2.5 Remedial Action Objectives

Based on the COCs, potential exposure pathways and risks to human-health and the environment, and potential ARARs, the following RAOs were developed for remediation of IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater:

- Minimize the potential for domestic use of groundwater with concentrations of COCs exceeding the established respective CGs.
- Minimize off-Station migration of groundwater with concentrations of COCs exceeding the established respective CGs.

The above RAOs are consistent with the provisions of 40 C.F.R. § 300.430 (e)(2)(i), since they specify COCs (listed in Section 4.2.2), medium of concern (groundwater), potential exposure pathways (domestic use) and remediation goals/CGs. The NCP further specifies that remediation goals shall establish acceptable exposure levels that are protective of human-health and the environment, and shall be developed by considering several factors including ARARs, cancer risk/non-cancer hazards, factors related to technical limitations such as detection/quantification limits, factors related to uncertainty, and other pertinent information (40 C.F.R. § 300.430 [e][2][i]). Based on this, the CGs/remediation goals for COCs in IRP Sites 1 and 2 groundwater were established at the levels that comply with potential chemical-specific ARARs (see Section 4.2.4), and are protective of human-health and the environment.

The potential chemical specific ARARs for groundwater remedial action at IRP Sites 1 and 2 include Federal MCLs, Federal *non-zero* MCLGs, and State MCLs. In order to comply with ARARs and protection of human-health, the CGs for COCs for remediation of perchlorate-impacted groundwater at IRP Site 1 and VOC-impacted groundwater at IRP Site 2, were set at the values that represent the least of the Federal MCL, Federal non-zero MCLGs, and California MCL (see Table 4-1).

4.3 GENERAL RESPONSE ACTIONS

The GRAs describe those actions that will satisfy RAOs. The following sections present GRAs for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater.

4.3.1.1 NO ACTION

Under this GRA, no further response action would be conducted for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater.

4.3.1.2 NATURAL ATTENUATION AND MONITORING

Under this GRA, natural attenuation processes including dispersion, dilution, and biodegradation would be relied upon to reduce concentrations of COCs in groundwater. Groundwater sampling and analyses would be conducted to monitor the efficiency of natural attenuation mechanisms for reduction in concentrations of COCs and to evaluate potential migration of VOC-impacted groundwater beyond the Station Boundary.

4.3.1.3 INSTITUTIONAL CONTROLS

The ICs would include non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to VOC-impacted groundwater by restricting its use. The administrative/legal controls may be in the form of restrictions that prohibit the use of groundwater for purposes that may lead to unacceptable exposure of the current or potential future land/groundwater users.

4.3.1.4 CONTAINMENT

This GRA includes containment of VOC-impacted groundwater at or near the Station Boundary in the vicinity of IRP Site 2 by a vertical barrier. The containment would minimize off-Station migration of the VOC-impacted groundwater posing unacceptable risk to human-health.

4.3.1.5 IN-SITU TREATMENT

This GRA would include treatment of VOC-impacted groundwater using physical/chemical or biological treatment technologies. Groundwater would not be extracted aboveground and the treatment would occur entirely in the subsurface. The implementation scope for in-situ treatment would be to achieve the RAOs.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
25	screening of technologies and process options	Section 2.8	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 4.5 and Tables 4-2 and 4-3. AECOM. April 2011.

4.3.1.6 *Ex-Situ Treatment and Discharge*

This GRA would include extraction of VOC-impacted groundwater and aboveground treatment using physical/chemical or biological processes. The treated groundwater would be discharged using appropriate technologies. As with the in-situ treatment, the implementation scope for ex-situ treatment would be to achieve the RAOs.

4.4 Target Remediation Zone

4.4.1 IRP Site 1

The groundwater remedial action at IRP Site 1 would address perchlorate to achieve the RAOs established in Section 4.2.5. The target zone for this remedial action would be defined by the perchlorate concentrations exceeding the California MCL of 6 µg/L. The most recent groundwater monitoring data suggest that in general groundwater with perchlorate concentrations exceeding 6 µg/L (perchlorate-impacted groundwater) extends from the central portion of IRP Site 1 downgradient to the hydropunch location 02NEW12 (see Figure 3-7). In addition, there are isolated locations with perchlorate concentrations exceeding 6 µg/L in the northern portion of IRP Site 1.

It should be noted that past data have shown that there is some variability with respect to the extent of perchlorate downgradient of IRP Site 2. The groundwater monitoring data from December 2005 showed perchlorate concentrations exceeding 6 µg/L extending outside the Station Boundary up to Monitoring Well 02NEW26.

4.4.2 IRP Site 2

The groundwater remedial action at IRP Site 2 would address COCs to achieve the RAOs established in Section 4.2.5. The target zone for this remedial action would be defined by the COC concentrations exceeding their respective CGs. The extent of COCs exceeding their respective CGs are shown on Figures 3-8 and 3-12.

4.5 Identification and Screening of Technology Types and Process Options

The identification and screening of technology types and process options were carried out separately for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater as follows:

- In the first-step, potentially available technically implementable technology types were identified corresponding to each GRA identified for the impacted groundwater. In accordance with the EPA *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (U.S. EPA 1988b), the technology types include general categories of remediation technologies such as ICs, PRBs, in-situ bioremediation, and ex-situ physical/chemical or biological treatment.
- In the second step, technology process options were identified for each remediation technology. For example, in-situ bioremediation includes several process options such as direct injection, groundwater recirculation loop, and a trench/trenchless PRB.
- In the third step, technically implementable process options were evaluated based on effectiveness, implementability, and cost, to select representative process options for alternative development. The effectiveness evaluation focused on ability of the process option to handle estimated areas and volumes of groundwater (i.e., to reduce volume, toxicity, and mobility of COCs in groundwater), potential impacts to human-health and the environment during implementation of the process option, and whether the process is reliable and proven for remediation of COCs.

The implementability evaluation focused on technical as well as institutional aspects of implementability, such as the ability to obtain necessary regulatory approvals, availability of equipment and skilled workers, extensiveness of knowledge required to implement the process option, and the need for treatment or disposal of process waste.

The cost evaluation included semi-quantitative analysis based on engineering judgment. Relative capital and operation and maintenance (O&M) costs were used rather than detailed estimates. Based on the costs, each process option was evaluated as to whether costs are high, low, or medium relative to other process options in the same technology type.

Tables 4-2 and 4-3 present identification and screening of technology types and process options for IRP Site 1 perchlorate-impacted groundwater, and IRP Site 2 VOC-impacted groundwater, respectively.

Process options selected during the screening process were carried forward in the FS in the development and evaluation of remedial alternatives in later sections; those process options that are screened out were not carried forward.

Table 4-2: Identification and Screening of Technology Types and Process Options — IRP Site 1 Perchlorate-Impacted Groundwater

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
No-Action	None	None Available	No Action	No remedial action would be implemented to reduce volume, toxicity or mobility of perchlorate in groundwater. Any reduction in perchlorate volume, toxicity, or mobility would occur primarily through natural attenuation. Perchlorate may migrate off-Station at concentrations exceeding its CG and pose potential risks to human-health.	Easily implementable since no action needs to be taken.	There are no costs associated with this technology.	**Selected** as a stand-alone alternative in compliance with the NCP.
Natural Attenuation and Monitoring	Monitored Natural Attenuation (MNA)	MNA	MNA involves natural in-situ physical, chemical, and/or biological processes including biodegradation, dispersion, dilution, sorption, volatilization, chemical or biological stabilization, transformation, or destruction of contaminants, that under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. Under this process option, groundwater monitoring would be conducted at IRP Site 1 to assess the efficacy of natural attenuation mechanisms for perchlorate reduction and to evaluate potential migration of perchlorate-impacted groundwater beyond the Station Boundary.	An evaluation of perchlorate data over time from individual wells indicates that relatively high fluctuations in perchlorate concentrations have been observed over time in most wells. In some cases, there is a positive correlation between perchlorate concentrations and water levels. In other cases, there is limited or inverse correlation between perchlorate concentrations and water levels. No clear/consistent decreasing trends in perchlorate concentrations are evident from intra-well perchlorate data over time. However, the spatial distribution of perchlorate at IRP Sites 1 and 2, indicates that perchlorate concentrations decrease by one order of magnitude from the Source Area in the central portion of IRP Site 1 to the aquifer immediately upgradient of IRP Site 2. This indicates that natural attenuation processes such as dilution and dispersion may be effective in reducing volume and toxicity of perchlorate in groundwater. MNA is not expected to effectively control the potential off-Station migration of perchlorate-impacted groundwater and potential exposure of off-site receptors. Minimal adverse impacts are expected during the implementation of MNA, since perchlorate-impacted groundwater would be treated in-place and would not be pumped aboveground.	This is a passive approach inherent at every site. Since only groundwater monitoring is required, this technology is easily implementable.	Low.	**Selected** for alternative development.
ICs and Access Restrictions	ICs	ICs	ICs include administrative and/or legal controls such as groundwater use restrictions to minimize the potential for exposure to impacted groundwater.	ICs do not reduce volume, toxicity, or mobility of perchlorate in groundwater. However, ICs would minimize the potential for exposure to perchlorate-impacted groundwater by restricting groundwater use. No adverse impacts occur during the implementation of ICs since no construction activities are associated with this process option.	ICs are relatively easy to implement. Implementation of ICs for off-Station portion of the groundwater plume may require additional administrative effort.	Low.	**Selected** for alternative development. To be used in conjunction with other remediation technologies for alternative development.
Containment	Vertical Barriers	Slurry Walls/ Sheet Pile Walls/ Grout Curtains	Containment using slurry walls involves containing the contaminated media by excavating vertical trenches around the contaminated mass and filling them up with slurry (mixture of bentonite and water or cement, bentonite, and water) to reduce contaminant migration due to groundwater movement. This technology may also include driving sheet piles into the subsurface to create a vertical barrier to contaminant migration. Containment using grout curtains involves installation of narrow, vertical, grout walls in the ground by pressure injecting grout directly into the soil at closely spaced intervals around the contaminated mass to reduce contaminant migration due to groundwater movement.	This technology does not directly reduce volume or toxicity of perchlorate in groundwater. If implemented properly, this technology may reduce mobility of perchlorate-impacted groundwater. This technology would rely on natural attenuation for remediation of perchlorate. Although, vertical barriers may be able to minimize potential off-Station migration of perchlorate-impacted groundwater, the other options such as PRBs (discussed below) are expected to be much more cost-effective to achieve the same purpose. Site workers may get exposed to impacted soil, fugitive dust, and gas emissions during construction.	High-level of site-specific characterization and experienced personnel would be required for implementation. Equipment and materials are readily available. However, it would be technically challenging to install vertical barriers to depths exceeding 60 feet bgs.	Very High	**Not selected** for alternative development primarily due to effectiveness and cost considerations.

Table 4-2: Identification and Screening of Technology Types and Process Options — IRP Site 1 Perchlorate-Impacted Groundwater (continued)

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
In-Situ Treatment	In-Situ Bioremediation	Groundwater Recirculation System	This technology includes installation of extraction and injection wells within the contaminated portion of the aquifer. Contaminated water is extracted from the extraction wells, amended with substrates and reinjected into the aquifer. The amendments may be soluble organic substrates such as lactate or molasses. These organic substrates are used by perchlorate-degrading bacteria as electron donors to biodegrade perchlorate to innocuous end products. For containment of perchlorate-impacted groundwater, a groundwater recirculation system may be installed downgradient of IRP Site 1 near the Station Boundary to minimize the potential for off-Station migration of the impacted groundwater with perchlorate concentrations exceeding its CG. For in-situ bioremediation of the estimated extent perchlorate-impacted groundwater at and downgradient of IRP Site 1, two or more groundwater recirculation systems may need to be installed perpendicular to the groundwater flow.	The in-situ bioremediation pilot studies have demonstrated that this technology completely destroys perchlorate by converting it into innocuous products, and is capable of reducing perchlorate concentrations to less than its CG. Groundwater recirculation coupled with bioremediation is capable of minimizing potential off-Station migration of perchlorate at concentrations exceeding its MCL/CG. The effectiveness of this technology depends greatly upon sustainable extraction and injection rates for groundwater and capture zones. Site workers may get exposed to impacted groundwater since it is pumped and handled aboveground. At least one pilot scale study has been identified nationwide where a hydraulic biobarrier was used to reduce perchlorate concentrations in groundwater from 8,000 μg/L to less than 4 μg/L (ITRC 2005).	Installation of extraction and injection wells for groundwater remediation is a mature, well-known technology. The design and construction of a groundwater recirculation system may require pre-design studies and experienced personnel.	High	**Selected** for alternative development.
		Direct Injection	This in-situ bioremediation technology involves delivery of electron donors/nutrients under pressure directly into the contaminated portion of the aquifer at injection points or wells typically distributed in a grid pattern. The electron donor stimulates bacteria that use perchlorate as an electron acceptor and degrades it into innocuous products. The injection of an electron donor may be conducted using groundwater injection wells or using hydraulic or pneumatic fracturing technologies. Hydraulic or pneumatic fracturing technologies increase the permeability of the subsurface by creating a network of fractures using pressurized liquid or gas. This increase in permeability may lead to more uniform and efficient subsurface distribution of substrate.	This technology completely destroys perchlorate by converting it into innocuous products, and is capable of reducing perchlorate concentrations to less than its CG of 6 μg/L. The pilot studies have shown that this technology may be effective in reducing perchlorate concentrations in the Source Area near the central portion of IRP Site 1. The implementation of this technology for remediation of the estimated extent of perchlorate-impacted groundwater at and downgradient of IRP Site 1 may not be cost effective since the capital costs may be excessive. This technology does not require pumping of groundwater aboveground, thus reducing potential risks to site workers due to exposure to perchlorate-impacted groundwater. At least two full-scale studies have been identified nationwide where in-situ bioremediation using direct injection of electron donors was used to effectively remediate perchlorate in groundwater. An average reduction of perchlorate concentrations of 94.3 percent was reported in one of these studies (U.S. EPA 2005).	Installation of injection wells for an electron donor is a mature, well-known technology. Many vendors are available for fracturing technology, if hydraulic or pneumatic fracturing is used for electron donor delivery. The design and construction of an in-situ bioremediation using direct injection may require experienced personnel.	Medium	**Selected** for development of alternatives for the Source Area (central portion of IRP Site 1) remediation.
		Trench Permeable Reactive Barrier (PRB)	A trench PRB consists of a physical barrier created in the flow path of the contaminated plume by emplacing reactive materials or amendments in engineered trenches. For containment of perchlorate-contaminated groundwater, a trench barrier may be installed downgradient of IRP Site 1 near the Station Boundary to minimize the potential for off-Station migration of the contaminated groundwater with perchlorate concentrations exceeding 6 μg/L. For in-situ bioremediation of the estimated extent perchlorate-impacted groundwater at and downgradient of IRP Site 1, two or more PRBs may need to be installed perpendicular to the groundwater flow. The amendments placed in the trench PRBs may be organic substrates such as woodchips, pecan shells, cotton seed, chitin, and other composting materials (U.S. EPA 2005). These materials provide both electron donors and nutrients for indigenous bacteria that can biodegrade perchlorate to innocuous end products by using it as an electron acceptor. Other reactive products that may be used in PRBs for perchlorate treatment include zero valent iron (ZVI) and nanoscale bimettalic particles (iron/palladium). These reactive materials may chemically reduce perchlorate to innocuous byproducts.	Trench PRB completely destroys perchlorate by converting it into innocuous products, and is capable of reducing perchlorate concentrations to less than its CG of 6 μg/L. This technology is capable of minimizing potential off-Station migration of perchlorate at concentrations posing unacceptable risk to potential off-site receptors. Since this technology does not involve aboveground pumping of groundwater, potential adverse impacts to site workers due to exposure to perchlorate-impacted groundwater are minimized. However, site workers may get exposed to fugitive dust during trenching activities. At least two full-scale systems have been identified nationwide where trench PRBs have been used to remediate perchlorate. These applications indicate that this technology is capable of reducing perchlorate concentrations as high as 13,000 μg/L to less than 0.45 μg/L (U.S. EPA 2005).	Trench barrier is a well-developed technology. Currently, trench barriers can be installed to depths of 25 feet to 30 feet using relatively inexpensive excavation equipment, such as a standard backhoe. At greater depths, relatively more expensive commercial methods may have to be deployed, such as clamshell or caisson excavation (Gavaskar et al. 2000). The perchlorate-impacted groundwater downgradient from IRP Site 1 generally extends to depths exceeding 40 feet bgs. Therefore, implementation of a trench PRB may require specialized excavation equipment and highly skilled personnel.	High.	**Not Selected** for alternative development primarily due to cost and implementability considerations.

Table 4-2: Identification and Screening of Technology Types and Process Options — IRP Site 1 Perchlorate-Impacted Groundwater (continued)

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
In-Situ Treatment (continued)	In-Situ Bioremediation (continued)	Trenchless PRB	The treatment principle for trenchless PRB is similar to trench PRB with an exception that instead of emplacing amendments in engineered trenches, injection wells or fracturing technologies are used to create a treatment wall for perchlorate. For containment of perchlorate-contaminated groundwater, trenchless well PRB may be installed downgradient of IRP Site 1 at or near the Station Boundary to minimize the potential for off-Station migration of the contaminated groundwater with perchlorate concentrations exceeding 6 μg/L. For in-situ bioremediation of the estimated extent perchlorate-impacted groundwater at and downgradient of IRP Site 1, two or more PRBs may need to be installed perpendicular to the groundwater flow. Organic substrates such as lactate, molasses, or edible oil may be injected into the subsurface to create a biologically active zone perpendicular to the groundwater flow. Indigenous perchlorate degrading bacteria could use organic substrates as electron donors to degrade perchlorate to innocuous end products.	Trenchless well PRB completely destroys perchlorate by converting it into innocuous products, and is capable of reducing perchlorate concentrations to less than its CG of 6 μg/L. The pilot studies have shown that this technology may be effective in reducing perchlorate concentrations in the Source Area near the central portion of IRP Site 1 and minimizing potential off-Station migration of perchlorate-impacted groundwater. This technology does not require pumping of groundwater aboveground, thus reducing potential risks to site workers due to exposure to perchlorate-impacted groundwater. At least two pilot-scale systems have been identified where PRBs using injection wells have been tested for perchlorate remediation. These applications indicate that this technology is capable of reducing perchlorate concentrations as high as 10,000 μg/L to less than 4 μg/L (U.S. EPA 2005, ITRC 2005).	PRB using injection wells is a well-developed technology. PRBs using injection wells can be established to greater depths compared to trench PRBs. The equipment required for implementing injection well PRB is readily available. However, if fracturing is used, only a limited number of vendors are available for PRB installation. The design, construction, and operation of a trenchless PRB may require experienced personnel.	Medium	**Selected** for alternative development.
	In-Situ Chemical Reduction	Zero Valent Iron Reduction (ZVI)	This technology includes injection of ZVI into the subsurface for chemical reduction of perchlorate to innocuous products. As with in-situ biological reduction, the design configuration for injection may be direction injection or a PRB.	The effectiveness of this technology for perchlorate remediation is not as fully established as bioremediation using electron donors. The research conducted in support of this FS suggests that this technology is in the development stage and is yet to be applied or accepted as a viable treatment approach for perchlorate.	The technology is still under development for perchlorate remediation. The implementation of this technology will require pilot tests and highly skilled personnel.	High	**Not Selected** for alternative development primarily due to implementability considerations.
	Phytoremediation	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize, or destroy contaminants in soil, sediment, and groundwater. Although phytoremediation involves several mechanisms, experimental results suggest that the two most important phytoremediation processes for perchlorate involve the uptake and subsequent phytodegradation of the chemical in branches and leaves, and rhizodegradation (AFCEE 2002).	Phytoremediation is still an emerging process. Phytoremediation may be slower than other competing in-situ and ex-situ remediation technologies. Root contact is a primary limitation on phytoremediation applicability. Remediation with plants requires that the chemicals be in contact with the root zone of the plants. It is reasonably easy to plant trees to influence groundwater that is 15 feet bgs. The deepest phytoremediation impacted aquifer is at 40 feet bgs (U.S. EPA 2000). Perchlorate has been identified at depths exceeding 40 feet bgs downgradient of IRP Site 1. Therefore, phytoremediation may not be effective in reducing concentrations of perchlorate in deep groundwater and achieve the RAOs. This technology does not require pumping of groundwater aboveground, thus reducing potential risks to site workers due to exposure to VOC-impacted groundwater.	Phytoremediation is an emerging technology. Pilot tests will be required to assess the effectiveness of phytoremediation for treatment of perchlorate at and downgradient of IRP Site 1.	Moderate	**Not selected** for alternative development primarily due to effectiveness and implementability considerations.
Ex-Situ Treatment and Discharge	Physical/Chemical Treatment	Ion-Exchange Resin	This ex-situ remediation technology includes extraction of perchlorate-contaminated groundwater and treatment using ion-exchange (IX) resin. IX is a treatment process by which an ion on the solid phase (synthetic resin) is exchanged for an ion in the feed water. The synthetic resin is chosen to preferentially adsorb the particular contaminant of concern. As water flows through the resin beds, ions with higher affinity (perchlorate) are collected by the resin and replace the chloride ions, which enter the water stream and become part of the effluent. Exhaustion occurs when all sites on the resin beads have been filled by contaminant ions. At this point, the resin is either regenerated or disposed appropriately.	This technology is capable of removing perchlorate in groundwater to concentrations less than its CG of 6 μg/L. However, perchlorate is not destroyed in the treatment process but is merely transferred from groundwater into the resin. Although IX may be effective in removing perchlorate in groundwater, the effectiveness (although not necessarily timely) of the ex-situ perchlorate remediation largely depends upon sustainable groundwater extraction rates. Based on the aquifer tests conducted in the central portion of IRP Site 1 and at IRP Site 2, groundwater extraction rates are likely to be low, resulting in longer remediation time frames. Site workers may get exposed to impacted groundwater since it is pumped and handled aboveground. The EPA's Issue Paper on perchlorate treatment technologies (U.S. EPA 2005) identifies 15 full-scale treatment systems where IX has been used for perchlorate treatment. Perchlorate concentrations in the influent treated by IX have ranged from 10 µg/L to 350,000 µg/L and the effluent concentrations ranged from non-detect (at a detection limit of 0.35 µg/L) to 2,000 µg/L.	IX is a fully developed technology for perchlorate treatment in water. Several vendors are available that offer this technology commercially. Additionally, installation of groundwater extraction wells is a mature, well-known technology. The implementation of IX for perchlorate treatment generates wastes in the form of spent resin or regenerating solution that may need disposal. The design and construction of an ex-situ remediation using IX may require pilot studies and experienced personnel.	High	**Selected** for alternative development.

Table 4-2: Identification and Screening of Technology Types and Process Options — IRP Site 1 Perchlorate-Impacted Groundwater (continued)

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
Ex-Situ Treatment and Discharge (Continued)	Physical/Chemical Treatment (Continued)	Granular Activated Carbon (GAC)	This ex-situ remediation technology includes extraction of perchlorate-impacted groundwater and treatment using GAC. GAC is a highly adsorbent material used to remove contamination from water. As the water passes over GAC, perchlorate gets adsorbed over the surface of the carbon particles and gets removed from the water. When adsorption sites are saturated with perchlorate, the column containing GAC must be regenerated or disposed of and replaced with new media.	GAC has been used relatively infrequently for the treatment of perchlorate. GAC has a relatively small treatment capacity for perchlorate removal, and research is underway to identify methods to improve the treatment capacity of a GAC system for perchlorate removal, including "Tailored GAC" (U.S. EPA 2005). Therefore, currently GAC is not expected to be as effective as IX for treatment of perchlorate-impacted groundwater. Similar to IX technology, the effectiveness (although not necessarily timely) of ex-situ perchlorate remediation largely depends upon sustainable groundwater extraction rates. Previous studies have shown that groundwater extraction rates at IRP Sites 1 and 2 are likely to be low, limiting the effectiveness of this technology. Site workers may get exposed to impacted groundwater since it is pumped and handled aboveground. The U.S. EPA's Issue Paper on perchlorate treatment technologies (U.S. EPA 2005) identifies two pilot-scale and two full-scale treatment systems where GAC has been used for perchlorate treatment. For the two groundwater projects, influent perchlorate concentrations ranged from 1.8 µg/L to 5 µg/L, while the effluent concentrations were less than 0.35 µg/L.	Vendors are available that offer this technology commercially. Additionally, installation of groundwater extraction wells is a mature, well-known technology. The implementation of GAC for perchlorate treatment generates wastes in the form of spent carbon or regenerating solution that may need disposal. The design and construction of an ex-situ remediation using GAC may require pilot studies and experienced personnel.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		ZVI Reduction	This remediation technology includes extraction of perchlorate-impacted groundwater and treatment using iron and iron oxide. In addition ultraviolet light is used to accelerate the reaction rate.	This technology is in the development stage and is yet to be applied or accepted as a viable treatment approach for perchlorate.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Titanium Chemical Reduction	This technology includes extraction of perchlorate-impacted groundwater and treatment using titanium chemical reduction. Titanium chemical reduction technology has been developed by Georgetown University using titanous ions to chemically reduce perchlorate to titanium dioxide and chloride in acidic aqueous media.	Titanium chemical reduction is an emerging process in the development stage, for which there is limited performance data to support the conclusion that it would be effective in reducing perchlorate concentrations.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Electrochemical Reduction	This technology includes extraction of perchlorate-impacted groundwater and treatment using electrochemical reduction. Electrochemical reduction involves reduction of perchlorate by an ion exchange membrane separated by cathodic and anodic compartments, and consists of titanium electrodes coated with a thin film of titanium dioxide particles.	Electrochemical reduction is an emerging process in the development stage and is yet to be applied or accepted as a viable treatment approach for perchlorate. In addition, perchlorate reduction using this technology is limited due to the competition among anions for active sites on the electrode surface, with perchlorate being less strongly adsorbed than both sulfate and chloride.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Capacitive Deionization	This technology includes extraction of perchlorate-impacted groundwater and treatment using capacitive deionization. Capacitive deionization relies on the separation of ions from solution by applying an electric field between carbon-aerogel electrodes. The cations and anions are electrosorbed onto the carbon aerogel of the cathode and anode, respectively. Regeneration is accomplished by electrically discharging the electrodes and yields a stream of purified water and a concentrated reject. In the case of perchlorate removal, the concentrated solution will require further treatment before it can be discharged.	This technology patented in 1995 by Lawrence Livermore National Laboratory is in the development stage and has yet to be applied or accepted as a viable treatment approach for perchlorate.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Reverse Osmosis	This technology includes extraction of perchlorate-impacted groundwater and treatment using reverse osmosis. Reverse osmosis is a process during which the influent stream is driven under pressure through a semi-permeable membrane that does not allow the contaminant to pass, and the contaminant is removed from the process in a concentrate or brine, which requires further treatment or destruction.	Reverse osmosis is an emerging process for perchlorate treatment, and is being investigated and tested. There is limited performance data to support the conclusion that it would be effective in reducing the perchlorate concentrations.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.

Table 4-2: Identification and Screening of Technology Types and Process Options — IRP Site 1 Perchlorate-Impacted Groundwater (continued)

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
Ex-Situ Treatment and Discharge (Continued)	Physical/Chemical Treatment (Continued)	Electrodialysis	This technology includes extraction of perchlorate-impacted groundwater and treatment using electrodialysis. Electrodialysis is a process in which water is passed through channels of alternating semi-permeable and permeable membranes (to either cations or anions), while being exposed to an electrical field. The direct current voltage potential induces the cation to migrate toward the negatively charged anode through the cation-transfer membrane as the influent feed flows through the flow channels between the membranes. Simultaneously, the anions migrate toward the positively-charged cathode through the anion-transfer membrane.	Electrodialysis is an emerging process for perchlorate treatment and is being investigated and tested. There is limited data to support the conclusion that it would be effective in reducing the perchlorate concentrations.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Nanofiltration/Ultra-filtration	This technology includes extraction of perchlorate-impacted groundwater and treatment using nanofiltration/ultrafiltration. Nanofiltration/ultrafiltration are membrane treatment technologies like reverse osmosis. These technologies consist of the synthetic porous membrane material which acts as a shield and prevents particles of a defined size or larger from passing through. These membrane filtration technologies have very high energy requirements and produce brines equal to 20 percent of the volume of the groundwater treated, which require treatment or disposal.	Nanofiltration/ultrafiltration for perchlorate treatment is in the development stage and is yet to be applied or accepted as a viable treatment approach.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Catalytic Gas Membrane	This technology involves extraction of perchlorate-impacted groundwater and treatment using a catalytic gas membrane. This emerging technology is based on the thermodynamic reduction of perchlorate by hydrogen. However, the reaction is very slow in dilute solutions at relevant groundwater temperatures due to the high activation energy required to initiate the reaction, and would involve use of a proper catalyst to facilitate perchlorate reduction in a time frame.	A catalytic gas membrane is an emerging process and is in the developmental stage for perchlorate treatment. This technology is being investigated and tested, but has yet to be applied or accepted as a viable treatment approach for perchlorate.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Fluidized Bed Reactor (FBR)	This ex-situ remediation technology includes extraction of perchlorate-impacted groundwater and treatment using a FBR. The FBR is a reactor that fosters the growth of microorganisms on a hydraulically fluidized bed of media, usually sand or activated carbon. Perchlorate is used by bacteria as a terminal electron acceptor under anaerobic conditions, and is completely transformed into chloride, an innocuous end product. Field application of FBRs for perchlorate treatment usually consists of cylindrical reactor with GAC media, electron donor (ethanol, acetate etc.) feed system, nutrient feed system and pH adjustment system (Guarini 2002).	This technology is capable of completely destroying perchlorate by converting it into innocuous end products, and of reducing perchlorate concentrations to less than 6 μg/l. Although FBR may be effective in removing perchlorate in groundwater, the effectiveness (although not necessarily timely) of the ex-situ perchlorate remediation largely depends upon sustainable groundwater extraction rates. Based on the aquifer tests conducted in the central portion of IRP Site 1 and at IRP Site 2 groundwater extraction rates are likely to be low, limiting the effectiveness of this technology. Site workers may get exposed to impacted groundwater since it is pumped and handled aboveground. A review of the U.S. EPA's Issue Paper on perchlorate treatment technologies (U.S. EPA 2005) indicates that FBR is currently the most widely used bioreactor for perchlorate treatment nationwide. This paper identifies four full-scale and two pilot-scale applications of FBR for perchlorate treatment in groundwater or drinking water. Perchlorate concentrations in influent treated by FBR during these applications ranged from 100 μg/L to 200,000 μg/L and effluent concentrations were generally less than 4 μg/L.	FBR is a fully developed technology for perchlorate treatment in water. Several vendors are available that offer this technology commercially. Additionally, installation of groundwater extraction wells is a mature, well-known technology. A limited amount of waste may be generated during the operation of a FBR for perchlorate treatment that may need disposal. The design and construction of an ex-situ remediation system using a FBR may require pilot studies and experienced personnel. However, the scope of pilot studies is expected to be less than in-situ technologies.	High	**Selected** for alternative development.

Table 4-2: Identification and Screening of Technology Types and Process Options — IRP Site 1 Perchlorate-Impacted Groundwater (continued)

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
Ex-Situ Treatment and Discharge (Continued)	Ex-Situ Biological Treatment	Packed Bed Reactor (PBR)	This remediation technology includes extraction of perchlorate-impacted groundwater and treatment using a PBR. The PBR is a fixed-film bioreactor that uses a solid media to support microorganisms to chemically reduce perchlorate. These organisms grow as a biofilm on or within the packing material and degrade aqueous contaminants as water moves through the reactor. The basic reactor consists of a vessel filled with sheet packing, coarse sand, plastic rings, or other support media, and all associated pumps and controls to set water flow and to supply necessary amendments to the water being treated.	The laboratory and pilot scales testing has shown that this alternative can effectively remove perchlorate in groundwater for short periods of time. However, the absence of an effective technique to control biomass within these reactors has caused questions concerning their long-term operability in the field. With time, biomass overgrowth within the PBR can cause channeling through the reactor and a subsequent loss of performance due to a shortening of the hydraulic residence time (ITRC 2005). The U.S. EPA's Issue Paper on perchlorate treatment technologies (U.S. EPA 2005) reports one pilot-scale study using PBR for perchlorate treatment. At present, there are no full-scale PBR systems treating perchlorate in groundwater or wastewater that are fully operational (ITRC 2005).	PBR is not fully developed and widely implemented as the FBR technology for perchlorate treatment. Backwashing of the reactor for biomass removal may generate wastes that require off-site disposal. The design and construction of ex-situ remediation using a PBR may require pilot studies and experienced personnel. However, the scope of pilot studies is expected to be less than in-situ technologies.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Continuous-Flow Stirred-Tank Reactor (CSTR)	This technology includes extraction of perchlorate-impacted groundwater and treatment using CSTRs. The CSTR uses bacteria to chemically reduce perchlorate to innocuous end products. Perchlorate is used by bacteria as a terminal electron acceptor under anaerobic conditions, and is completely transformed into chloride, an innocuous end product. This process maintains biodegradative organisms in suspension and has continuous influent and effluent flow.	This alternative is best suited for low-flow and high-strength waste streams (ITRC 2005). However, IRP Site 1 has a low-flow and low-strength waste stream, which may result in reduced reaction rates. Thus, this alternative is not expected to efficiently reduce the volume and extent of the perchlorate in groundwater.	CSTR is not as fully developed and widely implemented as FBR technology for perchlorate treatment. The design and construction of an ex-situ remediation system using a CSTR may require pilot studies and experienced personnel. However, the scope of pilot studies is expected to be less than in-situ technologies.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Hollow-fiber Membrane Biofilm Reactor (HfMBR)	This technology includes extraction of perchlorate-impacted groundwater and treatment using a HfMBR. This technology consists of a bioreactor containing a bundle of hydrophobic hollow-fiber membranes connected to a hydrogen-supplying manifold at one end and sealed at the other. Hydrogen gas diffuses through the wall of a composite membrane and an autotrophic biofilm naturally develops on the outside of the membrane, where the bacteria reduce perchlorate.	The U.S. EPA's Issue Paper on perchlorate treatment technologies (U.S. EPA 2005) reports one pilot study where HfMBR reduced influent perchlorate concentrations of 55 µg/L to 2 µg/L. However, the effectiveness of this technology for perchlorate treatment is yet to be fully established.	HfMBR is not as fully developed and as widely implemented as the FBR technology for perchlorate treatment. The design and construction of an ex-situ remediation system using a HfMBR may require pilot studies and experienced personnel. However, the scope of pilot studies is expected to be less than in-situ technologies.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.
		Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize, or destroy contaminants in soil, sediment, and groundwater. Although phytoremediation involves several mechanisms, experimental results suggest that the two most important phytoremediation processes for perchlorate involve the uptake and subsequent phytodegradation of the chemical in branches and leaves, and rhizodegradation (AFCEE 2002). Since perchlorate-impacted groundwater at IRP Site 1 generally extends 30 feet to 40 feet bgs in the weathered bedrock and phytoremediation is anticipated to be most applicable to shallow groundwater contamination, ex-situ application of phytoremediation is considered for IRP Site 1. Perchlorate-impacted groundwater would be extracted and used for irrigation of specialized plant species planted for phytoremediation of perchlorate.	Phytoremediation is still an emerging process and its effectiveness to treat perchlorate is not fully demonstrated on full-scale. Phytoremediation may be slower than other competing physical/chemical and biological treatment technologies for perchlorate treatment at IRP Site 1. In addition, climatic changes can significantly impact plant growth, thus requiring variation in the treatment period. The U.S. EPA's Issue Paper on perchlorate treatment technologies (U.S. EPA 2005) reports one pilot study where phytoremediation using 425 hybrid poplars was performed, with the trees planted in March 2003 on a 0.7-acre demonstration site. The concentrations of perchlorate were reduced from 34 mg/L to 23 mg/L, as of March 2004.	This technique is not fully developed for perchlorate treatment.	High	**Not Selected** for alternative development primarily due to effectiveness and implementability considerations.

Table 4-2: Identification and Screening of Technology Types and Process Options — IRP Site 1 Perchlorate-Impacted Groundwater

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
Ex-Situ Treatment and Discharge (Continued)	Discharge	Infiltration	This technology would include infiltration of treated groundwater back into the aquifer at IRP Site 1 using flooding or infiltration trenches and galleries.	The infiltration rates at IRP Site 1 are expected to be low; however, since the groundwater extraction rates at IRP Site 1 are also expected to be low, infiltration may be effective for discharge of treated groundwater back into the aquifer. Site workers may get exposed to fugitive dust during trenching and excavation activities.	Infiltration trenches or galleries are easy to install and implement. A pilot test may be required to estimate infiltration rates for proper design and implementation of infiltration galleries.	Low	**Selected** for alternative development for disposal of treated groundwater.
		Irrigation	Following treatment of impacted groundwater, treated groundwater could be used for irrigation of the golf course, on-site agricultural land, recreational areas, and landscaping.	Effective approximately 6 months of the year when irrigation is required.	Irrigation is easy to implement.	Low	**Selected** for alternative development for disposal of treated groundwater.
		Surface Water Discharge	This technology would include discharge of treated groundwater into the Borrego Canyon Wash.	Surface discharge may be an effective option for disposal of treated groundwater.	The RWQCB may have concerns over surface discharge if it results in impairment of the downstream water body. This may require substantial technical and administrate effort in getting approval.	Low	**Selected** for alternative development for disposal of treated groundwater.
		Reinjection of Treated Groundwater	This technology would include installation of groundwater injection wells and injection of treated groundwater into these wells using pumps.	Reinjection into injection wells may be an effective option for treated groundwater discharge.	Installation of injection wells for groundwater reinjection is a mature and well-known technology.	High	**Selected** for alternative development for disposal of treated groundwater.

Notes:

[a] Evaluation factors included ability of the process option to handle estimated areas and volumes of groundwater (i.e., to reduce volume, toxicity, and mobility of COCs in groundwater), and attain one or more of the RAOs; potential impacts to human-health and the environment during implementation of the process option; and whether the process is reliable and proven for remediation of perchlorate.

[b] Evaluation factors included ability to obtain regulatory approval; availability of equipment and skilled workers; extensiveness of knowledge required to implement the process option; and need for treatment or disposal of process waste.

[c] Each process option was rated (high, low or medium) based on cost relative to other process options in the same technology type based on engineering judgment.

IX = ion exchange
µg/L = micrograms per liter
AFCEE = Air Force Center for Environmental Excellence
bgs = below ground surface
CG = cleanup goal
COC = constituent of concern
CSTR = continuous-flow stirred tank reactor
FBR = fluidized bed reactor
FS = feasibility study
GAC = granular activated carbon
GRA = general response action
HfMBR = hollow-fiber membrane biofilm reactor
ICs = institutional controls
IRP = Installation Restoration Program
ITRC = Interstate Technology and Regulatory Council
MCL = maximum contaminant level
MEC = munitions and explosives of concern
MNA = monitored natural attenuation
NCP = National Oil and Hazardous Substances Pollution and Contingency Plan
PBR = packed bed reactor
pH = negative logarithm of hydrogen ion concentration
PRB = permeable reactive barrier
RAO = remedial action objective
RWQCB = Regional Water Quality Control Board
U.S. EPA = United States Environmental Protection Agency
VOC = volatile organic compound
ZVI = zero-valent ion

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Table 4-3: Identification and Screening of Technology Types and Process Options — VOC-Impacted Groundwater at IRP Site 2

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
No-Action	None	None Available	No Action	No remedial action would be implemented to reduce volume, toxicity or mobility of COCs in groundwater. Any reduction in COC concentrations, toxicity, or mobility would occur primarily through natural attenuation mechanisms such as dilution, dispersion, and biodegradation.	Easily implementable since no action needs to be taken.	There are no costs associated with this technology.	**Selected** as a stand-alone alternative in compliance with the NCP.
ICs and Access Restrictions	ICs	ICs	ICs include administrative and/or legal controls such as groundwater use restrictions to minimize the potential for exposure to impacted groundwater.	ICs do not directly reduce volume, toxicity, or mobility of COCs in groundwater. However, ICs would minimize the potential for exposure to COCs in groundwater by restricting groundwater use. No adverse impacts occur during the implementation of ICs since no construction activities are associated with this process option.	ICs are relatively easy to implement. Implementation of ICs for off-Station portion of the groundwater plume may require additional administrative effort.	Low.	**Selected** for alternative development. To be used in conjunction with other remediation technologies for alternative development.
Natural Attenuation and Monitoring	MNA	MNA	MNA involves natural in-situ physical, chemical, and/or biological processes including biodegradation, dispersion, dilution, sorption, volatilization, chemical or biological stabilization, transformation, or destruction of contaminants, that under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. Under this process option, groundwater monitoring would be conducted at IRP Site 2 to assess the efficacy of natural attenuation mechanisms for reduction in COC concentrations and to evaluate potential migration of COC-impacted groundwater.	The extent of the TCE (most widespread COC) plume has remained relatively stable and the concentrations of TCE have either remained stable or decreased over time. In addition, the consistent presence of cis-1,2-DCE in wells with elevated TCE concentrations indicates that some biodegradation may have occurred within the TCE plume. In addition to anaerobic biodegradation, natural attenuation processes, such as dispersion, dilution, sorption, and volatilization, may be contributing to the containment and slow reduction of the TCE plume. Minimal adverse impacts are expected during the implementation of MNA, since COC-impacted groundwater would be treated in-place and would not be pumped aboveground.	This is a passive approach inherent at every site. Since only groundwater monitoring is required, this technology is easily implementable.	Low.	**Selected** for alternative development.
Containment	Vertical Barriers	Slurry Walls/ Sheet Pile Walls/ Grout Curtains	Containment using slurry walls involves containing the contaminated media by excavating vertical trenches around the contaminated mass and filling them up with slurry (mixture of bentonite and water or cement, bentonite, and water) to reduce contaminant migration due to groundwater movement. This technology may also include driving sheet piles into the subsurface to create a vertical barrier to contaminant migration. Containment using grout curtains involves installation of narrow, vertical, grout walls in the ground by pressure injecting grout directly into the soil at closely spaced intervals around the contaminated mass to reduce contaminant migration due to groundwater movement.	This technology does not directly reduce volume or toxicity of COCs in groundwater. If implemented properly, this technology may reduce mobility of COCs. This technology would rely on natural attenuation for remediation of COCs. Although, vertical barriers may be able to minimize potential off-Station migration of COC-impacted groundwater, the other options such as PRBs (discussed below) are expected to be much more cost-effective to achieve the same purpose. Site workers may get exposed to impacted soil, fugitive dust, and gas emissions during construction.	High-level of site-specific characterization and experienced personnel would be required for implementation. Equipment and materials are readily available. However, it would be technically challenging to install vertical barriers to depths exceeding 60 feet bgs.	Very High	**Not selected** for alternative development primarily due to effectiveness and cost considerations.
In-Situ Treatment	In-Situ Chemical Oxidation	Direct Injection or Recirculation Loop	This technology would include injection of a chemical reagent/oxidant directly into the contaminated portion of the aquifer at injection points or wells under pressure. Alternatively, chemical reagent/oxidant may also be injected using a groundwater recirculation loop. Groundwater recirculation loop includes installation of extraction and injection wells within the contaminated portion of the aquifer. Contaminated water is extracted from the extraction wells, amended with reagent/oxidant, and reinjected into the aquifer. The injected oxidant would oxidize the COCs into innocuous products such as carbon dioxide and water. The commonly used chemical oxidants include hydrogen peroxide, potassium/sodium permanganate, and sodium persulfate.	ISCO is expected to completely destroy the COCs by converting them into innocuous products provided oxidant is effectively emplaced in the subsurface. The pilot studies for in-situ bioremediation in IRP Site 2 area indicate that reagents can be injected relatively effectively in groundwater at IRP Site 2. If reagent/oxidant is delivered using direct injection, pumping of groundwater aboveground is not required, thus reducing potential risks to site workers due to exposure to VOC-impacted groundwater. If groundwater recirculation is used, site workers may get exposed to impacted groundwater since it is pumped and handled aboveground.	Installation of injection/extraction wells for injection of an oxidant is a mature, well-known technology. Many vendors are available for well installation and oxidant injection. The design and construction of ISCO will require experienced personnel.	High	**Selected** for alternative development.
	In-Situ Bioremediation	Direct Injection or Recirculation Loop	This bioremediation technology involves delivery of electron donors/acceptor into the contaminated portion of the aquifer (also referred to as biostimulation). In some instances specific strains of microorganisms that are known to degrade the contaminants present at the site are also injected into the subsurface in addition to substrate (also referred to as bioaugmentation). As explained above for ISCO, bioremediation amendments may be delivered to the subsurface using direct injection or groundwater recirculation. For anaerobic bioremediation, an electron donor is injected in the subsurface to promote more strongly reducing conditions in the aquifer and to serve as a source of electron donor for the microorganisms. Some common electron donors include molasses, vegetable oil, methanol, and lactate. These electron	The in-situ bioremediation pilot studies have demonstrated that this technology is capable of reducing TCE (most widespread COC) and cis-1,2-DCE concentrations to less than their respective CGs. If bioremediation amendments are delivered using direct injection, pumping of groundwater aboveground is not required, thus reducing potential risks to site workers due to exposure to VOC-impacted groundwater. If groundwater recirculation is used, site workers may get exposed to impacted groundwater since it is pumped and handled aboveground. In-situ bioremediation has been successfully applied at various sites across the U.S. for treatment of VOCs (U.S. EPA 2000).	Installation of injection/extraction wells for injection of bioremediation amendment is a mature, well-known technology. Many vendors are available for well installation and bioremediation amendment injection. Experienced personnel will be required for full-scale design and implementation of bioremediation.	Moderately High	**Selected** for alternative development.

Table 4-3: Identification and Screening of Technology Types and Process Options — VOC-Impacted Groundwater at IRP Site 2

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
			donors can also serve as a source of carbon for the microorganisms.				
In-Situ Treatment (continued)	PRB	Trench PRB/ Trenchless PRB	PRB consists of a continuous, in-situ permeable treatment zone designed to intercept and remediate a contaminant plume. The treatment zone may be created using reactive materials such as zero valent iron (ZVI) or indirectly using materials such as carbon substrates that stimulate secondary processes such as biodegradation. Therefore contaminant treatment may occur through physical, chemical, or biological processes. A trench PRB consists of a physical barrier created in the flow path of the contaminated plume by emplacing reactive materials or amendments in engineered trenches. A trenchless PRB consists of creating a treatment wall for COCs using subsurface injection of organic substrate using pressurized injection or other specialized technologies such as fracturing. The PRBs that use in-situ bioremediation to treat contaminated groundwater may include amendments that consist of organic substrates such as woodchips, pecan shells, cotton seed, chitin, or other composting materials such as lactate, molasses, or edible oil. The PRBs that use physical/chemical treatment may include ZVI, zeolites, and limestone.	The in-situ bioremediation pilot studies have demonstrated that this technology is capable of reducing TCE (most widespread COC) and cis-1,2-DCE concentrations to less than their respective CGs. However, this bioremediation technology is a passive technology and would rely on natural flow of groundwater at IRP Site 2 for treatment of COCs. The TCE plume boundary at IRP Site 2 has remained relatively stable based on the historical data; therefore, this technology may require long-term operation and maintenance. Since this technology does not involve aboveground pumping of groundwater, potential adverse impacts to site workers due to exposure to VOC-impacted groundwater are minimized. However, site workers may get exposed to fugitive dust during trenching activities. In-situ bioremediation using PRB is a well-established technology for remediation of VOCs in groundwater.	Trench barrier is a well-developed technology. Currently, trench barriers can be installed to depths of 25 feet to 30 feet using relatively inexpensive excavation equipment, such as a standard backhoe. At greater depths, relatively more expensive commercial methods may have to be deployed, such as clamshell or caisson excavation (Gavaskar et al. 2000). The total depth of treatment at IRP Site 2 is estimated to exceed 60 feet. Therefore, implementation of trench PRBs may be technically challenging. PRB using injection wells is a well-developed technology. PRBs using injection wells can be established to greater depths compared to trench PRBs. The equipment required for implementing injection well PRB is readily available. The design, construction, and operation of a trenchless PRB may require experienced personnel.	Moderately High	**Selected** for alternative development.
	Thermal Treatment	Electrical Resistance Heating (ERH)/ Steam Flushing/Conductive Heating	In-situ thermal treatment refers to a number of individual technologies that use heat to remove or destroy VOCs from environmental media, including ERH, steam flushing, and conductive heating. ERH is a poly-phase, electrical technology that uses electrical resistive heating and in-situ steam production to accomplish subsurface remediation. Electrical energy is delivered to the subsurface by electrodes installed using standard drilling techniques. The resistance of the subsurface to the electric current movement causes heating that leads to VOC remediation through, volatilization of chemicals, steam generation and subsequent steam distillation of contaminants, and in-situ thermal destruction of certain contaminants. The contaminant-laden vapors generated in the subsurface are generally extracted using soil vapor extraction (SVE) and treated aboveground. Steam flushing involves heating the subsurface by injecting steam to vaporize the volatile and semi-volatile contaminants. Vaporized components rise to the unsaturated zone where they are removed by SVE and then treated. Conductive hearing includes applying heat to the subsurface using an array of vertical heater/vacuum wells. The wells can be installed using conventional drilling techniques or direct push. A resistive heating unit is lowered into the well and current is supplied. The steel pipe is heated by radiant energy and the soil surrounding it by thermal conductance. The heat leads to volatilization of VOCs and SVE system is used to remove these VOCs. The extracted VOCs are treated aboveground.	Thermal treatment is particularly effective for removal of high concentrations of VOCs from the subsurface including DNAPLs. However, the concentrations of VOCs in groundwater at IRP Site 2 are low. Thermal treatment may be able to effectively remove these VOCs but energy requirements per unit mass of chemical removed may be very high. The removed VOCs are transferred from groundwater to vapors/steam that gets treated aboveground using granular activated carbon or other technologies. Site workers may get exposed to COC-laden vapors that are extracted from the subsurface during the implementation of in-situ thermal treatment.	ERH, steam flushing, and conductive heating are considered fairly well-developed technologies with equipment and vendors readily available. Pilot studies may be required to assess the effectiveness of in-situ thermal technologies for remediation of groundwater at IRP Site 2.	Very High	**Not selected** for alternative development primarily due to cost considerations.
In-Situ Treatment (continued)	In-Situ ZVI Reduction	In-Situ ZVI Reduction	This technology includes injection of ZVI into the subsurface using direct push technology or other specialized injection technologies. ZVI is a strong reducing agent that is capable of abiotically dehalogenating several common chlorinated solvents (e.g., TCE). An advanced type of ZVI, nano-scale zero-valent iron (NZVI), can also be used as an in-situ chemical reduction reagent.	ZVI has been shown to be generally effective in treating high concentrations of VOCs provided ZVI is effectively emplaced in the subsurface. This technology would lead to complete destruction of PCE, TCE, cis-1,2-DCE into innocuous products. This technology does not require pumping of groundwater aboveground, thus reducing potential risks to site workers due to exposure to VOC-impacted groundwater.	In-situ chemical reduction using ZVI is a mature well known technology. Bench/pilot studies may be required to assess the effectiveness of ZVI for remediation of groundwater at IRP Site 2.	High	**Selected** for alternative development.

Table 4-3: Identification and Screening of Technology Types and Process Options — VOC-Impacted Groundwater at IRP Site 2

General Response Actions	Remedial Technology Type	Remedial Technology Process Option	Technology Process Option Description	Effectiveness[a]	Implementability[b]	Cost[c]	Screening/Evaluation Comments
	Phytoremediation	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize, or destroy contaminants in soil, sediment, and groundwater. The mechanisms of phytoremediation include enhanced rhizosphere biodegradation (takes place in soil or groundwater immediately surrounding plant roots), phytoextraction (also known as phytoaccumulation, the uptake of contaminants by plant roots and the translocation/accumulation of contaminants into plant shoots and leaves), phytodegradation (metabolism of contaminants within plant tissues), and phytostabilization (production of chemical compounds by plants to immobilize contaminants at the interface of roots and soil).	Phytoremediation is still an emerging process and its effectiveness to treat all the COCs in IRP Site 2 groundwater is not fully demonstrated. Phytoremediation may be slower than other competing in-situ and ex-situ remediation technologies. Root contact is a primary limitation on phytoremediation applicability. Remediation with plants requires that the chemicals be in contact with the root zone of the plants. It is reasonably easy to plant trees to influence groundwater that is 15 feet below ground surface. The deepest phytoremediation impacted aquifer is at 40 feet below ground surface (U.S. EPA 2000). The COCs in IRP Site 2 groundwater have been identified at depths exceeding 60 feet bgs. Therefore, phytoremediation may not be effective in reducing concentrations of COCs in IRP Site 2 groundwater. This technology does not require pumping of groundwater aboveground, thus reducing potential risks to site workers due to exposure to VOC-impacted groundwater.	Phytoremediation is an emerging technology for remediation of chlorinated solvents. Pilot tests will be required to assess the effectiveness of phytoremediation for treatment of COCs in groundwater at IRP Site 2.	Moderate	**Not selected** for alternative development primarily due to effectiveness and implementability considerations.
In-Situ Treatment (continued)	Air Sparging / SVE	Air Sparging / SVE	Air sparging involves the injection of air or oxygen through the impacted aquifer. Injected air traverses horizontally and vertically in channels through the aquifer, creating an underground stripper that removes VOCs by volatilization. The injected air helps to flush the COCs into the unsaturated zone. SVE usually is implemented in conjunction with air sparging to remove the generated vapor-phase COCs from the vadose zone. Oxygen added to the impacted groundwater and vadose-zone soils also can enhance biodegradation of COCs below and above the water table.	Because of the low concentrations of VOCs in IRP Site 2 groundwater, efficient mass transfer from groundwater to air may not occur which may lead to ineffective removal of VOCs from groundwater. In addition, air sparging may not be effective due to low hydraulic conductivity of the subsurface.	Air sparging/SVE is a mature well known technology. Pilot studies will be required to assess the effectiveness of these technologies for remediation of groundwater at IRP Site 2.	High	**Not selected** for alternative development primarily due to effectiveness and implementability considerations.
Ex-situ Treatment and Discharge	Groundwater Extraction and Ex-Situ Treatment	Groundwater Extraction using Wells, and Ex-Situ Treatment using Adsorption, Chemical Reduction, Physical, or Biological Treatment	This technology would include extraction of COC-impacted groundwater aboveground from a network of extraction wells. The extracted groundwater could then be treated using a variety of technologies that rely on physical/chemical or biological processes such as adsorption, filtration, and biodegradation to remove COCs from water. The ex-situ treatment technologies may include granular activated carbon, chemical oxidant, ZVI, and biological reactors.	The ex-situ technologies are generally effective in treating VOCs in groundwater; however, the effectiveness of these technologies largely depends on sustainable rate of chemical extraction from the subsurface. Based on the aquifer tests conducted in the central portion of IRP Site 1 and at IRP Site 2, groundwater extraction rates are likely to be low, thereby limiting the effectiveness of this technology. Site workers may get exposed to impacted groundwater that is extracted from the subsurface during the implementation of this technology.	Installation of extraction wells for groundwater is a mature and well-known technology. The ex-situ treatment technologies including granular activated carbon adsorption, ZVI, and biological reactors are also mature and well-known technologies.	Very High	**Selected** for alternative development
	Discharge	Infiltration	This technology would include infiltration of treated groundwater back into the aquifer using flooding or infiltration trenches and galleries.	The infiltration rates at the site are expected to be low. Site workers may get exposed to fugitive dust during trenching and excavation activities.	Infiltration trenches or galleries are easy to install and implement. A pilot test may be required to estimate infiltration rates for proper design and implementation of infiltration galleries.	Low	**Selected** for alternative development for disposal of treated groundwater.
		Irrigation	Provided the VOC concentrations are low enough, treated groundwater could be used for irrigation of the golf course, onsite agricultural land, recreational areas, and landscaping.	Effectively approximately 6 months of the year when irrigation is required.	Irrigation is easy to implement.	Low	**Selected** for alternative development for disposal of treated groundwater.
		Surface Water Discharge	This technology would include discharge of treated groundwater into the Borrego Canyon Wash.	Surface discharge may be an effective option for disposal of treated groundwater.	The RWQCB may have concerns over surface discharge if it results in impairment of the water body. This may require substantial technical and administrate effort in getting approval.	Low	**Selected** for alternative development for disposal of treated groundwater.
		Reinjection of Treated Groundwater	This technology would include installation of groundwater injection wells and injection of treated groundwater into these wells using pumps.	Reinjection into injection wells would be an effective option for treated groundwater discharge. The groundwater to be reinjected may be amended with treatment amendments to enhance in-situ destruction/degradation of COCs.	Installation of injection wells for groundwater reinjection is a mature and well-known technology.	High	**Selected** for alternative development for disposal of treated groundwater.

Notes:
[a] Evaluation factors included ability of the process option to handle estimated areas and volumes of groundwater (i.e. to reduce volume, toxicity, and mobility of COCs in groundwater), and attain one or more of the RAOs; potential impacts to human- environment during implementation of the process option; and whether the process is reliable and proven for remediation of COCs found in OU-2B groundwater.
[b] Evaluation factors included ability to obtain regulatory approval; availability of equipment and skilled workers; extensiveness of knowledge required to implement the process option; and need for treatment or disposal of process waste.
[c] The relative cost for each option is estimated as to whether it is low, moderate, or high based on the engineering judgment.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
26	**remedial alternatives developed for IRP Site 1 perchlorate-impacted groundwater**	**Section 2.8.1.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 5.1 and Figures 5-3 through 5-6. AECOM. April 2011.

5. Development of Alternatives

5.1 PERCHLORATE IMPACTED GROUNDWATER – IRP SITE 1

The remedial action alternatives for perchlorate-impacted groundwater at IRP Site 1 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 4.3 (see Figure 5-1). The target remediation area was also considered while developing the alternatives. This process resulted in the development of alternatives representing a range of treatment and containment combinations. The following remedial alternatives were developed for perchlorate-impacted groundwater, two of which have options:

- Alternative G1-1: No Action
- Alternative G1-2: MNA and ICs
- Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring , and ICs
- Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs
- Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs
- Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Each of these alternatives is described in detail in the following sections.

5.1.1 Alternative G1-1: No Action

The NCP (40 C.F.R. § 300.430 [e][6]) requires that the No-Action Alternative be developed and evaluated in the FS. This alternative provides a baseline condition for comparing other alternatives. Under the No-Action Alternative, none of the GRAs, including ICs, containment, and in-situ or ex-situ treatment would be implemented for perchlorate-impacted groundwater. Alternative G1-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G1-1, perchlorate would continue to have the potential to migrate in the groundwater. Naturally attenuation processes such as biodegradation, dilution, and dispersion would be acting to reduce the concentrations of perchlorate in groundwater; however, these mechanisms would not be monitored under this alternative.

5.1.2 Alternative G1-2: Monitored Natural Attenuation and Institutional Controls

The U.S. EPA defines MNA as (U.S. EPA 1997):

The term "monitored natural attenuation" refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored clean-up approach) to achieve site-specific remedial objectives within a time frame that is reasonable compared to other methods. The "natural attenuation processes" that are at work in such a remediation approach include a variety of physical, chemical, and/or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and groundwater. These in situ processes include: biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants.

Alternative G1-2 would rely on natural attenuation processes and monitoring for remediation of perchlorate-impacted groundwater. The natural attenuation processes may include a variety of physical, chemical or biological processes, including dilution, dispersion, and biodegradation that,

under favorable conditions, would act without human intervention to reduce concentrations of perchlorate in groundwater. In accordance with the U.S. EPA Directive on MNA (U.S. EPA 1999c), Alternative G1-2 would include groundwater monitoring to demonstrate that natural attenuation is occurring and to evaluate off-Station migration of perchlorate.

An evaluation of groundwater concentrations of perchlorate over time from individual wells indicates that relatively high fluctuations in perchlorate concentrations have been observed over time in most wells (see Appendix H). In some cases, there is a positive correlation between perchlorate concentrations and water levels. In other cases, there is limited or inverse correlation between perchlorate concentrations and water levels. No clear/consistent decreasing trends in perchlorate concentrations are evident from intra-well perchlorate concentration data over time. In addition, geochemical conditions such as relatively high DO concentrations in most wells (generally exceeding 2.89 mg/L based on March 2009 round of groundwater monitoring prior to the pilot study [Trevet 2010]) indicate limited potential for biodegradation of perchlorate. However, an evaluation of the spatial distribution of perchlorate at IRP Sites 1 and 2, indicates that perchlorate concentrations decrease by one order of magnitude from the Central Source Area at IRP Site 1 to the aquifer immediately upgradient of IRP Site 2. The decline in perchlorate concentrations appears to be the result of advection and dispersion, and dilution as a result of convergence of IRP Site 1 groundwater with groundwater from the unnamed tributary at the southern end of IRP Site 1, groundwater beneath Borrego Canyon Wash at IRP Site 2, and groundwater in the Irvine Management Zone. This indicates that the natural attenuation processes such as dilution and dispersion are occurring to reduce perchlorate concentrations as it migrates from the Central Source Area at IRP Site 1 to the Station Boundary. The most recent data available at the time of preparation of this FS indicate that perchlorate concentrations are reduced to less than the CG before it reaches the Station Boundary.

Since the nearest off-Station drinking water well is located approximately 4.4 miles from the Station Boundary, currently MNA appears to be protective to off-Station receptors. However, there is uncertainty with respect to long-term effectiveness of MNA to protect human-health and the environment, and to reduce perchlorate concentrations to less than the CG. Under Alternative G1-2, perchlorate concentrations at the Station Boundary are expected to increase for some time before they start to show the decreasing trend due to natural attenuation processes. Groundwater modeling (see Section 5.3 and Appendix E) conducted in support of this FS indicates that it would take more than 200 years for IRP Site 1 perchlorate-impacted groundwater to naturally attenuate to concentrations less than the CG.

The U.S. EPA guidance on MNA (USEPA 1999c) recommends the identification of a contingency remedy. The contingency remedy is a cleanup technology or approach that functions as a backup remedy if MNA fails to perform as anticipated. If MNA is selected as the preferred remedy for IRP Site 1, the protectiveness of the remedy will be evaluated as part of the 5-year review and as data from monitoring are collected. If this evaluation concludes that the selected remedy is not protective (e.g., a consistent exceedence of MCLs for the COCs at the point of compliance or a documented unacceptable risk to human-health or the environment), an evaluation of the application of a contingency remedy would be conducted. In accordance with the U.S. EPA guidance, the details of the contingency remedy will be presented in the site remedy decision document, if Alternative G1-2 is selected as the remedy for IRP Site 1 perchlorate-impacted groundwater.

To attain the RAOs, MNA would be combined with ICs. ICs would include non-engineered mechanisms established to limit potential human exposure to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced to less than its MCL. The following sections present a summary of implementation mechanisms for ICs and potential groundwater use restrictions for

perchlorate-impacted groundwater. A detailed discussion of implementation mechanisms for ICs and groundwater use restrictions will be presented in the Land-Use Control Remedial Design if Alternative G1-2 is selected as the remedy for IRP Site 1 perchlorate-impacted groundwater.

The tentative boundaries of the areas requiring ICs (ARICs) based on the current extent of perchlorate-impacted groundwater are presented on Figure 5-2. The final boundaries of ARICs will be presented in the Land-Use Control Remedial Design.

5.1.2.1 IMPLEMENTATION MECHANISMS

The DON in consultation with other Federal Facility Agreement (FFA) signatories, would implement and enforce ICs to minimize the potential for existing and future use of perchlorate-impacted groundwater in a manner that presents unacceptable risk, protect the remedial system components such as monitoring wells, and to allow for potential future monitoring and maintenance activities by DON and oversight of those activities by the FFA signatories.

The ICs for perchlorate-impacted groundwater may be implemented through the following mechanisms:

1. Memorandum of Understanding (MOU) with the FAA since a major portion of the property overlying the perchlorate-impacted groundwater downgradient of IRP Site 1 is owned by the FAA (see Figure 5-2).
2. MOU with the Federal agency to whom the DON transfers IRP Site 1 property.
3. In the event that DON transfers the property overlying perchlorate-impacted groundwater (including IRP Site 1 property) to a non-federal entity, the DON would use proprietary ICs in the form of environmental restrictive covenants as provided in the Memorandum of Agreement (MOA) between the DON and the DTSC and attached covenant models (DON and DTSC 2000) (see Appendix D). More specifically, ICs objectives will be achieved through land use/activity restrictions, which will be incorporated into two separate legal instruments as provided in the DON/DTSC MOA:
    - Restrictive covenants included in one or more “quitclaim deed(s)” from the DON to the property recipient.
    - Restrictive covenants included in one or more “Covenant(s) to Restrict Use of Property” entered into by the DON and the DTSC as provided in the DON/DTSC MOA and consistent with the substantive provisions of CCR tit. 22 § 67391.1.

The “Coventant(s) to Restrict Use of Property” will incorporate the land use/activity restrictions into the environmental restrictive covenants that run with the land and that are enforceable by the DTSC against future transferees. The “quitclaim deed(s)” will include the identical land use/activity restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the DON against future transferees.

ICs would also be implemented to protect human-health for the potential off-Station receptors. The DON will coordinate with the State agencies including the Orange County Health Care Agency (OCHCA) and the Orange County Water District (OCWD) to implement these ICs. The ICs for the off-Station portion of the aquifer would likely be based on local permit programs administered by the OCHCA and OCWD.

5.1.2.2 LAND-USE RESTRICTIONS

The ARICs for IRP Site 1 perchlorate-impacted groundwater currently or in future may consist of the following (see Figure 5-2):

- A 74-acre area constituting IRP Site 1 currently owned by the DON
- Property downgradient of IRP Site 1 currently owned by the FAA
- Leased property consisting of portions of Carve-outs II-V and/or II-F
- Off-Station property

The land-use restrictions pertaining to each of these are discussed in the following sections.

IRP Site 1 Property

The ICs would be implemented within the IRP Site 1 property to limit exposure of future landownwer(s) and/or user(s) to perchlorate-impacted groundwater and to maintain the integrity of the remedial action components such as monitoring wells. These restrictions may be included in the MOU, or "quitclaim deed(s)" and "Covenant(s) to Restrict Use of Property," depending upon whether the property overlying perchlorate-impacted groundwater is transferred to a Federal or non-Federal entity, respectively. The land-use restrictions would achieve the following objectives:

- Prevent activities that present unacceptable risk to human-health due to COCs in groundwater; and
- Protect site security and remedial action components, such as monitoring wells, fences, and signs.

The land-use restrictions in general would include the following until the concentrations of COCs in groundwater are reduced to levels below site-specific CGs:

- Alteration, disturbance, or removal of any component of a response or cleanup action including groundwater extraction, injection, and monitoring wells and associated piping and equipment; without the prior review and written concurrence of DON and the other FFA signatories.
- The extraction of groundwater and installation of new groundwater wells without prior review and written concurrence from DON and the other FFA signatories.
- The installation of any well that has the potential to affect migration of perchlorate without prior review and written concurrence from DON and the other FFA signatories.
- The removal of or damage to security features (e.g., fences, locks on monitoring wells, signs, or monitoring equipment and associated pipelines and appurtenances) without prior written approval by the DON.

In addition to the above restrictions, the environmental protection provisions included in the ICs may include provisions that would allow DON, FFA signatories, and their authorized agents, employees, contractors, and subcontractors access to the property overlying perchlorate-impacted groundwater to conduct necessary investigations, data collection, data evaluation, long-term maintenance and monitoring activities, or closure activities as a part of the CERCLA response action. The ICs would also stipulate that the use of the property by future landowner(s) and/or user(s) shall not interfere with investigations or other response actions conducted as part of CERCLA.

Property Downgradient of IRP Site 1 Owned by FAA

The major portion of the property overlying the perchlorate-impacted groundwater downgradient of IRP Site 1 that also includes IRP Site 2 is owned by the FAA. The DON transferred this property to the FAA in accordance with the MOU finalized on 3 December 2001. This MOU would be modified to include a comprehensive list of restrictions to protect potential receptors from exposure to perchlorate-impacted groundwater. The restrictions documented in the current MOU are summarized below.

The current MOU documents the following restriction that prohibits:

- exposing or extracting groundwater from the shallow or principal aquifer at IRP Site 2 without prior approval of DON.

The MOU also states that the FAA shall comply with the provisions of the Land Use Control Implementation Plan for IRP Sites 2 and 17. The ICs included in the Land Use Control Plan (DON 2009a) as modified through the Explanation of Significant Differences (ESD) (DON 2009b) prohibit the following in the ARICs defined for IRP Sites 2 and 17:

- residential use of the sites and construction of hospitals for humans, schools or persons under 21 years of age, day care centers for children, or any permanently occupied human habitation on the sites;
- construction of facilities, structures, or appurtenances; excavation; or any other land-disturbing activity into or on the surface of the landfills that may affect the drainage or increase erosion or infiltration unless prior approval is obtained from the DON and the FFA signatories;
- construction of structures within 1,000 feet of the edge of the landfill without prior approval of the DON and FFA signatories;
- planting deep-rooted plants that could threaten the integrity of the landfill cap;
- irrigating the surface of the landfill except when it is used for establishment, repair, and maintenance of vegetation cover required for effective performance of the cap;
- land-disturbing activity on lands adjacent to the landfill and currently or formerly owned by DON that may cause adverse effects upon the landfill through erosion of the surface or diversion of off-site surface water runoff onto the landfill, are prohibited unless the land owner of the adjacent property provides for mitigation of such adverse effects (e.g., through structural drainage and erosion control measures such as diversion channels, riprap) and obtains the prior approval of DON, U.S. EPA Region 9, DTSC, and RWQCB;
- the removal of or damage to security features (e.g., locks on monitoring wells) or to monitoring equipment and associated pipelines and appurtenances.

Leased Property Downgradient of IRP Site 1

Portions of ARICs for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may encompass Carve-outs II-V and/or II-F (Figures 3-8 and 5-2). Carve-outs II-V and II-F constitute portions of former MCAS El Toro that were leased in 2005 to Heritage Fields, LLC (Orange County Great Park Corporation and Lennar Corporation), a private developer. Carve-outs II-V and II-F will be leased until the time FFA signatories concur on the following:

- groundwater remedies for IRP Site 1 perchlorate-impacted and/or IRP Site 2 VOC-impacted groundwater are operating properly and successfully, and
- reduction of the buffer zone for IRP Site 2 soil remedy from 1,000 feet to 100 feet.

Following concurrence of the FFA signatories, Carve-outs II-V and II-F will be transferred to a non-Federal entity.

The interim land-use restrictions will be administratively handled through a Lease In Furtherance of Conveyance (LIFOC), until the time Carve-outs II-V and II-F are conveyed by deed to the Lessee. The LIFOC for Parcel II at former MCAS El Toro is currently in place and includes the following land use restrictions (DON 2005a):

- Lessee shall not conduct any subsurface excavation, digging, drilling or other disturbance of the ground surface without prior Government approval.
- Lessee shall not install new groundwater wells of any type and shall not use contaminated groundwater without prior written Government approval.
- Lessee shall not install any well that has the potential to affect plume migration.
- Lessee shall not alter, disturb or remove groundwater monitoring wells, remedial action equipment (e.g., pumps), or associated utilities without prior written Government approval.
- Removal of or damage to security features (e.g., locks on monitoring wells, survey monuments, signs or monitoring equipment and associated pipelines and appurtenances) is prohibited without prior written Government approval.
- The construction of structures within 1,000 feet of the edge of the landfill is prohibited without prior DON approval. Therefore, construction of structures within Carve-outs II-F and II-V is prohibited without prior DON approval.

In addition to the above restrictions, the LIFOC includes the provisions for ensuring that DON and regulatory agencies have access to the leased premises including Carve-outs II-F and II-V.

Following transfer of leased property, ICs would be implemented using the mechanisms discussed in Section 5.1.2.1, to protect human-health and the environment. These ICs would achieve the objectives and would contain restrictions discussed under subsection “IRP Site 1 Property” above.

Off-Station Property

ICs would be implemented to provide protection of human-health for the potential off-Station receptors. The ICs for the off-Station portion of the aquifer would likely be based on local permit programs administered by the OCHCA and OCWD. The details of these ICs will be presented in the ROD and/or remedial design/remedial action work plan.

5.1.3 Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs

Alternative G1-3 consists of the following components:

- In-situ bioremediation of perchlorate-impacted groundwater near the Station Boundary,
- Groundwater monitoring and ICs

The conceptual design of Alternative G1-3 is presented on Figure 5-3 and each of its individual components are described in the following sections.

5.1.3.1 IN-SITU BIOREMEDIATION NEAR THE STATION BOUNDARY

Alternative G1-3 would include in-situ bioremediation of perchlorate-impacted groundwater near the Station Boundary to minimize the potential for migration of perchlorate at concentrations exceeding its CG. The implementation of in-situ bioremediation would include injection of electron donor or substrate into the subsurface near the Station Boundary to create a biologically active zone transverse to the groundwater flow. The addition of substrate would stimulate indigenous microorganisms to grow and multiply by using injected substrate as carbon and energy source. In this process, the naturally occurring chemical species such as oxygen, nitrate, and sulfate are used as electron acceptors. After the oxygen is depleted and the redox conditions of the aquifer become anoxic/anaerobic, perchlorate-degrading bacteria would use perchlorate as an electron acceptor and in this process degrade it to innocuous end products such as chloride ions and oxygen. The microcosm and pilot studies conducted at IRP Sites 1 and 2 (see Section 3.4) demonstrate that indigenous perchlorate-degrading bacteria are capable of rapidly degrading perchlorate under reducing conditions (AECOM and ECS 2010).

The emplacement of substrate into the subsurface may be accomplished using a PRB or groundwater recirculation loop as summarized below:

- A PRB would include a series of injection points oriented perpendicular to the groundwater flow. Both regular pressurized injection and hydraulic fracturing were found to be effective strategies for implementation of the PRB during the pilot study (AECOM and ECS 2010). The design parameters for the PRB, including location, total length, injection point spacing, and treatment thickness would be finalized during the remedial design/remedial action phase, and would be based on the most recent groundwater monitoring data available at the time, and the in-situ bioremediation pilot study conducted near the Station Boundary (AECOM and ECS 2010). For cost-estimation purposes, it is assumed that the length of the PRB near the Station Boundary would be 100 feet and the thickness of the treatment zone would be 40 feet.

  The substrate injected into the subsurface to create a PRB may be a slow release substrate such as EOS® or EHC®. The use of slow release substrate would eliminate the need for continuous or frequent injection of substrate into the aquifer, thereby significantly lowering the O&M costs compared to aqueous-phase injection of soluble carbon sources.

- A groundwater recirculation loop would include installation of injection and extraction wells. Groundwater would be extracted using the extraction wells placed near the Station Boundary, amended with an electron-donor to enhance biological treatment, and reinjected into the aquifer using injection wells placed upgradient. The design parameters including the location of the groundwater recirculation system would be determined as part of remedial design/remedial action.

  Based on the groundwater model developed in support of the IRP Site 2 FS, two extraction wells and three injection wells would be sufficient to hydraulically contain groundwater impacted with perchlorate near the Station Boundary and form a groundwater recirculation loop. Based on the aquifer tests conducted in the vicinity of the Station Boundary, the groundwater extraction rates for the recirculation system would be approximately 0.3-gpm. Soluble substrate such as molasses or lactate may be used to amend extracted groundwater because of the ease with which soluble substrates can be mixed with groundwater. Substrate amendments applied in recirculation systems are more readily controlled and distributed

through the treatment zone relative to passive systems such as a PRB (AFCEE, NFESC, and ESTCP 2004). However, since recirculation systems involve continuous extraction and injection of groundwater, the O&M costs for these systems are generally higher than passive systems such as a PRB.

5.1.3.2 Groundwater Monitoring and ICs

Groundwater monitoring would be implemented to evaluate the effectiveness of in-situ bioremediation and to track the distribution of perchlorate in the area between the perchlorate Source Area and the Station Boundary.

Near the Station Boundary, perchlorate-impacted groundwater is commingled with groundwater impacted by TCE. The source of the TCE reported near the Station Boundary is IRP Site 2 (Earth Tech 2004). TCE is being addressed as part of groundwater remedial action at IRP Site 2 (Earth Tech 2005). It is widely known and also has been demonstrated during the in-situ bioremediation pilot study conducted near the Station Boundary (AECOM and ECS 2010) that TCE is amenable to biodegradation (also referred to as reductive dechlorination) under anaerobic conditions. Therefore, as the groundwater passes through the biologically-active zone near the Station Boundary, TCE is likely to get biodegraded along with perchlorate. If the reductive dechlorination of TCE is complete, ethene would be formed as an end product. However, if reductive dechlorination of TCE is incomplete, cis-dichloroethene (cis-DCE) and/or vinyl chloride (VC) would be formed. Performance monitoring for in-situ bioremediation would incorporate monitoring for TCE, TCE biodegradation products, and/or other COCs associated with IRP Site 2, as appropriate. Performance monitoring would be conducted using existing or newly-installed monitoring wells/piezometers. This monitoring would include collection of groundwater samples from wells upgradient and downgradient of the PRB and analysis of these samples for perchlorate, geochemical parameters (nitrate, sulfate, etc.) or other parameters such as total organic carbon (TOC). The performance monitoring would verify that perchlorate does not migrate off-Station at concentrations exceeding its CG.

To attain the RAOs, Alternative G1-3 would also include implementation of ICs. ICs would be implemented as part of Alternative G1-3 to minimize exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG. The implementation of ICs for Alternative G1-3 would be as described in Section 5.1.2.1.

5.1.3.3 Estimated Time Frames for Remediation

Groundwater modeling conducted in support of this FS indicates that in-situ bioremediation near the Station Boundary would need to be operated for more than 200 years to minimize the risk for potential off-Station migration of perchlorate at concentrations exceeding the CG (see Section 5.3 and Appendix E).

Since Alternative G1-3 is expected to require more than 5 years to attain the RAOs, the protectiveness of the remedy will be evaluated as part of 5-year reviews. The 5-year reviews would include review of the collected data, interviews, and site-inspections to evaluate if the remedy remains protective of human-health and the environment.

5.1.4 Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs

Alternative G1-4 consists of the following components:

- In-situ bioremediation of the perchlorate Source Area,
- In-situ bioremediation of perchlorate-impacted groundwater near the Station Boundary, and

- Groundwater monitoring and ICs

The conceptual design of Alternative G1-4 is presented on Figure 5-4 and each of its individual components are described in the following sections.

5.1.4.1 IN-SITU BIOREMEDIATION OF PERCHLORATE SOURCE AREA

Alternative G1-4 would include implementation of in-situ bioremediation at the Source Area and near the Station Boundary. The implementation of in-situ bioremediation at the Source Area would treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize downgradient migration. The design configurations for the implementation of in-situ bioremediation at the Source Area may include a PRB, direct injection, or groundwater recirculation, are summarized in the subsections below (see Figure 5-4).

Perchlorate Source Area Control using PRB

A PRB would be installed downgradient of and near the perchlorate Source Area to treat and contain relatively high concentrations of perchlorate in groundwater and minimize downgradient migration. The perchlorate Source Area includes the central portion of IRP Site 1 including the area underlain by paleochannel (see Figure 3-7). Under steady state conditions, perchlorate is primarily present in the weathered and/or competent (moderately indurated) bedrock in this area.

The design parameters for the PRB would be based on the in-situ bioremediation pilot study conducted in the central portion of IRP Site 1 (AECOM and ECS 2010). For cost-estimation purposes, it is assumed that length of the PRB downgradient of the Source Area would be 75 feet and the thickness of the treatment zone would be 30 feet.

The substrate injected into the subsurface to create a PRB may be a slow release substrate such as EOS® or EHC®. The use of slow release substrate would eliminate the need for continuous or frequent injection of substrate into the aquifer, thereby significantly lowering the O&M costs compared to aqueous-phase injection of soluble carbon sources.

The substrate may be injected into the subsurface using regular pressurized injection or using hydraulic fracturing. Both regular pressurized injection and hydraulic fracturing were found to be effective strategies for subsurface injection of substrate during the pilot study. The nature of substrate and substrate injection strategy would be ascertained during the design phase.

Some of the injection wells for Alternative G1-4 may be located in areas with munitions and/or naphthalene-impacted soil. Therefore, implementation of a remedial action for Alternative G1-4 may need to be coordinated with implementation of remedial actions for MEC and/or naphthalene-impacted soil at IRP Site 1. The nature of this coordination (if required) would be addressed during the Remedial Design/Remedial Action phase.

Groundwater modeling conducted in support of this FS indicates that a PRB installed downgradient of the perchlorate Source Area would need to be operated for more than 90 years for remediation of the entire Source Area to perchlorate concentrations less than its CG.

Perchlorate Source Area Treatment Using Direct Injection

The second option for in-situ bioremediation of the perchlorate Source Area is direct injection of an electron donor into groundwater. Substrate would be injected into the saturated weathered bedrock in the Source Area using multiple injection points distributed throughout the treatment area using regular pressurized injection or fracturing technologies such as hydraulic or pneumatic fracturing.

Both regular pressurized injection and hydraulic fracturing were found to be effective in injection in substrate in the Source Area during the pilot study (AECOM and ECS 2010).

The substrate injected into the subsurface for in-situ treatment may be a slow release substrate such as EOS® or hydrogen release compound (HRC®) or soluble carbon substrate such as lactate or molasses. The electron donor for direct injection would be selected during the design phase.

Current data suggests that the aquifer in the central portion of IRP Site 1 is aerobic; therefore, the substrate would have to be injected in sufficient quantities to overcome the demand exerted by native electron acceptors such as oxygen and nitrate in the subsurface and perchlorate. Following depletion of oxygen and the change in redox conditions of the aquifer to anoxic/anaerobic, perchlorate-degrading bacteria would use perchlorate as an electron acceptor and in this process degrade it to innocuous end products such as chloride ions and oxygen. The microcosm and pilot studies conducted for IRP Site 1 clearly demonstrate that indigenous perchlorate-degrading bacteria are capable of rapidly degrading perchlorate under reducing conditions (ECS 2006 and AECOM and ECS 2010).

Some of the injection wells for Alternative G1-4 may be located in areas with MEC and/or naphthalene-impacted soil. Therefore, implementation of a remedial action for Alternative G1-4 may need to be coordinated with implementation of remedial actions for MEC and/or naphthalene-impacted soil at IRP Site 1. The nature of this coordination (if required) would be addressed during the Remedial Design/Remedial Action phase.

Perchlorate Source Area Treatment using Groundwater Recirculation

The third option for implementation of in-situ bioremediation at the Source Area is a groundwater recirculation system. This groundwater recirculation loop would be implemented downgradient of the perchlorate Source Area to create a biologically active zone similar to the PRB, as discussed in Section 5.1.4.1. Alternatively, multiple groundwater recirculation loops would be implemented within the perchlorate Source Area to distribute electron donor/substrate.

As part of the implementation of a groundwater recirculation loop, groundwater would be extracted using extraction wells, amended with an electron-donor to enhance biological treatment, and reinjected into the aquifer using injection wells placed upgradient. Soluble substrate such as molasses or lactate may be used to amend extracted groundwater because of the ease with which soluble substrates can be mixed with groundwater.

5.1.4.2 In-Situ Bioremediation Near the Station Boundary

The implementation of in-situ bioremediation near the Station Boundary would minimize the potential for further off-Station migration of perchlorate at concentrations exceeding its CG. The bioremediation near the Station Boundary would be implemented using the design configurations discussed for Alternative G1-3.

5.1.4.3 Groundwater Monitoring and ICs

Groundwater monitoring would be conducted as a component of Alternative G1-4 to evaluate the effectiveness of in-situ bioremediation in the Source Area, and near the Station Boundary to treat perchlorate. In addition, groundwater monitoring would also be used to track the distribution of perchlorate in the saturated sandstone/alluvium between the Source Area and the Station Boundary, and beyond. The groundwater monitoring would include collection of groundwater samples and analyses for perchlorate, and geochemical parameters such as DO, and nitrate. The groundwater

samples collected near the Station Boundary would also be analyzed for TCE, TCE biodegradation products, and/or other COCs associated with IRP Site 2.

Alternative G1-4 would also include implementation of ICs to attain the RAOs. ICs would be implemented as part of Alternative G1-4 to minimize exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG. The implementation of ICs for Alternative G1-4 would be as described in Section 5.1.2.1.

5.1.4.4 Estimated Time Frames for Remediation

Groundwater modeling conducted in support of this FS indicates that it would take more than 200 years for perchlorate concentrations to decrease to less than its CG across the estimated extent of the perchlorate impacted groundwater using Alternative G1-4 (see Section 5.3 and Appendix E).

Since Alternative G1-4 is expected to require more than 5 years to attain the RAOs, the protectiveness of the remedy will be evaluated as part of 5-year reviews. The five-year reviews would include review of the collected data, interviews, and site-inspections to evaluate if the remedy remains protective of human-health and the environment.

5.1.5 Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs

Alternative G1-5 consists of the following components:

- In-situ bioremediation at the perchlorate Source Area,
- In-situ bioremediation of perchlorate-impacted groundwater downgradient of the perchlorate Source Area using an intermediate PRB between IRP Sites 1 and 2,
- In-situ bioremediation of perchlorate near the Station Boundary, and
- Groundwater monitoring and ICs

The conceptual design of Alternative G1-5 is presented on Figure 5-5 and each of its individual components are described in the following sections.

5.1.5.1 In-Situ Bioremediation of Perchlorate Source Area

In-situ bioremediation of the perchlorate Source Area under Alternative G1-5 would be implemented as discussed in Section 5.1.4.

5.1.5.2 Intermediate PRB between IRP Sites 1 and 2

An intermediate PRB for perchlorate bioremediation may be installed at a location between IRP Sites 1 and 2 and would include installation of a series of injection points perpendicular to the groundwater flow. The length of the PRB and the thickness of the injection zone would be sufficient to treat the estimated lateral and vertical extent of perchlorate in groundwater in the region between IRP Sites 1 and 2.

For cost estimating purposes and based on the current data, the length of the intermediate PRB is estimated to be 150 feet and the thickness of the injection zone for substrate is estimated to be approximately 40 feet. The substrate injected into the subsurface to create a PRB may be a slow release substrate such as EOS® or EHC®. The use of slow release substrate would eliminate the need for continuous or frequent injection of substrate into the aquifer, thereby lowering the O&M costs

compared to an aqueous-phase injection of soluble carbon sources. The nature of the selected electron donor for creation of a PRB would be ascertained during the design phase.

The substrate may be injected into the subsurface using regular pressurized injection or using hydraulic fracturing. Both regular pressurized injection and hydraulic fracturing were found to be effective strategies for subsurface injection of substrate during the pilot study. The nature of substrate and substrate injection strategy would be ascertained during the design phase.

Monitoring would be conducted to evaluate the performance of the intermediate PRB using existing or newly installed monitoring wells/piezometers. This monitoring would include collection of groundwater samples from wells upgradient and downgradient of the PRB and analysis of these samples for perchlorate or other parameters such as nitrate and TOC.

5.1.5.3 In-Situ Bioremediation Near the Station Boundary

In-situ bioremediation of perchlorate near the Station Boundary under Alternative G1-5 would be implemented as discussed in Section 5.1.3.

5.1.5.4 Groundwater Monitoring and ICs

Groundwater monitoring would be conducted as a component of Alternative G1-5 to evaluate the effectiveness of in-situ bioremediation in the Source Area, intermediate area and the Station Boundary to treat perchlorate. In addition, groundwater monitoring would also be used to track the distribution of perchlorate in the saturated sandstone/alluvium between the Source Area and the intermediate PRB, intermediate PRB and the Station Boundary, and beyond. The groundwater monitoring would include collection of groundwater samples and analyses for perchlorate, and geochemical parameters such as DO, and nitrate.

Alternative G1-5 would also include implementation of ICs as described in Section 5.1.2.1 to attain the RAOs for perchlorate-impacted groundwater.

5.1.5.5 Estimated Time Frames for Remediation

Groundwater modeling conducted in support of this FS indicates assuming direct injection is used for remediation of the Source Area, and PRBs are installed in the intermediate area between IRP Sites 1 and 2, and the Station Boundary, perchlorate concentrations would be reduced to less than its CG for the estimated extent of IRP Site 1 perchlorate-impacted groundwater in approximately 19 years (see Section 5.3 and Appendix E).

Since Alternative G1-5 is expected to require more than 5 years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of 5-year reviews. The 5-year reviews would include review of the collected data, interviews, and site-inspections to evaluate if the remedy remains protective of human-health and the environment.

5.1.6 Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Alternative G1-6 would include installation of groundwater extraction wells along the estimated extent of IRP Site 1 perchlorate-impacted groundwater. Groundwater modeling conducted in support of this FS indicates that approximately 176 groundwater extraction wells would be required to reduce perchlorate concentrations to less than the CG in approximately 49 years (see Appendix E). Sustainable extraction rates ranging between 0.3-gpm to 2 gpm were assumed for individual extraction wells in the groundwater model based on the aquifer tests conducted at IRP Site 1, and information on the geology between IRP Sites 1 and 2.

Extracted groundwater would be treated using one of the two technologies described in the following subsections. Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation. ICs would be implemented until the time perchlorate is reduced to concentrations less than or equal to its CG as described in Section 5.1.2.1. The conceptual design of Alternative G1-6 is presented on Figure 5-6.

Some of the extraction wells under this alternative may be located in areas with MEC and/or naphthalene-impacted soil. Therefore, implementation of remedial actions using Alternative G1-6 may need to be coordinated with implementation of remedial actions for MEC and/or naphthalene-impacted soil. The nature of this coordination (if required) would be addressed during the Remedial Design/Remedial Action phase.

5.1.6.1 EX-SITU TREATMENT WITH FLUIDIZED BED REACTOR

Under this option, perchlorate in extracted groundwater would be treated using a fluidized bed reactor (FBR). The FBR is a reactor that fosters the growth of microorganisms on a hydraulically fluidized bed of media, usually sand or activated carbon. Perchlorate is used by bacteria as a terminal electron acceptor under anaerobic conditions, and is completely transformed into chloride, an innocuous end product. Field application of FBRs for perchlorate treatment usually consists of a cylindrical reactor with granular activated carbon (GAC) media, electron donor (ethanol, acetate etc.) feed system, nutrient feed system, and pH adjustment system (Guarini 2002).

5.1.6.2 EX-SITU TREATMENT WITH ION EXCHANGE

Under this option, perchlorate in extracted groundwater would be treated using ion exchange resin (IX). IX is a physical/chemical process by which an ion on the solid phase (synthetic resin) is exchanged for an ion in the feed water. The synthetic resin is chosen to preferentially adsorb the particular COC. As water flows through the resin beds, ions with higher affinity (perchlorate) are collected by the resin and replace the chloride ions, which enter the water stream and become part of the effluent stream. Exhaustion occurs when entire surface of the resin beads has been filled by contaminant ions. At this point, the bed is either replaced or regenerated by rinsing the ion exchange column with a regenerant – a concentrated solution of ions initially exchanged from the resin.

5.1.6.3 ESTIMATED TIME FRAMES FOR REMEDIATION

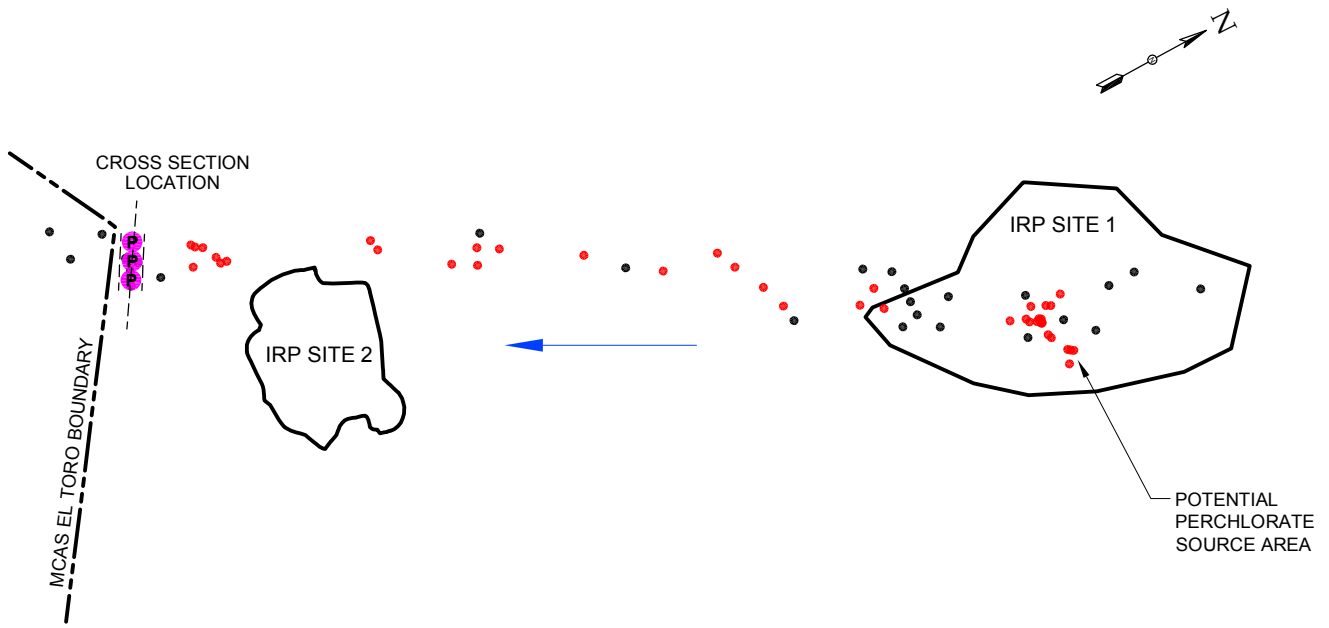
Groundwater modeling conducted in support of this FS indicates that assuming 176 extraction wells are installed capable of extracting groundwater at the rate of 0.3-gpm to 2 gpm, perchlorate concentrations would be reduced to less than its CG for the estimated extent of IRP Site 1 perchlorate-impacted groundwater in approximately 49 years (see Section 5.3 and Appendix E).

Since Alternative G1-6 is expected to require more than 5 years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of 5-year reviews. The 5-year reviews would include review of the collected data, interviews, and site-inspections to evaluate if the remedy remains protective of human-health and the environment.

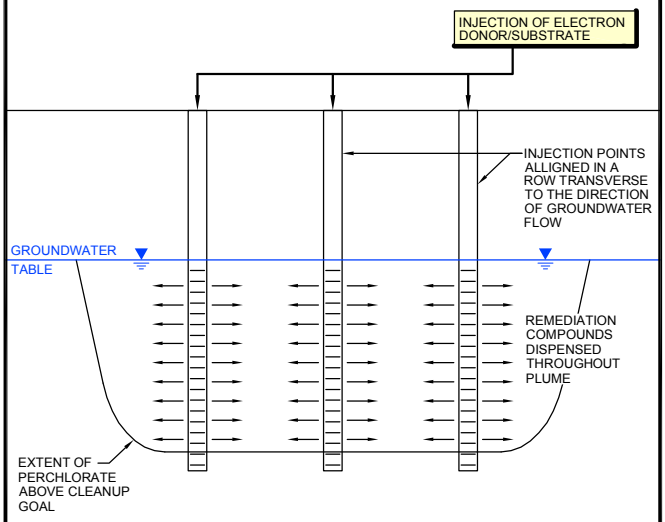
5.2 VOC-IMPACTED GROUNDWATER – IRP SITE 2

Similar to perchlorate-impacted groundwater at IRP Site 1, the remedial action alternatives for VOC-impacted groundwater at IRP Site 2 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 4.3 (see Figure 5-7). The target remediation area was also considered while developing the alternatives. This process resulted in the development of alternatives representing a range of treatment and containment combinations. The

CONCEPTUAL PLAN

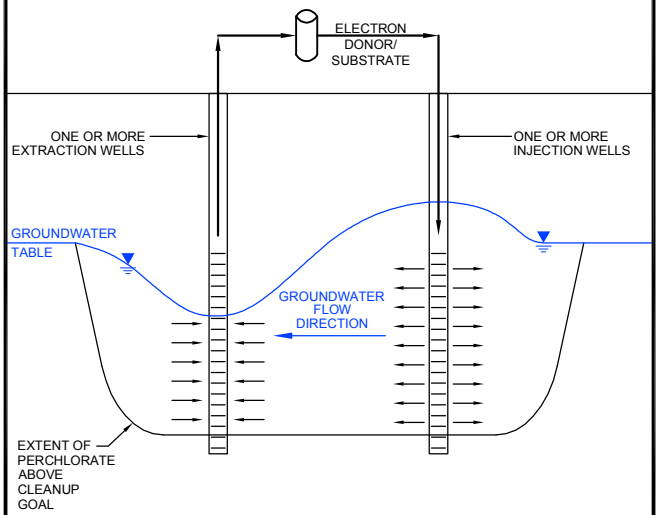


CONCEPTUAL PERMEABLE REACTIVE BARRIER CROSS SECTION



NOTE:
DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

CONCEPTUAL CROSS SECTION OF GROUNDWATER RECIRCULATION SYSTEM



LEGEND:

- (P) CONCEPTUAL LOCATION OF PERMEABLE REACTIVE BARRIER (PRB) OR GROUNDWATER RECIRCULATION SYSTEM. FINAL LOCATION TO BE DETERMINED IN THE REMEDIAL DESIGN.
- INDICATES PERCHLORATE CONCENTRATIONS GREATER THAN 6 µg/L
- INDICATES DETECTABLE PERCHLORATE CONCENTRATIONS LESS THAN 6 µg/L
- GENERAL GROUNDWATER FLOW DIRECTION

NOTES:
1. DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

µg/L	MICROGRAMS PER LITER
EOD	EXPLOSIVE ORDNANCE DISPOSAL
IC	INSTITUTIONAL CONTROL
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION

Feasibility Study — Draft Final

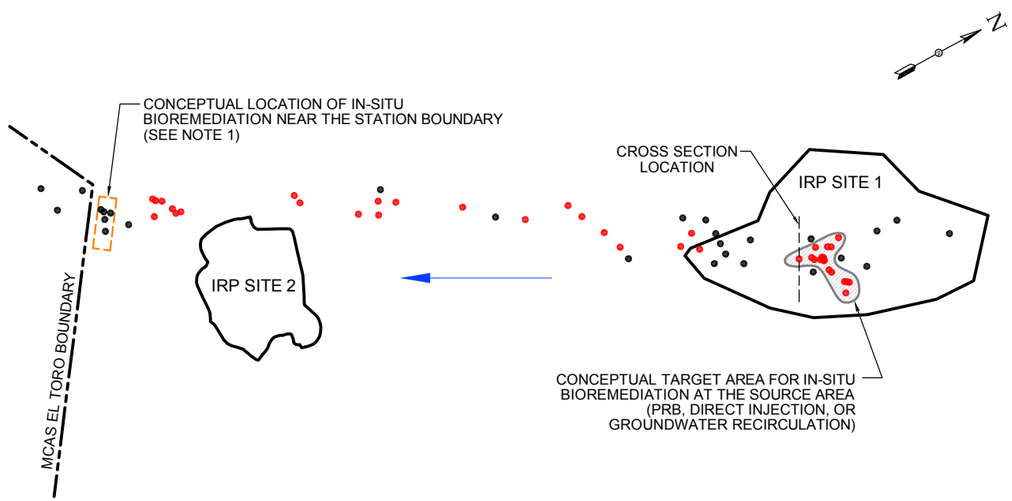
Conceptual Design: Alternative G1-3
In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-3

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-3.dwg Time: Sep 22, 2010 - 4:42pm

CONCEPTUAL PLAN



LEGEND:

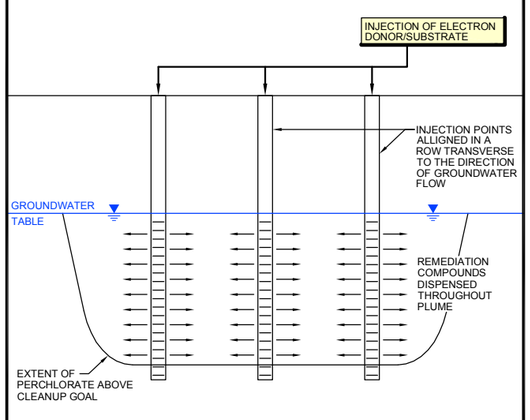
- ● INDICATES PERCHLORATE CONCENTRATIONS GREATER THAN 6 µg/L
- ● INDICATES DETECTABLE PERCHLORATE CONCENTRATIONS LESS THAN 6 µg/L
- ← GENERAL GROUNDWATER FLOW DIRECTION

NOTES:

1. IN-SITU BIOREMEDIATION AT THE STATION BOUNDARY WOULD BE IMPLEMENTED USING THE DESIGN CONFIGURATIONS PRESENTED FOR ALTERNATIVE G1-3. (SEE FIGURE 5-2)

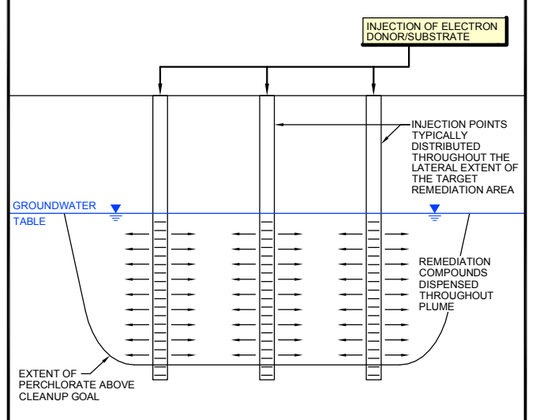
µg/L MICROGRAMS PER LITER
IC INSTITUTIONAL CONTROL
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION
PRB PERMEABLE REACTIVE BARRIER

CONCEPTUAL PERMEABLE REACTIVE BARRIER CROSS SECTION



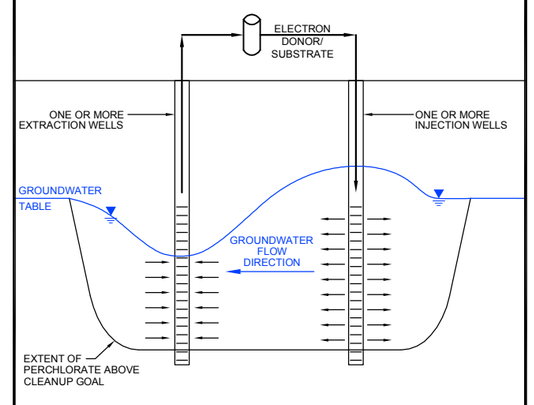
NOTE:
DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

CONCEPTUAL CROSS SECTION FOR DIRECT INJECTION IN THE SOURCE AREA



NOTE:
DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

CONCEPTUAL CROSS SECTION OF GROUNDWATER RECIRCULATION SYSTEM

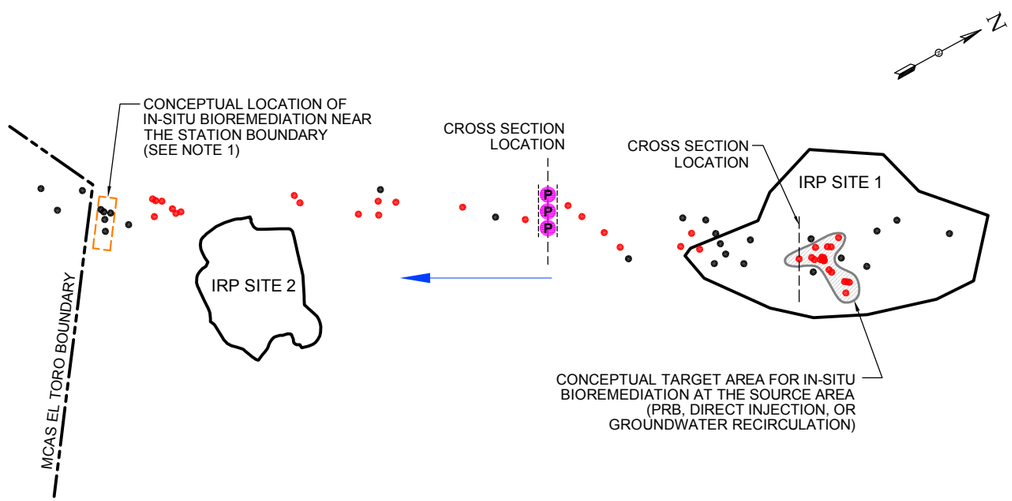


ALTERNATIVE IN-SITU BIOREMEDIATION DESIGN CONFIGURATIONS - SOURCE AREA TREATMENT

Feasibility Study		Draft Final
Conceptual Design: Alternative G1-4 In-Situ Bioremediation at the Source Area & Near the Station Boundary, Monitoring, and ICs IRP Sites 1 & 2		
Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-4

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-4.dwg Time: Sep 27, 2010 - 4:31pm

CONCEPTUAL PLAN



LEGEND:

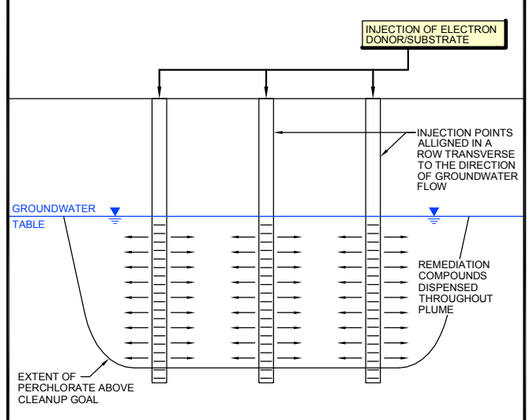
- P — CONCEPTUAL LOCATION OF PERMEABLE REACTIVE BARRIER BETWEEN IRP SITES 1 & 2. FINAL LOCATION TO BE DETERMINED DURING THE REMEDIAL DESIGN.
- INDICATES PERCHLORATE CONCENTRATIONS GREATER THAN 6 µg/L
- INDICATES DETECTABLE PERCHLORATE CONCENTRATIONS LESS THAN 6 µg/L
- GENERAL GROUNDWATER FLOW DIRECTION

NOTES:

1. IN-SITU BIOREMEDIATION AT THE STATION BOUNDARY WOULD BE IMPLEMENTED USING THE DESIGN CONFIGURATIONS PRESENTED FOR ALTERNATIVE G1-3. (SEE FIGURE 5-2)

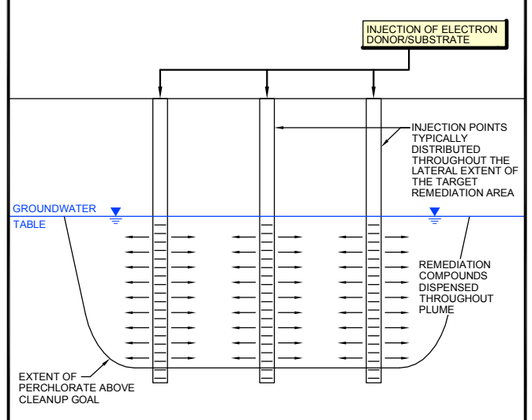
µg/L MICROGRAMS PER LITER
IC INSTITUTIONAL CONTROL
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION
PRB PERMEABLE REACTIVE BARRIER

CONCEPTUAL PERMEABLE REACTIVE BARRIER CROSS SECTION



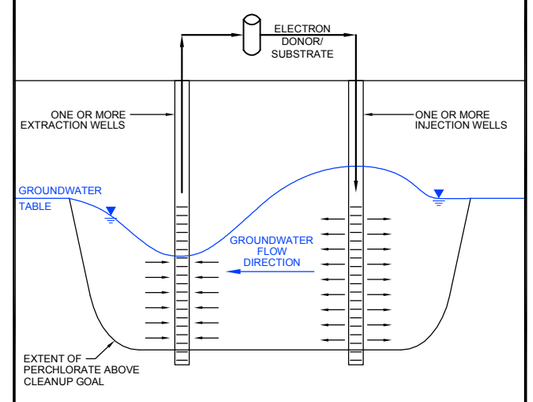
NOTE:
DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

CONCEPTUAL CROSS SECTION FOR DIRECT INJECTION IN THE SOURCE AREA



NOTE:
DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

CONCEPTUAL CROSS SECTION OF GROUNDWATER RECIRCULATION SYSTEM

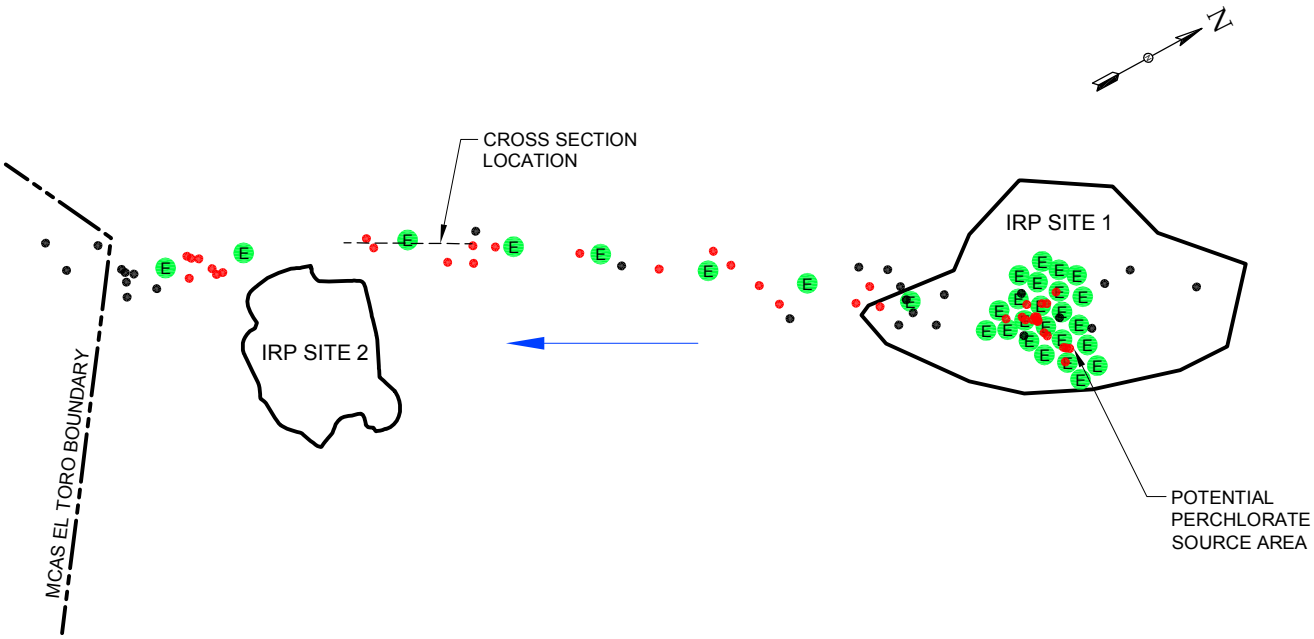


ALTERNATIVE IN-SITU BIOREMEDIATION DESIGN CONFIGURATIONS

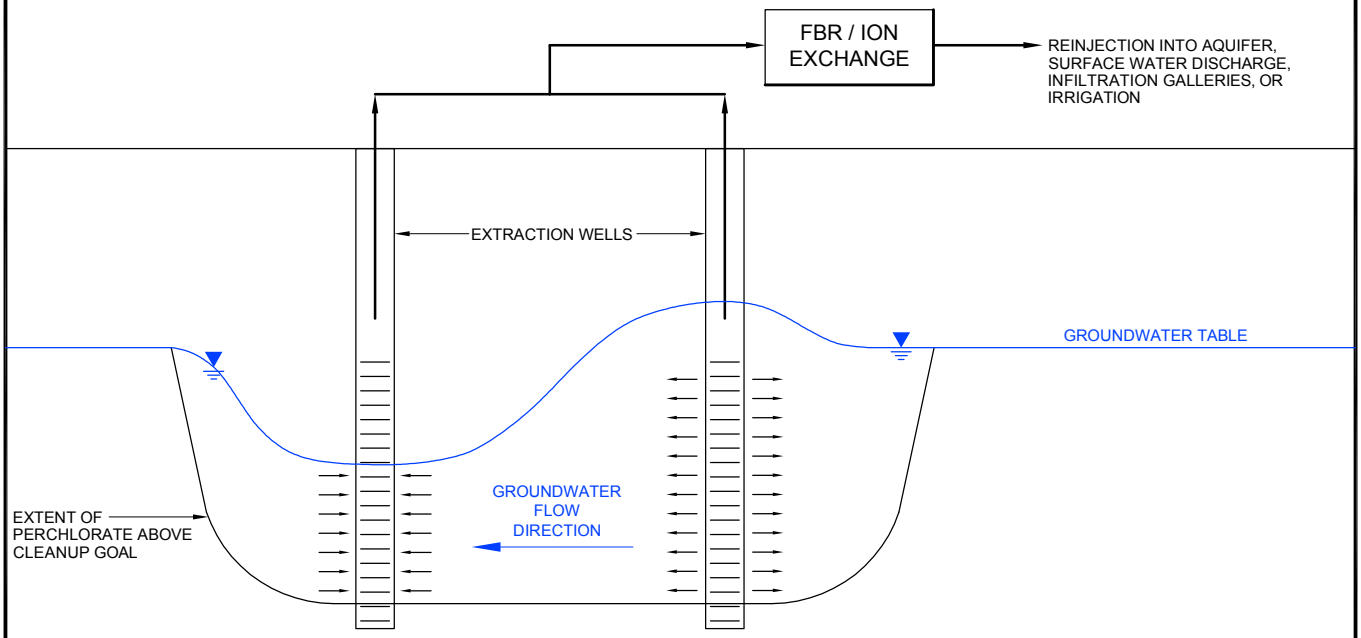
Feasibility Study		Draft Final
Conceptual Design: Alternative G1-5 In-Situ Bioremediation at the Source Area, Downgradient of the Source Area & Near the Station Boundary, Monitoring, and ICs IRP Sites 1 & 2		
Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-5

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-5.dwg Time: Sep 27, 2010 - 4:32pm

CONCEPTUAL PLAN



CONCEPTUAL CROSS SECTION



LEGEND:

- E — EXTRACTION WELL CONCEPTUAL LOCATION FOR EVALUATION ONLY. FINAL LOCATION TO BE DETERMINED IN THE REMEDIAL DESIGN.
- INDICATES PERCHLORATE CONCENTRATIONS GREATER THAN 6 µg/L
- INDICATES DETECTABLE PERCHLORATE CONCENTRATIONS LESS THAN 6 µg/L
- GROUNDWATER FLOW DIRECTION

NOTES:

1. A TOTAL OF 92 WELLS IS ASSUMED IN THE SOURCE AREA AND ALONG THE ENTIRE PLUME.

µg/L MICROGRAMS PER LITER
FBR FLUIDIZED BED REACTOR
IC INSTITUTIONAL CONTROL
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION

Feasibility Study — Draft Final

Conceptual Design: Alternative G1-6
Hydraulic Containment / Treatment, Monitoring, and ICs

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-6

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-6.dwg Time: Sep 27, 2010 - 4:32pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
27	**Present Worth Cost[d]: $3,223,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1, page 3-1; and Tables 2 and 3. AECOM. April 2011.

3. Assumptions and Costs for Remedial Alternatives

The underlying assumptions and quantities for cost estimates and individual cost summaries for the groundwater remedial alternatives for IRP Sites 1 and 2 selected for detailed analysis in this FS are presented in the following sections.

3.1 PERCHLORATE-IMPACTED GROUNDWATER – IRP SITE 1

3.1.1 Alternative G1-2: Monitored Natural Attenuation and Institutional Controls

Alternative G1-2 consists of natural attenuation monitoring and institutional controls to attain the RAOs for perchlorate-impacted groundwater are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce perchlorate concentrations in groundwater. Monitoring would also assess migration of perchlorate off-Station at concentrations exceeding its CG.

Institutional controls under Alternative G-2 would include non-engineered controls to limit human exposure to perchlorate-impacted groundwater. Restrictions on future groundwater use would be to protect potential on-site and off-site receptors, and protect the MNA system components. Since this remedial action alternative results in perchlorate remaining at the site above the levels that allow for unlimited use and unrestricted exposure, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G-2 are presented in Table 2. Table 3 presents the assumptions and parameters used for Alternative G-2 cost estimate.

3.1.2 Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs

Alternative G1-3 would include in-situ bioremediation of perchlorate-impacted groundwater near the Station boundary to minimize the potential for further migration of perchlorate at concentrations greater than its CG. The design configurations for the implementation of in-situ bioremediation near the Station boundary may include a permeable reactive barrier (PRB) or a groundwater recirculation loop, and are summarized in Section 5 of the main text of the FS. The cost estimate for Alternative G1-3 is based on the assumption that a PRB would be used for in-situ bioremediation of perchlorate impacted groundwater near the Station boundary.

To attain the RAOs, Alternative G1-3 would also include implementation of ICs and groundwater monitoring. ICs would be implemented as part of Alternative G1-3 to limit exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG. Groundwater monitoring would be implemented to evaluate the effectiveness of in-situ bioremediation and to assess the distribution of perchlorate in the area between the perchlorate source area and the Station boundary.

Since Alternative G1-3 results in perchlorate remaining at the site above the levels that allow for unlimited use and unrestricted exposure, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. A complete description of Alternative G1-3 is presented in Section 5 of the main text of the FS. The estimated costs for Alternative G1-3 are presented in Table 4. Table 5 presents the assumptions and parameters used for Alternative G1-3 cost estimate.

Table 2: Estimated Costs for Alternative G1-2

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020
CAPITAL COSTS									
Remedial Design	$18,624								
Institutional Controls Planning Documents (Capital)	$30,650								
Institutional Controls Implementation (Capital)		$73,852							
Groundwater Monitoring Well Installation (Capital)		$202,429							
O&M COSTS									
Institutional Controls Monitoring (O&M)			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Groundwater Monitoring (O&M)			$113,168	$56,584	$56,584	$56,584	$56,584	$28,618	$28,618
PERIODIC COSTS									
Groundwater Monitoring Well Replacement (Periodic)									
Five-Year Reviews (Periodic)						$29,800			
Sub-Total	$49,274	$276,281	$134,542	$77,958	$77,958	$107,759	$77,958	$49,993	$49,993
Contingency		$40,486	$26,908	$15,592	$15,592	$15,592	$15,592	$9,999	$9,999
Sub-Total	$49,274	$316,767	$161,451	$93,550	$93,550	$123,350	$93,550	$59,991	$59,991
Discount Factor (Discount Rate 2.8 percent)	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01
Present Value	$46,626	$291,582	$144,566	$81,485	$79,266	$101,669	$75,007	$46,790	$45,515

Table 2: Estimated Costs for Alternative G1-2

Phase Name	Calendar Year 10 2021	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents (Capital)									
Institutional Controls Implementation (Capital)									
Groundwater Monitoring Well Installation (Capital)									
O&M COSTS									
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Groundwater Monitoring (O&M)	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Groundwater Monitoring Well Replacement (Periodic)		$202,429							
Five-Year Reviews (Periodic)		$29,800					$29,800		
Sub-Total	$49,993	$282,222	$49,993	$49,993	$49,993	$49,993	$79,793	$49,993	$49,993
Contingency	$9,999	$50,484	$9,999	$9,999	$9,999	$9,999	$9,999	$9,999	$9,999
Sub-Total	$59,991	$332,706	$59,991	$59,991	$59,991	$59,991	$89,792	$59,991	$59,991
Discount Factor (Discount Rate 2.8 percent)	7.38E-01	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$44,276	$238,860	$41,897	$40,755	$39,645	$38,566	$56,150	$36,493	$35,499

Table 2: Estimated Costs for Alternative G1-2

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Calendar Year 21 2032	Calendar Year 22 2033	Calendar Year 23 2034	Calendar Year 24 2035	Calendar Year 25 2036
CAPITAL COSTS							
Remedial Design							
Institutional Controls Planning Documents (Capital)							
Institutional Controls Implementation (Capital)							
Groundwater Monitoring Well Installation (Capital)							
O&M COSTS							
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Groundwater Monitoring (O&M)	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS							
Groundwater Monitoring Well Replacement (Periodic)			$202,429				
Five-Year Reviews (Periodic)			$29,800				
Sub-Total	$49,993	$49,993	$282,222	$49,993	$49,993	$49,993	$49,993
Contingency	$9,999	$9,999	$50,484	$9,999	$9,999	$9,999	$9,999
Sub-Total	$59,991	$59,991	$332,706	$59,991	$59,991	$59,991	$59,991
Discount Factor (Discount Rate 2.8 percent)	5.76E-01	5.60E-01	5.45E-01	5.30E-01	5.15E-01	5.01E-01	4.88E-01
Present Value	$34,532	$33,592	$181,223	$31,787	$30,921	$30,079	$29,260

Table 2: Estimated Costs for Alternative G1-2

Phase Name	Calendar Year 26 2037	Calendar Year 27 2038	Calendar Year 28 2039	Calendar Year 29 2040	Calendar Year 30 2041	Calendar Years 31 - 100 2042 - 2011	Row Total
CAPITAL COSTS							
Remedial Design							$18,624
Institutional Controls Planning Documents (Capital)							$30,650
Institutional Controls Implementation (Capital)							$73,852
Groundwater Monitoring Well Installation (Capital)							$202,429
O&M COSTS							
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$1,524,576	$2,123,063
Groundwater Monitoring (O&M)	$28,618	$28,618	$28,618	$28,618	$28,618	$2,003,282	$3,001,007
PERIODIC COSTS							
Groundwater Monitoring Well Replacement (Periodic)						$1,417,002	$1,821,860
Five-Year Reviews (Periodic)	$29,800					$417,203	$566,204
Sub-Total	$79,793	$49,993	$49,993	$49,993	$49,993	$5,362,063	$7,837,689
Contingency	$9,999	$9,999	$9,999	$9,999	$9,999	$988,972	$1,429,672
Sub-Total	$89,792	$59,991	$59,991	$59,991	$59,991	$6,351,035	$9,267,360
Discount Factor (Discount Rate 2.8 percent)	4.74E-01	4.62E-01	4.49E-01	4.37E-01	4.25E-01	--	--
Present Value	$42,601	$27,687	$26,933	$26,200	$25,486	$1,218,087	$3,223,000 *

Notes:

* The costs are rounded off to nearest thounsands.

Table 3: Assumptions / Parameters for Cost Estimation of Alternative G1-2, Monitored Natural Attenuation and Institutional Controls

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	1. RACER Technology Model Used: Administrative Land Use Controls 2. Includes costs for planning documents and meetings for Land Use Control Plan and accompanying site maps.
Institutional Controls Implementation	1. RACER Technology Model Used: Administrative Land Use Controls 2. Includes costs for preparation of legal documents, and access control signs.
Groundwater Monitoring Well Installation	1. RACER Technology Model Used: Groundwater Monitoring Well 2. Number of monitoring wells assumed for additional assessment of perchlorate migration and natural attenuation: 10 3. Depth to groundwater: 50 feet 4. Average well depth: 90 feet 5. Drilling method: Hollow-stem Auger 6. Well diameter: 4-inch 7. Well construction material: PVC Schedule 40 8. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 9. Analysis for waste characterization: Perchlorate, target analyte list (TAL) metals, toxicity characteristic leaching procedure (TCLP), semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), and pH.
O&M	
Groundwater Monitoring	1. RACER Technology Model Used: Monitoring 2. Total duration of monitoring: 100 years 3. Number of monitoring wells sampled during each event: 20 4. Frequency of monitoring for first year: Quarterly 5. Frequency of monitoring for second to fifth year = Semi-Annually 6. Frequency of monitoring for sixth to 100th year = Annually 7. Average Sample Depth = 70 feet 8. Analyses = Perchlorate, DO, ORP, and pH
Institutional Controls Monitoring	1. RACER Technology Model Used: Administrative Land Use Controls 2. Includes costs for monitoring and enforcement, and modification/termination. 3. Frequency of inspection = Annual
PERIODIC COSTS	
Groundwater Monitoring Well Replacement	1. RACER Technology Model Used: Groundwater Monitoring Well 2. Monitoring wells assumed to be replaced every 10 years. 3. Number of monitoring wells replaced during each event: 10 4. Depth to groundwater: 50 feet 5. Average well depth: 90 feet 6. Drilling method: Hollow-stem Auger 7. Well diameter: 4-inch 8. Well construction material: PVC Schedule 40 9. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 10. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Five-Year Reviews	1. RACER Technology Model Used = Five-year review 2. Reviews assumed to occur every five years. 3. Tasks included = Document review, interviews, site inspection, and reports.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
28	**Timeframe[e]: Greater than 200 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.1; Table E5-1; and Figure E4-1. AECOM. April 2011.

E4. SIMULATION OF REMEDIAL ALTERNATIVES

This appendix presents updated results of groundwater flow and transport models developed as part of the FS to evaluate remedial alternatives for perchlorate-impacted groundwater at IRP Site 1. Both flow and transport model assumptions and input parameter values used during the preparation of the Draft FS (Earth Tech 2007) are assumed to still be valid. The detailed descriptions for model development and calibration are included Sections E2 and E3. Updated transport simulations were performed with current perchlorate-impacted groundwater configuration, which are based on groundwater sampling results between 2007 and 2009.

Six remedial alternatives are proposed in this FS for IRP Site 1 perchlorate-impacted groundwater. Detailed description for each alternative is presented in Section 4 of the main text of the FS. The following is a brief description of each remedial alternative and a summary of the updated modeling results. The predicted perchlorate concentrations are depicted graphically on Figures E4-1 through E4-7, which are for comparative purposes only.

E4.1 ALTERNATIVE G1-1: NO ACTION, AND ALTERNATIVE G1-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

No active treatment or containment would be applied in these two alternatives. Processes that would influence the fate and transport of the perchlorate-impacted groundwater include advection, dispersion, and diffusion. The current perchlorate distribution was used as the initial condition, as shown on Figure E4-1. The predicted perchlorate distribution for years 10, 50, 100, and 200 are shown on Figure E4-1.The predicted time-frames for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-1 and G1-2 are presented in Table E4-1.

E4.2 ALTERNATIVE G1-3: IN-SITU BIOREMEDIATION NEAR THE STATION BOUNDARY PLUS MONITORING AND INSTITUTIONAL CONTROLS

Alternative G1-3 would include in-situ bioremediation of perchlorate-impacted groundwater using near the Station boundary.

The initial condition assumes a contiguous plume within the Station boundary. It is assumed that in-situ bioremediation at the Station boundary is assumed to be sufficient to reduce perchlorate concentrations to the cleanup goal (CG). The predicted perchlorate distribution for years 10, 50, 100, and 200 are shown on Figure E4-2. The predicted time-frame for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-3 is presented in Table E4-1

E4.3 ALTERNATIVE G1-4: IN-SITU BIOREMEDIATION AT THE SOURCE AREA AND NEAR THE STATION BOUNDARY, MONITORING AND INSTITUTIONAL CONTROLS

Under Alternative G1-4, in-situ bioremediation of the source area may be implemented using direct injection or a PRB. If source area remediation is implemented using direct injection, it is assumed that perchlorate degradation via injection of an electron donor would be rapid and the concentrations are assumed to be reduced to the CG in up to five-years.

However, if the PRB is used to remediate the source area, the remediation time-frames are expected to be higher. The modeling of Alternative G1-4 assumed that a PRB would be installed immediately

Table E5-1 Modeling Results Summary

Alternative	Approximate Time for Reduction of Source Area to less than 6 µg/L (years)	Approximate Time for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L (years)	Relative Duration for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L With Respect to Alternative G1-5[a]
Alternative G1-1: No Action,	NA	400[b]	26
Alternative G1-2: MNA and ICs	NA	400[b]	26
Alternative G1-3: In-Situ Bioremediation near the Station Boundary, Monitoring, and ICs	NA	400[b]	21
Alternative G1-4: In-Situ Bioremediation at the Source Area and near the Station Boundary using PRB Plus Monitoring and ICs	93[c]	367[d]	19.3
Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	--[e]	19[f]	1
Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs	--[g]	49 [b]	2.6

Notes:

[a] Relative duration was estimated by dividing the estimated time for perchlorate-impacted groundwater to attenuate below 6 µg/L under a particular remedial alternative by the estimated time required for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-5 (19 years). The groundwater modeling results indicate that of all remedial alternatives, Alternative G1-5 would take the shortest time to reduce perchlorate concentrations to less than 6 µg/L at and downgradient of IRP Site 1.

[b] Time required for remediation of the estimated extent of perchlorate-impacted groundwater at and downgradient of IRP Site 1 to concentrations less than 6 µg/L.

[c] The stated time duration for the source area remediation using a PRB. Under Alternative G1-4, source area may also be remediated using direct injection. If direct injection is used, the remediation time frame is expected to be much shorter; however, this time-frame was not estimated using groundwater modeling.

[d] Time required for natural attenuation of perchlorate-impacted groundwater downgradient from the source area at IRP Site 1 to concentrations less than 6 µg/L.

[e] Time required for remediation of the source area using direct injection was not simulated using groundwater modeling.

[f] Time required for remediation of perchlorate-impacted groundwater downgradient from the PRB (proposed near the location of Monitoring Wells 01-MW213 and 01-MW214) to concentrations less than 6 µg/L.

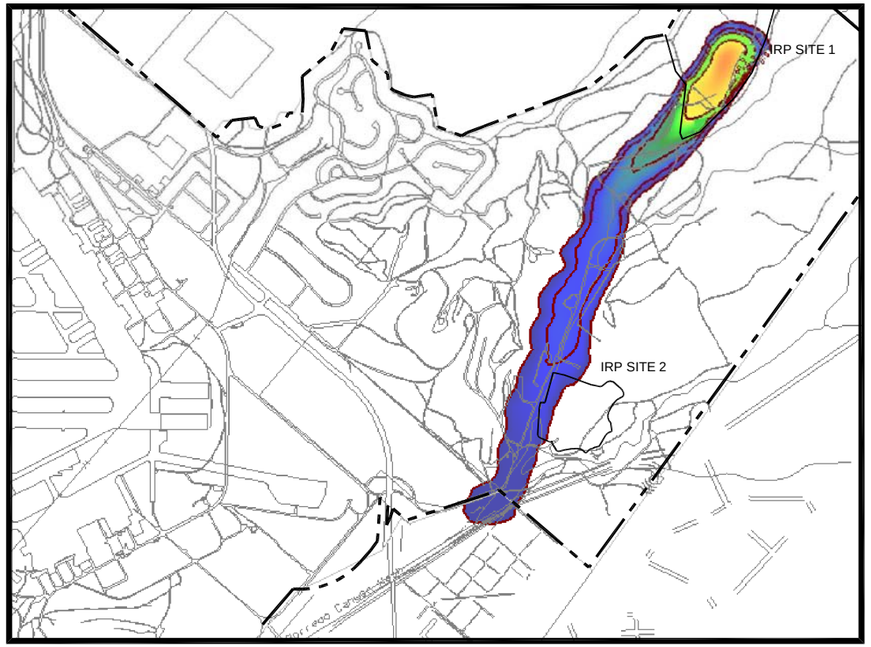
[g] Time required for remediation of perchlorate-impacted groundwater in the source area using direct injection was not separately estimated using groundwater modeling for Alternatives G1-6.

µg/L = micrograms per liter

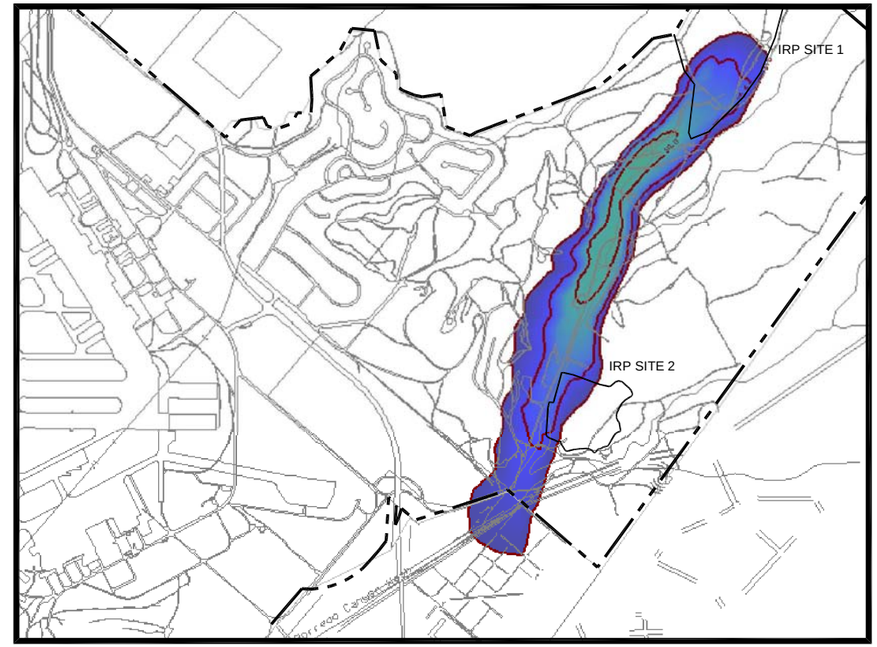
IC = institutional control

MNA = monitored natural attenuation

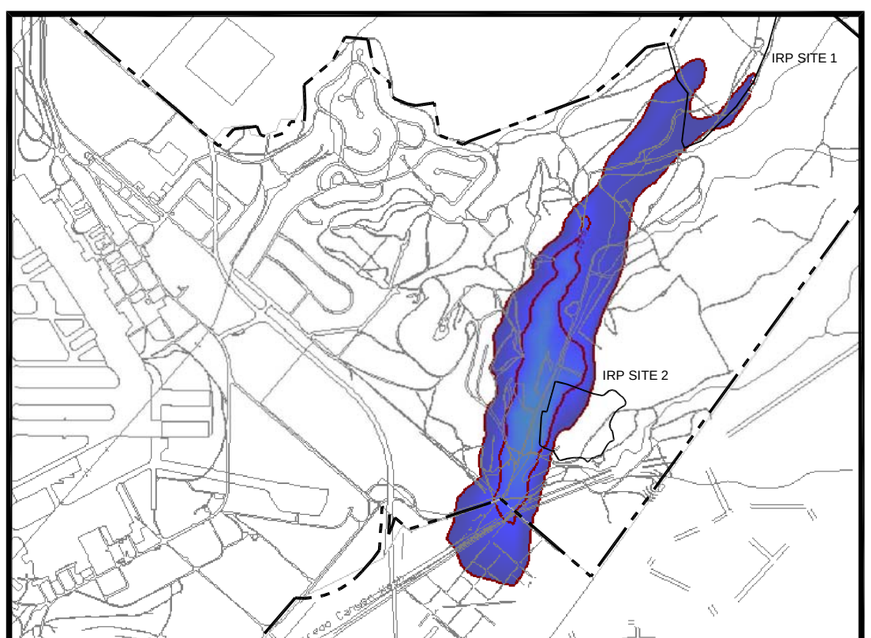
NA = not applicable



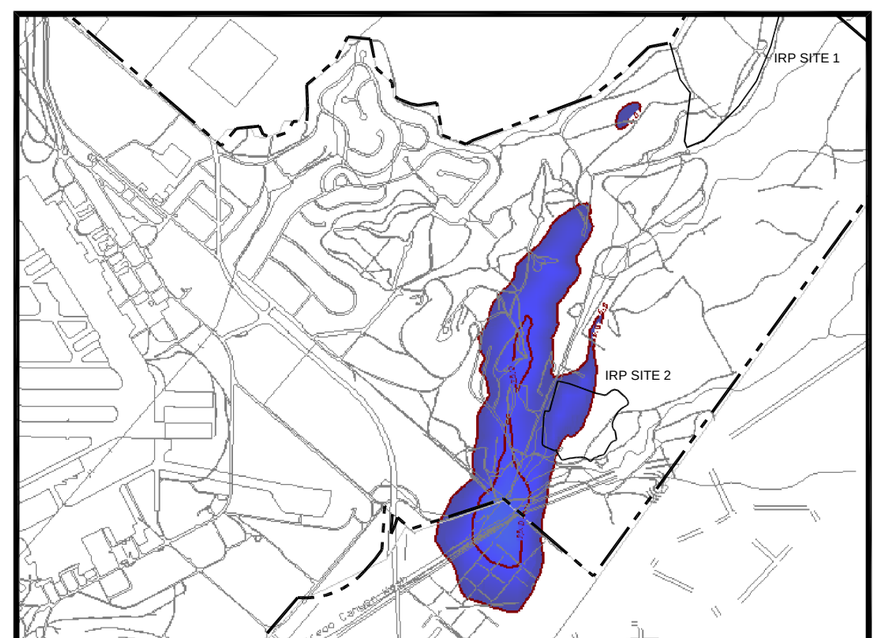
10 YEARS



50 YEARS



100 YEARS



200 YEARS

LEGEND:

FORMER MCAS EL TORO STATION BOUNDARY

IRP SITE BOUNDARY

PERCHLORATE CONCENTRATIONS (µg/L)

300
100
50
25
6

NOTES:

1. THERE IS NO ACTIVE TREATMENT OR CONTAINMENT INVOLVED.
2. MODELING RESULTS PRESENTED ARE BASED ON A SIMPLIFIED HYDROGEOLOGICAL MODEL FOR THE COMPARATIVE EVALUATION OF THE VARIOUS GROUNDWATER RESPONSE ALTERNATIVES. THESE RESULTS ARE NOT INTENDED TO BE USED AS PREDICTION OF REQUIRED RESTORATION DURATIONS.

µg/L MICROGRAMS PER LITER
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION

NORTH

0 1200 2400 FEET

APPROXIMATE SCALE: 1" = 2400'

Feasibility Study — Draft Final

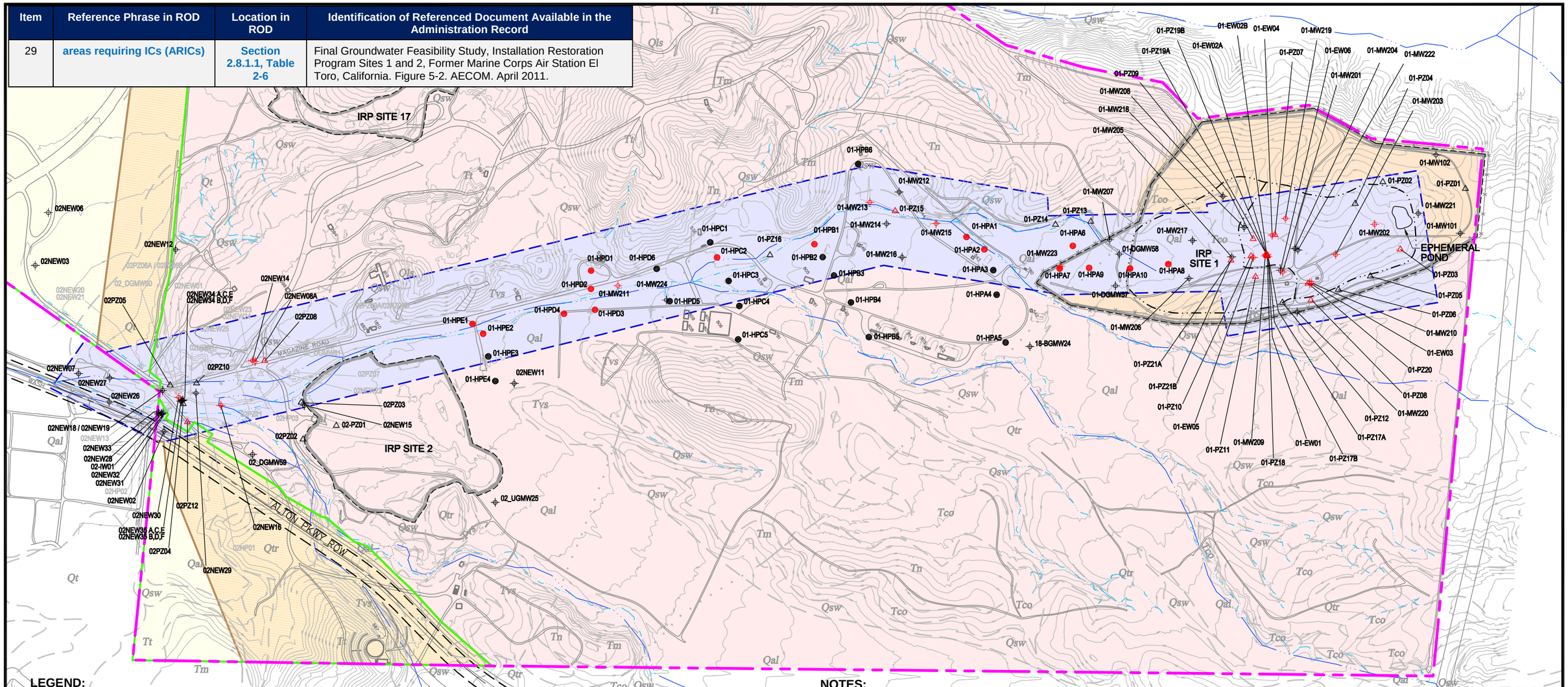
Alternatives G1-1 and G1-2:
Computed Perchlorate Concentrations

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	E4-1

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix E Figures\FIGURE E4-1.dwg Time: Sep 29, 2010 - 2:31pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
29	areas requiring ICs (ARICs)	Section 2.8.1.1, Table 2-6	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 5-2. AECOM. April 2011.



LEGEND:

- 01-HPE4 — HYDROPUNCH SAMPLING LOCATION (PERCHLORATE LESS THAN 6 µg/L)
- 01-HPA1 — HYDROPUNCH SAMPLING LOCATION (PERCHLORATE EXCEEDING 6 µg/L)
- 01-MW206 — 4-INCH GROUNDWATER MONITORING WELL (PERCHLORATE LESS THAN 6 µg/L)
- 01-MW201 — 4-INCH GROUNDWATER MONITORING WELL (PERCHLORATE EXCEEDING 6 µg/L)
- 01-PZ02 — 2-INCH PIEZOMETER (PERCHLORATE LESS THAN 6 µg/L)
- 01-PZ08 — 2-INCH PIEZOMETER (PERCHLORATE EXCEEDING 6 µg/L)
- 02NEW01 — ABANDONED GROUNDWATER MONITORING WELL
- 02PZ11 — ABANDONED PIEZOMETER
- CONCEPTUAL AREA REQUIRING ICs - IRP SITE 1 PERCHLORATE-IMPACTED GROUNDWATER
- DON OWNED
- FAA OWNED
- TRANSFERRED AREA
- LEASED PROPERTY (DON OWNED)
- DON SALE PARCEL BOUNDARY
- MCAS EL TORO BOUNDARY
- EOD RANGE BOUNDARY
- IRP SITE BOUNDARY (1, 2, AND 17)
- EPHEMERAL STREAM OR WASH (INTERPOLATED FROM TOPOGRAPHIC DATA)
- GEOLOGIC FAULT, DOTTED WHERE INFERRED
- EXISTING FENCE

NOTES:

1. DATA SOURCE: STATIONWIDE GROUNDWATER MONITORING (TREVET 2010); PRE-BASELINE SAMPLING; PHASE II RI (EARTH TECH 2006b; & AQUIFER CHARACTERIZATION AND BENCH-SCALE TREATABILITY TESTING (ECS 2006)

µg/L	MICROGRAMS PER LITER
DON	DEPARTMENT OF NAVY
EOD	EXPLOSIVE ORDNANCE DISPOSAL
FAA	FEDERAL AVIATION ADMINISTRATION
ICs	INSTITUTIONAL CONTROLS
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
RI	REMEDIAL INVESTIGATION
ROW	RIGHT OF WAY
TCE	TRICHLOROETHENE

DESCRIPTION OF MAP UNITS:

Qal	Flood Plain and Stream Channel Deposits (Holocene and Late Pleistocene)
Qsw	Sheetwash Deposits (Holocene to Middle Pleistocene)
Qtr	Trail Ridge Sands (Pleistocene)
Tn	Niguel Formation
Tco	Oso Member
Tm	Monterey Formation (Miocene)
Tt	Topanga Foundation (middle Miocene)
Tvs	Sespe and Vaqueros Formations

NORTH

0 350 700 FEET

SCALE: 1" = 700'

Feasibility Study — Draft Final

Conceptual Area Requiring ICs - IRP Site 1 Perchlorate-Impacted Groundwater

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-2

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-2.dwg Time: Sep 30, 2010 - 10:00am

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
30	**Present Worth Cost[d]:$9,378,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1, page 3-1; and Tables 4 and 5. AECOM. April 2011.

3. Assumptions and Costs for Remedial Alternatives

The underlying assumptions and quantities for cost estimates and individual cost summaries for the groundwater remedial alternatives for IRP Sites 1 and 2 selected for detailed analysis in this FS are presented in the following sections.

3.1 PERCHLORATE-IMPACTED GROUNDWATER – IRP SITE 1

3.1.1 Alternative G1-2: Monitored Natural Attenuation and Institutional Controls

Alternative G1-2 consists of natural attenuation monitoring and institutional controls to attain the RAOs for perchlorate-impacted groundwater are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce perchlorate concentrations in groundwater. Monitoring would also assess migration of perchlorate off-Station at concentrations exceeding its CG.

Institutional controls under Alternative G-2 would include non-engineered controls to limit human exposure to perchlorate-impacted groundwater. Restrictions on future groundwater use would be to protect potential on-site and off-site receptors, and protect the MNA system components. Since this remedial action alternative results in perchlorate remaining at the site above the levels that allow for unlimited use and unrestricted exposure, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G-2 are presented in Table 2. Table 3 presents the assumptions and parameters used for Alternative G-2 cost estimate.

3.1.2 Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs

Alternative G1-3 would include in-situ bioremediation of perchlorate-impacted groundwater near the Station boundary to minimize the potential for further migration of perchlorate at concentrations greater than its CG. The design configurations for the implementation of in-situ bioremediation near the Station boundary may include a permeable reactive barrier (PRB) or a groundwater recirculation loop, and are summarized in Section 5 of the main text of the FS. The cost estimate for Alternative G1-3 is based on the assumption that a PRB would be used for in-situ bioremediation of perchlorate impacted groundwater near the Station boundary.

To attain the RAOs, Alternative G1-3 would also include implementation of ICs and groundwater monitoring. ICs would be implemented as part of Alternative G1-3 to limit exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG. Groundwater monitoring would be implemented to evaluate the effectiveness of in-situ bioremediation and to assess the distribution of perchlorate in the area between the perchlorate source area and the Station boundary.

Since Alternative G1-3 results in perchlorate remaining at the site above the levels that allow for unlimited use and unrestricted exposure, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. A complete description of Alternative G1-3 is presented in Section 5 of the main text of the FS. The estimated costs for Alternative G1-3 are presented in Table 4. Table 5 presents the assumptions and parameters used for Alternative G1-3 cost estimate.

Table 4: Estimated Costs for Alternative G1-3

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020
CAPITAL COSTS									
Remedial Design	$109,748								
Institutional Controls Planning Documents	$30,650								
Institutional Controls Implementation		$73,852							
PRB Injection Well Installation		$435,595							
PRB Monitoring Well Installation		$150,371							
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring		$202,429							
O&M COSTS									
Institutional Controls Monitoring			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
PRB Performance Monitoring			$160,703	$40,176	$40,176	$40,176	$40,176	$33,263	$33,263
Overall Perchlorate Extent Monitoring			$113,168	$56,584	$56,584	$56,584	$56,584	$28,618	$28,618
PERIODIC COSTS									
Substrate Injection Costs		$407,761				$407,761			
Groundwater Monitoring Well Replacement									
Five-Year Reviews						$29,800			
Sub-Total	$140,398	$1,270,009	$295,245	$118,134	$118,134	$555,696	$118,134	$83,256	$83,256
Contingency		$239,231	$59,049	$23,627	$23,627	$105,179	$23,627	$16,651	$16,651
Sub-Total	$140,398	$1,509,240	$354,294	$141,761	$141,761	$660,875	$141,761	$99,907	$99,907
Discount Factor	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01
Present Value	$132,854	$1,389,245	$317,243	$123,478	$120,115	$544,713	$113,661	$77,922	$75,799

Table 4: Estimated Costs for Alternative G1-3

Phase Name	Calendar Year 10 2021	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
PRB Injection Well Installation									
PRB Monitoring Well Installation									
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
PRB Performance Monitoring	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Substrate Injection Costs	$407,761				$407,761				$407,761
Groundwater Monitoring Well Replacement		$202,429							
Five-Year Reviews		$29,800					$29,800		
Sub-Total	$491,017	$315,485	$83,256	$83,256	$491,017	$83,256	$113,056	$83,256	$491,017
Contingency	$98,203	$57,137	$16,651	$16,651	$98,203	$16,651	$16,651	$16,651	$98,203
Sub-Total	$589,221	$372,622	$99,907	$99,907	$589,221	$99,907	$129,707	$99,907	$589,221
Discount Factor	7.38E-01	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$434,864	$267,517	$69,773	$67,872	$389,387	$64,225	$81,111	$60,774	$348,665

Table 4: Estimated Costs for Alternative G1-3

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Calendar Year 21 2032	Calendar Year 22 2033	Calendar Year 23 2034	Calendar Year 24 2035	Calendar Year 25 2036	Calendar Year 26 2037
CAPITAL COSTS								
Remedial Design								
Institutional Controls Planning Documents								
Institutional Controls Implementation								
PRB Injection Well Installation								
PRB Monitoring Well Installation								
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring								
O&M COSTS								
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
PRB Performance Monitoring	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS								
Substrate Injection Costs				$407,761				$407,761
Groundwater Monitoring Well Replacement			$202,429					
Five-Year Reviews			$29,800					$29,800
Sub-Total	$83,256	$83,256	$315,485	$491,017	$83,256	$83,256	$83,256	$520,818
Contingency	$16,651	$16,651	$57,137	$98,203	$16,651	$16,651	$16,651	$98,203
Sub-Total	$99,907	$99,907	$372,622	$589,221	$99,907	$99,907	$99,907	$619,021
Discount Factor	5.76E-01	5.60E-01	5.45E-01	5.30E-01	5.15E-01	5.01E-01	4.88E-01	4.74E-01
Present Value	$57,509	$55,942	$202,964	$312,203	$51,495	$50,092	$48,728	$293,691

Table 4: Estimated Costs for Alternative G1-3

Phase Name	Calendar Year 27 2038	Calendar Year 28 2039	Calendar Year 29 2040	Calendar Year 30 2041	Calendar Years 31 - 100 2042 - 2011	Row Total
CAPITAL COSTS						
Remedial Design						$109,748
Institutional Controls Planning Documents						$30,650
Institutional Controls Implementation						$73,852
PRB Injection Well Installation						$435,595
PRB Monitoring Well Installation						$150,371
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring						$202,429
O&M COSTS						
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$1,496,219	$2,094,706
PRB Performance Monitoring	$33,263	$33,263	$33,263	$33,263	$2,328,410	$3,414,865
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$28,618	$28,618	$2,003,282	$3,001,007
PERIODIC COSTS						
Substrate Injection Costs				$407,761	$6,931,945	$10,194,037
Groundwater Monitoring Well Replacement					$1,417,002	$1,821,860
Five-Year Reviews					$417,203	$566,204
Sub-Total	$83,256	$83,256	$83,256	$491,017	$14,594,061	$22,095,323
Contingency	$16,651	$16,651	$16,651	$98,203	$2,835,372	$4,262,974
Sub-Total	$99,907	$99,907	$99,907	$589,221	$17,429,432	$26,358,297
Discount Factor	4.62E-01	4.49E-01	4.37E-01	4.25E-01		--
Present Value	$46,109	$44,853	$43,632	$250,318	$3,241,660	$9,378,000 *

Notes:

* The costs are rounded off to nearest thousands.

Table 5: Assumptions / Parameters for Cost Estimation of Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	Assumptions same as Alternative G1-2
Institutional Controls Implementation	Assumptions same as Alternative G1-2
PRB Injection Well Installation	1. General Assumption: In-situ bioremediation near the Station boundary would be implemented using a PRB. 2. RACER Technology Models Used: Groundwater Monitoring Well, User-Defined Costs, Off-site Transportation and Waste Disposal, and Professional Labor Management 3. Length of PRB = 100 feet 4. Assumed spacing between injection locations = 7.5 feet (based on the in-situ bioremediation pilot study results near the Station boundary) 5. Number of injection locations = 14 6. Number of injection wells = 28 (2 injection wells at each injection location since length of each injection well screen is restricted to 20 feet to uniformly distribute substrate across the vertical treatment interval) 7. Injection screen length per well = 20 feet 8. Diameter of injection wells = 2 inches 9. Well construction material: PVC Schedule 80 10. Depth to groundwater: 60 feet 11. Aquifer thickness requiring treatment = 40 feet 12. Drilling method = Hollow-stem Auger 1. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 2. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
PRB Performance Monitoring Well Installation	1. RACER Technology Model Used: Groundwater Monitoring Wells 2. Number of monitoring wells for PRB performance assessment: 8 3. Depth to groundwater: 60 feet 4. Average well depth: 100 feet 5. Drilling method: Hollow-stem Auger 6. Well diameter: 4-inch 7. Well construction material: PVC Sch. 40 8. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 9. Analysis for RCRA waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Installation of Monitoring Wells – Overall Perchlorate Extent Monitoring	Assumptions same as Alternative G1-2
O&M	
PRB Performance Monitoring	1. RACER Technology Model Used: Monitoring 2. Total duration of monitoring: 100 years 3. Number of monitoring wells sampled during each event: 10 4. Monitoring frequency from 0 to 6 months = Monthly 5. Monitoring frequency from 7 to 12 months = Quarterly 6. Monitoring frequency from 2nd to 5th year = Semi-annual 7. Monitoring frequency from 6th to 100th year = Annual 8. Average Sample Depth = 80 feet 9. Analyses = Perchlorate, nitrate/nitrite, sulfate, pH, total organic carbon, VOCs, methane, ethene, and ethane.
Overall Perchlorate Extent Monitoring	Assumptions same as Alternative G1-2.
Institutional Controls Monitoring	Assumptions same as Alternative G1-2.
PERIODIC COSTS	

Cost Element	Key Assumptions / Parameters
Substrate Injection Costs	1. RACER Technology Model Used: User-Defined Costs 2. Assumed substrate: Emulsified Oil Substrate (EOS®) 3. Approximate volume of 20 percent by volume EOS® proposed to be injected into each injection well: 3,500 gallons (based on the pilot study data) 4. Design life of substrate: 4 years 5. Assumed injection rate: 5 gpm (based on the pilot study data) 6. Substrate cost = $ 14.5 per gallon (estimate based on vendor quote)
Groundwater Monitoring Well Replacement	Assumptions same as Alternative G1-2
Five-Year Reviews	Assumptions same as Alternative G1-2

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
31	Timeframe[e]: Greater than 200 years	Section 2.8.1.1, Table 2-6	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.2; Table E5-1; and Figure E4-2. AECOM. April 2011.

E4. SIMULATION OF REMEDIAL ALTERNATIVES

This appendix presents updated results of groundwater flow and transport models developed as part of the FS to evaluate remedial alternatives for perchlorate-impacted groundwater at IRP Site 1. Both flow and transport model assumptions and input parameter values used during the preparation of the Draft FS (Earth Tech 2007) are assumed to still be valid. The detailed descriptions for model development and calibration are included Sections E2 and E3. Updated transport simulations were performed with current perchlorate-impacted groundwater configuration, which are based on groundwater sampling results between 2007 and 2009.

Six remedial alternatives are proposed in this FS for IRP Site 1 perchlorate-impacted groundwater. Detailed description for each alternative is presented in Section 4 of the main text of the FS. The following is a brief description of each remedial alternative and a summary of the updated modeling results. The predicted perchlorate concentrations are depicted graphically on Figures E4-1 through E4-7, which are for comparative purposes only.

E4.1 ALTERNATIVE G1-1: NO ACTION, AND ALTERNATIVE G1-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

No active treatment or containment would be applied in these two alternatives. Processes that would influence the fate and transport of the perchlorate-impacted groundwater include advection, dispersion, and diffusion. The current perchlorate distribution was used as the initial condition, as shown on Figure E4-1. The predicted perchlorate distribution for years 10, 50, 100, and 200 are shown on Figure E4-1.The predicted time-frames for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-1 and G1-2 are presented in Table E4-1.

E4.2 ALTERNATIVE G1-3: IN-SITU BIOREMEDIATION NEAR THE STATION BOUNDARY PLUS MONITORING AND INSTITUTIONAL CONTROLS

Alternative G1-3 would include in-situ bioremediation of perchlorate-impacted groundwater using near the Station boundary.

The initial condition assumes a contiguous plume within the Station boundary. It is assumed that in-situ bioremediation at the Station boundary is assumed to be sufficient to reduce perchlorate concentrations to the cleanup goal (CG). The predicted perchlorate distribution for years 10, 50, 100, and 200 are shown on Figure E4-2. The predicted time-frame for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-3 is presented in Table E4-1

E4.3 ALTERNATIVE G1-4: IN-SITU BIOREMEDIATION AT THE SOURCE AREA AND NEAR THE STATION BOUNDARY, MONITORING AND INSTITUTIONAL CONTROLS

Under Alternative G1-4, in-situ bioremediation of the source area may be implemented using direct injection or a PRB. If source area remediation is implemented using direct injection, it is assumed that perchlorate degradation via injection of an electron donor would be rapid and the concentrations are assumed to be reduced to the CG in up to five-years.

However, if the PRB is used to remediate the source area, the remediation time-frames are expected to be higher. The modeling of Alternative G1-4 assumed that a PRB would be installed immediately

Table E5-1 Modeling Results Summary

Alternative	Approximate Time for Reduction of Source Area to less than 6 µg/L (years)	Approximate Time for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L (years)	Relative Duration for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L With Respect to Alternative G1-5[a]
Alternative G1-1: No Action,	NA	400[b]	26
Alternative G1-2: MNA and ICs	NA	400[b]	26
Alternative G1-3: In-Situ Bioremediation near the Station Boundary, Monitoring, and ICs	NA	400[b]	21
Alternative G1-4: In-Situ Bioremediation at the Source Area and near the Station Boundary using PRB Plus Monitoring and ICs	93[c]	367[d]	19.3
Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	--[e]	19[f]	1
Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs	--[g]	49 [b]	2.6

Notes:

[a] Relative duration was estimated by dividing the estimated time for perchlorate-impacted groundwater to attenuate below 6 µg/L under a particular remedial alternative by the estimated time required for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-5 (19 years). The groundwater modeling results indicate that of all remedial alternatives, Alternative G1-5 would take the shortest time to reduce perchlorate concentrations to less than 6 µg/L at and downgradient of IRP Site 1.

[b] Time required for remediation of the estimated extent of perchlorate-impacted groundwater at and downgradient of IRP Site 1 to concentrations less than 6 µg/L.

[c] The stated time duration for the source area remediation using a PRB. Under Alternative G1-4, source area may also be remediated using direct injection. If direct injection is used, the remediation time frame is expected to be much shorter; however, this time-frame was not estimated using groundwater modeling.

[d] Time required for natural attenuation of perchlorate-impacted groundwater downgradient from the source area at IRP Site 1 to concentrations less than 6 µg/L.

[e] Time required for remediation of the source area using direct injection was not simulated using groundwater modeling.

[f] Time required for remediation of perchlorate-impacted groundwater downgradient from the PRB (proposed near the location of Monitoring Wells 01-MW213 and 01-MW214) to concentrations less than 6 µg/L.

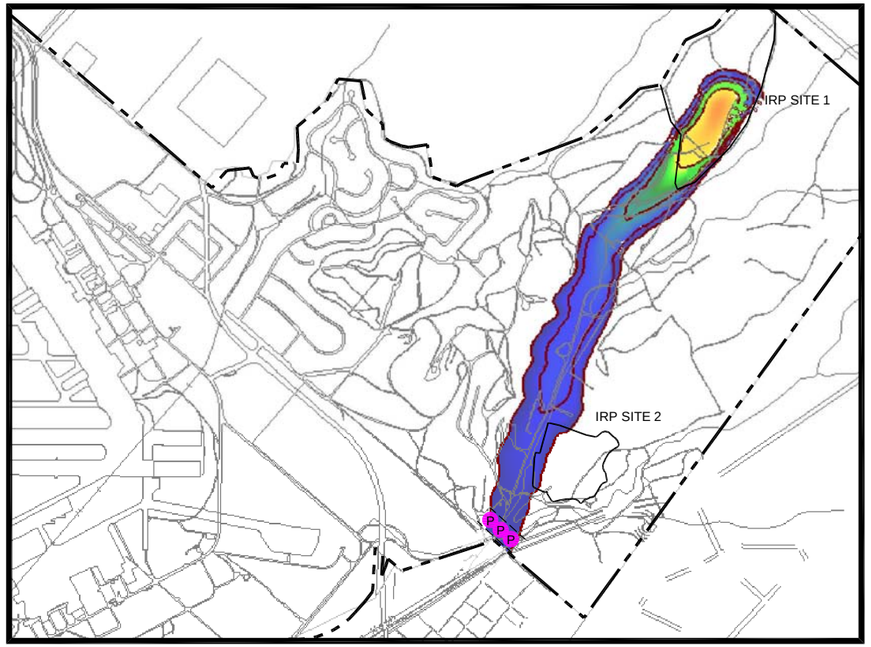
[g] Time required for remediation of perchlorate-impacted groundwater in the source area using direct injection was not separately estimated using groundwater modeling for Alternatives G1-6.

µg/L = micrograms per liter

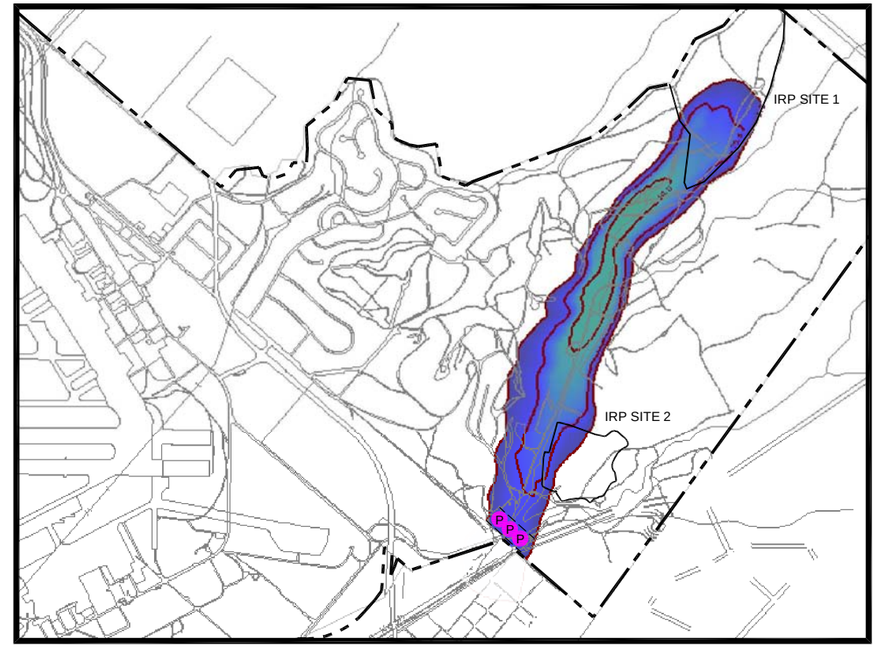
IC = institutional control

MNA = monitored natural attenuation

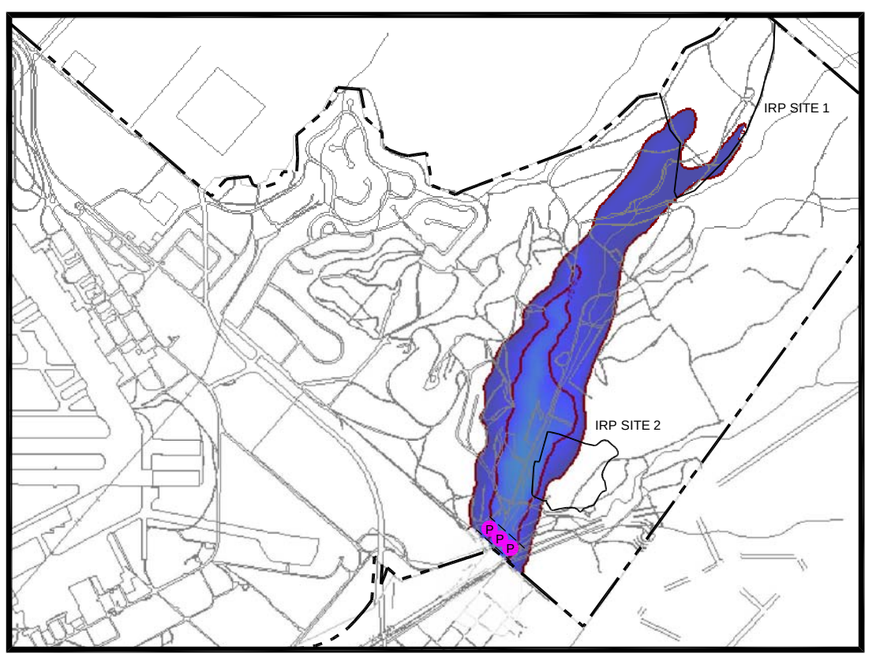
NA = not applicable



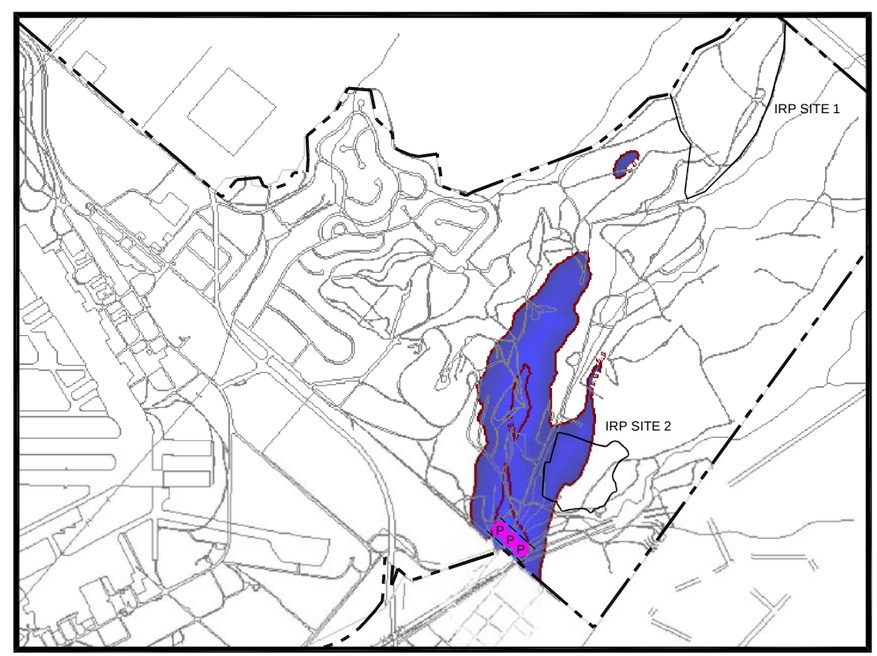
10 YEARS



50 YEARS



100 YEARS



200 YEARS

LEGEND:

- P — PERMEABLE REACTIVE BARRIER (PRB) NEAR THE STATION BOUNDARY
- FORMER MCAS EL TORO STATION BOUNDARY
- IRP SITE BOUNDARY

PERCHLORATE CONCENTRATIONS (µg/L)

300
100
50
25
6

NOTES:

1. PRB WOULD BE INSTALLED NEAR THE STATION BOUNDARY.
2. PRB NEAR THE STATION BOUNDARY IS ASSUMED TO BE SUFFICIENT TO REDUCE PERCHLORATE CONCENTRATIONS TO THE CLEANUP GOAL.
3. MODELING RESULTS PRESENTED ARE BASED ON A SIMPLIFIED HYDROGEOLOGICAL MODEL FOR THE COMPARATIVE EVALUATION OF THE VARIOUS GROUNDWATER RESPONSE ALTERNATIVES. THESE RESULTS ARE NOT INTENDED TO BE USED AS PREDICTION OF REQUIRED RESTORATION DURATIONS.

µg/L MICROGRAMS PER LITER
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION

NORTH

0 1200 2400 FEET

APPROXIMATE SCALE: 1" = 2400'

Feasibility Study — Draft Final

Alternative G1-3:
Computed Perchlorate Concentrations

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	E4-2

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix E Figures\FIGURE E4-2.dwg Time: Sep 29, 2010 - 2:31pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
32	**Present Worth Cost[d]: $12,479,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1.3; and Tables 6 and 7. AECOM. April 2011.

3.1.3 Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs

Alternative G1-4 would include implementation of in-situ bioremediation at the Source Area and near the Station boundary. The implementation of in-situ bioremediation at the source area would treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize their downgradient migration. The design configurations for the implementation of in-situ bioremediation at the source area may include a PRB, direct injection, or groundwater recirculation as summarized in Section 5 of the main text of the FS.

The implementation of in-situ bioremediation near the Station boundary would minimize the potential for further off-Station migration of perchlorate at concentrations exceeding its CG. The design configurations for the implementation of in-situ bioremediation near the Station boundary may include a PRB or a groundwater recirculation loop, and are summarized in Section 5 of the main text of the FS.

The cost estimate for Alternative G1-4 is based on the assumption that direct injection would be used for in-situ bioremediation of the source area and PRB would be installed near the Station boundary.

Groundwater monitoring would be conducted as a component of Alternative G1-4 to evaluate the effectiveness of in-situ bioremediation and to assess the distribution of perchlorate in the area between the source area and the Station boundary, and beyond due to natural attenuation processes.

To attain the RAOs, Alternative G1-4 would also include implementation of ICs. ICs would be implemented as part of Alternative G1-4 to limit exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG.

Since Alternative G1-4 results in perchlorate remaining at the site above the levels that allow for unlimited use and unrestricted exposure, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. A complete description of Alternative G1-4 is presented in Section 5 of the main text of the FS. The estimated costs for Alternative G1-4 are presented in Table 6. Table 7 presents the assumptions and parameters used for Alternative G1-4 cost estimate.

3.1.4 Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs

Alternative G1-5 consists of the following components:

- In-situ bioremediation of the perchlorate source area,
- In-situ bioremediation of perchlorate-impacted groundwater downgradient of the perchlorate source area using an intermediate PRB between IRP Sites 1 and 2,
- In-situ bioremediation of perchlorate near the Station boundary, and
- Groundwater monitoring and ICs

The implementation of in-situ bioremediation at the source area would treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize their downgradient migration. The design configurations for the implementation of in-situ bioremediation at the source area may include a PRB, direct injection, or groundwater recirculation, and are summarized in Section 5 of the main text of the FS.

Table 6: Estimated Costs for Alternative G1-4

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020
CAPITAL COSTS									
Remedial Design	$262,598								
Institutional Controls Planning Documents	$30,650								
Institutional Controls Implementation		$73,852							
Hydraulic Fracturing - Source Area		$968,108							
Installation of Injection Wells at Fractured Locations - Source Area		$865,289							
Station Boundary PRB Injection Well Installation		$435,595							
Station Boundary PRB Monitoring Well Installation		$150,371							
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring		$202,429							
O&M COSTS									
Institutional Controls Monitoring			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Source Area Direct Injection Performance Monitoring			$98,738	$24,685	$24,685	$24,685	$24,685		
Station Boundary PRB Performance Monitoring			$160,703	$40,176	$40,176	$40,176	$40,176	$33,263	$33,263
Overall Perchlorate Extent Monitoring			$113,168	$56,584	$56,584	$56,584	$56,584	$28,618	$28,618
PERIODIC COSTS									
Source Area Direct Injection - Substrate Injection Costs		$536,504				$134,126			
Station Boundary PRB - Substrate Injection Costs		$407,761				$407,761			
Groundwater Monitoring Well Replacement									
Five-Year Reviews						$29,800			
Sub-Total	$293,248	$3,639,910	$393,984	$142,819	$142,819	$714,506	$142,819	$83,256	$83,256
Contingency		$713,212	$78,797	$28,564	$28,564	$136,941	$28,564	$16,651	$16,651
Sub-Total	$293,248	$4,353,122	$472,780	$171,382	$171,382	$851,448	$171,382	$99,907	$99,907
Discount Factor	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01
Present Value	$277,491	$4,007,020	$423,338	$149,280	$145,214	$701,788	$137,411	$77,922	$75,799

Table 6: Estimated Costs for Alternative G1-4

Phase Name	Calendar Year 10 2021	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
Hydraulic Fracturing - Source Area									
Installation of Injection Wells at Fractured Locations - Source Area									
Station Boundary PRB Injection Well Installation									
Station Boundary PRB Monitoring Well Installation									
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Source Area Direct Injection Performance Monitoring									
Station Boundary PRB Performance Monitoring	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Source Area Direct Injection - Substrate Injection Costs									
Station Boundary PRB - Substrate Injection Costs	$407,761				$407,761				$407,761
Groundwater Monitoring Well Replacement		$202,429							
Five-Year Reviews		$29,800					$29,800		
Sub-Total	$491,017	$315,485	$83,256	$83,256	$491,017	$83,256	$113,056	$83,256	$491,017
Contingency	$98,203	$57,137	$16,651	$16,651	$98,203	$16,651	$16,651	$16,651	$98,203
Sub-Total	$589,221	$372,622	$99,907	$99,907	$589,221	$99,907	$129,707	$99,907	$589,221
Discount Factor	7.38E-01	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$434,864	$267,517	$69,773	$67,872	$389,387	$64,225	$81,111	$60,774	$348,665

Table 6: Estimated Costs for Alternative G1-4

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Calendar Year 21 2032	Calendar Year 22 2033	Calendar Year 23 2034	Calendar Year 24 2035	Calendar Year 25 2036
CAPITAL COSTS							
Remedial Design							
Institutional Controls Planning Documents							
Institutional Controls Implementation							
Hydraulic Fracturing - Source Area							
Installation of Injection Wells at Fractured Locations - Source Area							
Station Boundary PRB Injection Well Installation							
Station Boundary PRB Monitoring Well Installation							
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring							
O&M COSTS							
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Source Area Direct Injection Performance Monitoring							
Station Boundary PRB Performance Monitoring	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS							
Source Area Direct Injection - Substrate Injection Costs							
Station Boundary PRB - Substrate Injection Costs				$407,761			
Groundwater Monitoring Well Replacement			$202,429				
Five-Year Reviews			$29,800				
Sub-Total	$83,256	$83,256	$315,485	$491,017	$83,256	$83,256	$83,256
Contingency	$16,651	$16,651	$57,137	$98,203	$16,651	$16,651	$16,651
Sub-Total	$99,907	$99,907	$372,622	$589,221	$99,907	$99,907	$99,907
Discount Factor	5.76E-01	5.60E-01	5.45E-01	5.30E-01	5.15E-01	5.01E-01	4.88E-01
Present Value	$57,509	$55,942	$202,964	$312,203	$51,495	$50,092	$48,728

Table 6: Estimated Costs for Alternative G1-4

Phase Name	Calendar Year 26 2037	Calendar Year 27 2038	Calendar Year 28 2039	Calendar Year 29 2040	Calendar Year 30 2041	Calendar Years 31 - 100 2042 - 2011	Row Total
CAPITAL COSTS							
Remedial Design							$262,598
Institutional Controls Planning Documents							$30,650
Institutional Controls Implementation							$73,852
Hydraulic Fracturing - Source Area							$968,108
Installation of Injection Wells at Fractured Locations - Source Area							$865,289
Station Boundary PRB Injection Well Installation							$435,595
Station Boundary PRB Monitoring Well Installation							$150,371
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring							$202,429
O&M COSTS							
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$1,496,219	$2,094,706
Source Area Direct Injection Performance Monitoring							$197,477
Station Boundary PRB Performance Monitoring	$33,263	$33,263	$33,263	$33,263	$33,263	$2,328,410	$3,414,865
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$2,003,282	$3,001,007
PERIODIC COSTS							
Source Area Direct Injection - Substrate Injection Costs							$670,630
Station Boundary PRB - Substrate Injection Costs	$407,761				$407,761	$6,931,945	$10,194,037
Groundwater Monitoring Well Replacement						$1,417,002	$1,821,860
Five-Year Reviews	$29,800					$417,203	$566,204
Sub-Total	$520,818	$83,256	$83,256	$83,256	$491,017	$14,594,061	$24,949,678
Contingency	$98,203	$16,651	$16,651	$16,651	$98,203	$2,835,372	$4,803,275
Sub-Total	$619,021	$99,907	$99,907	$99,907	$589,221	$17,429,432	$29,752,952
Discount Factor	4.74E-01	4.62E-01	4.49E-01	4.37E-01	4.25E-01	--	--
Present Value	$293,691	$46,109	$44,853	$43,632	$250,318	$3,241,660	$12,479,000 *

Notes:

* The costs are rounded off to nearest thousands.

Table 7: Assumptions / Parameters for Cost Estimation of Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	Assumptions same as Alternative G1-2.
Institutional Controls Implementation	Assumptions same as Alternative G1-2.
Hydraulic Fracturing - Source Area	1. RACER Technology Models Used: User-Defined Estimate 2. Technology used for injecting substrate into the source area: Hydraulic fracturing 3. Area to be treated = 160,800 square feet 4. Total number of fracturing/injection locations = 80 5. Fracturing interval = 40 to 60 feet bgs 6. Cost of fracturing = $2,000 per injection well (based on a quote) 7. Cost of mobilizing fracturing equipment = $12,500 (based on a quote)
Installation of Injection Wells at Fractured Locations – Source Area	1. RACER Technology Models Used: Groundwater Monitoring Well, User-Defined Costs, Off-site Transportation and Waste Disposal, and Professional Labor Management 8. Total number of injection wells = 80 2. Injection screen length per well = 20 feet 3. Diameter of injection wells = 2 inches 4. Well construction material: PVC Schedule 80 5. Depth to groundwater: 40 feet 6. Aquifer thickness requiring treatment = 20 feet 7. Drilling method = Hollow-stem Auger 8. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 9. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Station Boundary PRB Injection Well Installation	Assumptions same as Alternative G1-3.
Station Boundary PRB Performance Monitoring Well Installation	Assumptions same as Alternative G1-3.
Installation of Monitoring Wells – Overall Perchlorate Extent Monitoring	Assumptions same as Alternative G1-2.
O&M	
Source Area Direct Injection Performance Monitoring	1. RACER Technology Model Used: Monitoring 2. Total duration of monitoring: 5 years 3. Number of monitoring wells sampled during each event: 10 4. Monitoring frequency from 0 to 6 months = Monthly 5. Monitoring frequency from 7 to 12 months = Quarterly 6. Monitoring frequency from 2nd to 5th year = Semi-annual 7. Average Sample Depth = 45 feet 8. Analyses = Perchlorate, nitrate/nitrite, sulfate, pH, and total organic carbon.
Station Boundary PRB Performance Monitoring	Assumptions same as Alternative G1-3.
Overall Perchlorate Extent Monitoring	Assumptions same as Alternative G1-2.
Institutional Controls Monitoring	Assumptions same as Alternative G1-2.
PERIODIC COSTS	
Source Area Direct Injection - Substrate Injection Costs	1. RACER Technology Model Used: User-Defined Costs 2. Assumed substrate: EOS® 3. Approximate volume of 20 percent by volume EOS® proposed to be injected into each injection well: 1,600 gallons (based on the pilot study data) 4. Design life of substrate: 4 years

Cost Element	Key Assumptions / Parameters
	5. Assumed injection rate: 5 gpm (based on the pilot study data) 6. Substrate cost = $ 14.5 per gallon (estimate based on vendor quote)
Substrate Injection Costs – Station Boundary PRB	Assumptions same as Alternative G1-3.
Groundwater Monitoring Well Replacement	Assumptions same as Alternative G1-2
Five-Year Reviews	Assumptions same as Alternative G1-2

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
33	**Timeframe[e]: Greater than 200 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.3; Table E5-1; and Figure E4-3. AECOM. April 2011.

E4. SIMULATION OF REMEDIAL ALTERNATIVES

This appendix presents updated results of groundwater flow and transport models developed as part of the FS to evaluate remedial alternatives for perchlorate-impacted groundwater at IRP Site 1. Both flow and transport model assumptions and input parameter values used during the preparation of the Draft FS (Earth Tech 2007) are assumed to still be valid. The detailed descriptions for model development and calibration are included Sections E2 and E3. Updated transport simulations were performed with current perchlorate-impacted groundwater configuration, which are based on groundwater sampling results between 2007 and 2009.

Six remedial alternatives are proposed in this FS for IRP Site 1 perchlorate-impacted groundwater. Detailed description for each alternative is presented in Section 4 of the main text of the FS. The following is a brief description of each remedial alternative and a summary of the updated modeling results. The predicted perchlorate concentrations are depicted graphically on Figures E4-1 through E4-7, which are for comparative purposes only.

E4.1 ALTERNATIVE G1-1: NO ACTION, AND ALTERNATIVE G1-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

No active treatment or containment would be applied in these two alternatives. Processes that would influence the fate and transport of the perchlorate-impacted groundwater include advection, dispersion, and diffusion. The current perchlorate distribution was used as the initial condition, as shown on Figure E4-1. The predicted perchlorate distribution for years 10, 50, 100, and 200 are shown on Figure E4-1.The predicted time-frames for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-1 and G1-2 are presented in Table E4-1.

E4.2 ALTERNATIVE G1-3: IN-SITU BIOREMEDIATION NEAR THE STATION BOUNDARY PLUS MONITORING AND INSTITUTIONAL CONTROLS

Alternative G1-3 would include in-situ bioremediation of perchlorate-impacted groundwater using near the Station boundary.

The initial condition assumes a contiguous plume within the Station boundary. It is assumed that in-situ bioremediation at the Station boundary is assumed to be sufficient to reduce perchlorate concentrations to the cleanup goal (CG). The predicted perchlorate distribution for years 10, 50, 100, and 200 are shown on Figure E4-2. The predicted time-frame for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-3 is presented in Table E4-1

E4.3 ALTERNATIVE G1-4: IN-SITU BIOREMEDIATION AT THE SOURCE AREA AND NEAR THE STATION BOUNDARY, MONITORING AND INSTITUTIONAL CONTROLS

Under Alternative G1-4, in-situ bioremediation of the source area may be implemented using direct injection or a PRB. If source area remediation is implemented using direct injection, it is assumed that perchlorate degradation via injection of an electron donor would be rapid and the concentrations are assumed to be reduced to the CG in up to five-years.

However, if the PRB is used to remediate the source area, the remediation time-frames are expected to be higher. The modeling of Alternative G1-4 assumed that a PRB would be installed immediately

downgradient of the source area within the boundary of IRP Site 1 to treat relatively high concentrations of perchlorate. In the transport model, the initial concentration condition includes a plume upgradient from the PRB and a plume downgradient from the PRB, as shown on Figure E4-4. The PRB downgradient from the source area is assumed to reduce the perchlorate to the CG. Therefore, no migration of perchlorate downgradient of the source area above CG is assumed.

The simulation results, as shown on Figure E4-4, estimate that perchlorate at the IRP Site 1 source area would attenuate below 6 µg/L in approximate 93 years. The perchlorate-impacted groundwater downgradient of the source area PRB would continue to migrate downgradient towards Station boundary. The simulation results indicate that it would take more than 200 years for perchlorate downgradient of the source area to attenuate below 6 µg/L.The predicted maximum concentration of perchlorate that would reach the Station boundary is 35 µg/L. The predicted perchlorate distribution for years 5, 10, 15, and 20 are shown on Figure E4-4. The predicted time-frame for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-4 is presented in Table E4-1

E4.4 ALTERNATIVE G1-5: IN-SITU BIOREMEDIATION AT THE SOURCE AREA, DOWNGRADIENT OF THE SOURCE AREA AND NEAR THE STATION BOUNDARY, MONITORING, AND INSTITUTIONAL CONTROLS

Under Alternative G1-5, it is assumed that direct injection is used to remediate perchlorate in the source area and PRBs would be installed downgradient from the source area between IRP Sites 1 and 2, and near the Station boundary. The intermediate PRB between IRP Sites 1 and 2 is simulated near the location of Monitoring Wells 01-MW213 and 01-MW214.

It is assumed that perchlorate degradation via injection of an electron donor in the source area would be rapid and the concentrations are assumed to be reduced to the CG in up to five-years. Groundwater modeling results indicate that source area treatment using direct injection and a PRB in combination with natural attenuation processes would reduce perchlorate concentrations to less than 6 µg/L in approximately 19 years. The predicted perchlorate distribution for years 5 and 10 are shown on Figure E4-6.

E4.5 ALTERNATIVE G1-6: HYDRAULIC CONTAINMENT/TREATMENT, MONITORING, AND ICS

Alternative G1-6 would include installation of groundwater extraction wells in areas with perchlorate concentrations exceeding 6 µg/L. The initial condition is based on the current perchlorate distribution (Figure E4-7). Groundwater modeling results indicate that approximately 176 wells would be required to reduce perchlorate concentrations below 6 µg/L in 49 years. Sustainable extraction rates of 0.3 gallons per minute (gpm) per extraction well (total 167 wells) in the source area, and 2.0 gpm per well between IRP Site 1 and IRP Site 2 (9 wells) were assumed. The predicted perchlorate distribution for years 5, 10, 15, and 20 are shown on Figure E4-7.

The results for all simulations, including number of years for perchlorate-impacted groundwater dissipation below 6 µg/L, are summarized in Table E4-1.

Table E5-1 Modeling Results Summary

Alternative	Approximate Time for Reduction of Source Area to less than 6 µg/L (years)	Approximate Time for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L (years)	Relative Duration for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L With Respect to Alternative G1-5[a]
Alternative G1-1: No Action,	NA	400[b]	26
Alternative G1-2: MNA and ICs	NA	400[b]	26
Alternative G1-3: In-Situ Bioremediation near the Station Boundary, Monitoring, and ICs	NA	400[b]	21
Alternative G1-4: In-Situ Bioremediation at the Source Area and near the Station Boundary using PRB Plus Monitoring and ICs	93[c]	367[d]	19.3
Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	--[e]	19[f]	1
Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs	--[g]	49 [b]	2.6

Notes:

[a] Relative duration was estimated by dividing the estimated time for perchlorate-impacted groundwater to attenuate below 6 µg/L under a particular remedial alternative by the estimated time required for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-5 (19 years). The groundwater modeling results indicate that of all remedial alternatives, Alternative G1-5 would take the shortest time to reduce perchlorate concentrations to less than 6 µg/L at and downgradient of IRP Site 1.

[b] Time required for remediation of the estimated extent of perchlorate-impacted groundwater at and downgradient of IRP Site 1 to concentrations less than 6 µg/L.

[c] The stated time duration for the source area remediation using a PRB. Under Alternative G1-4, source area may also be remediated using direct injection. If direct injection is used, the remediation time frame is expected to be much shorter; however, this time-frame was not estimated using groundwater modeling.

[d] Time required for natural attenuation of perchlorate-impacted groundwater downgradient from the source area at IRP Site 1 to concentrations less than 6 µg/L.

[e] Time required for remediation of the source area using direct injection was not simulated using groundwater modeling.

[f] Time required for remediation of perchlorate-impacted groundwater downgradient from the PRB (proposed near the location of Monitoring Wells 01-MW213 and 01-MW214) to concentrations less than 6 µg/L.

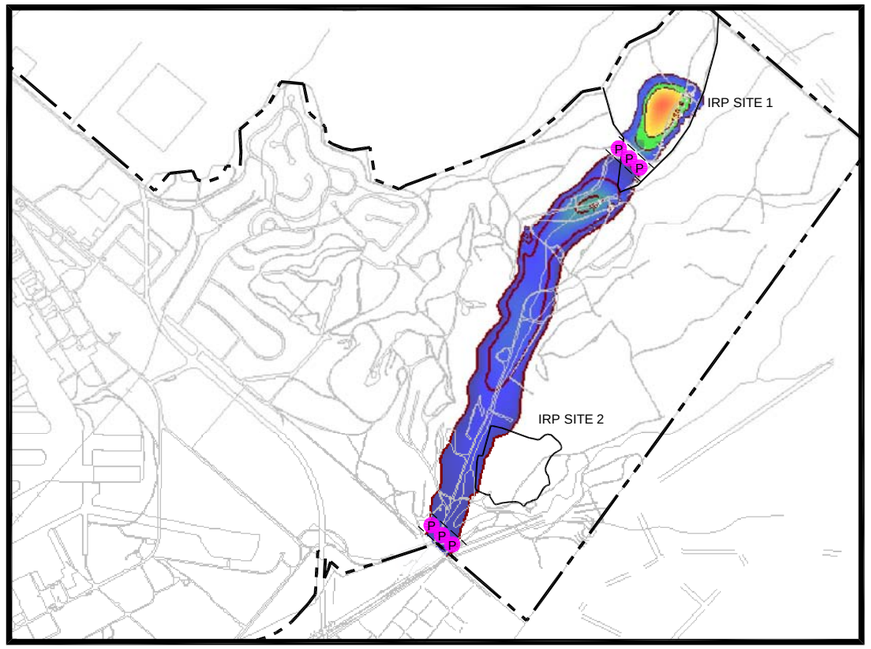
[g] Time required for remediation of perchlorate-impacted groundwater in the source area using direct injection was not separately estimated using groundwater modeling for Alternatives G1-6.

µg/L = micrograms per liter

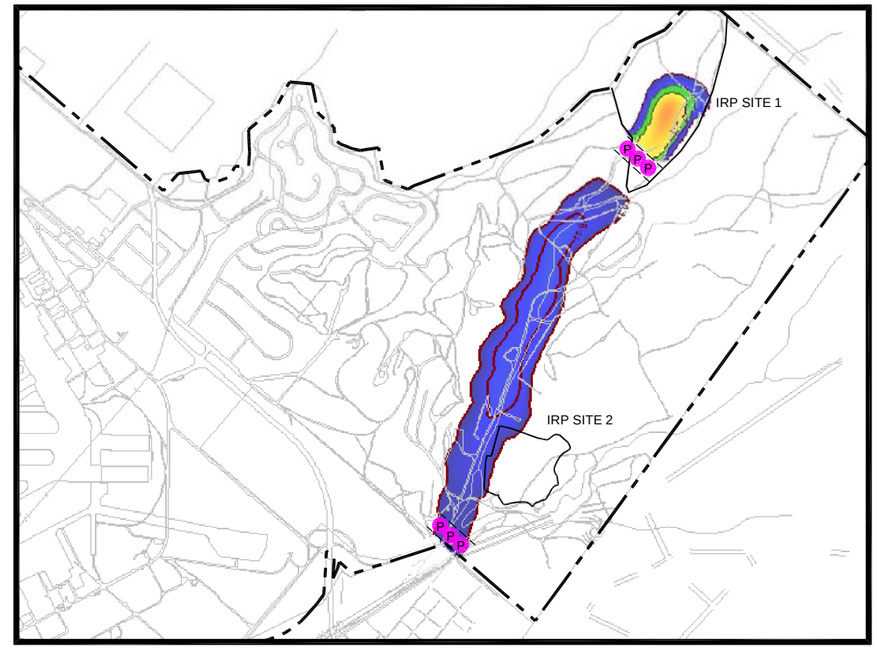
IC = institutional control

MNA = monitored natural attenuation

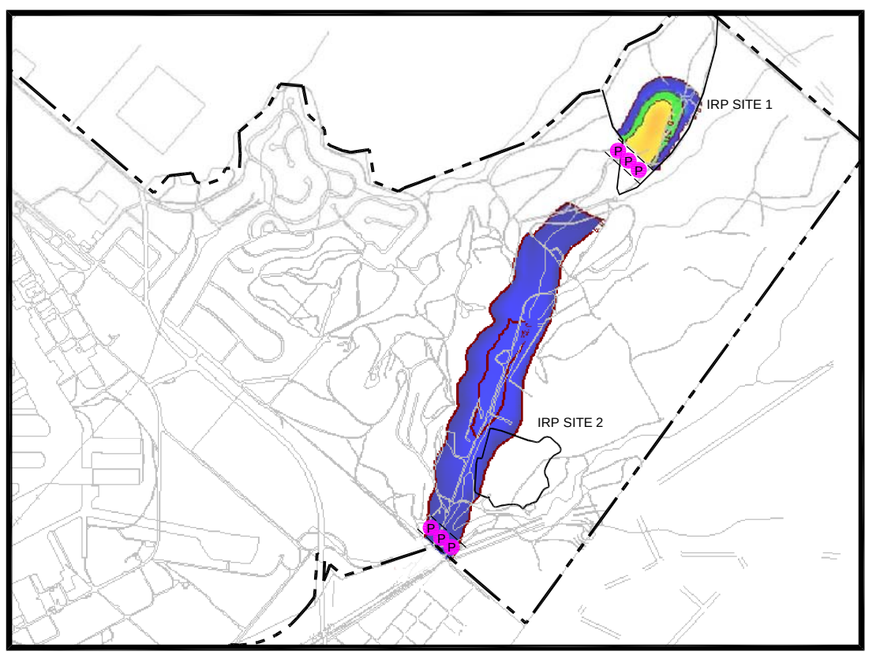
NA = not applicable



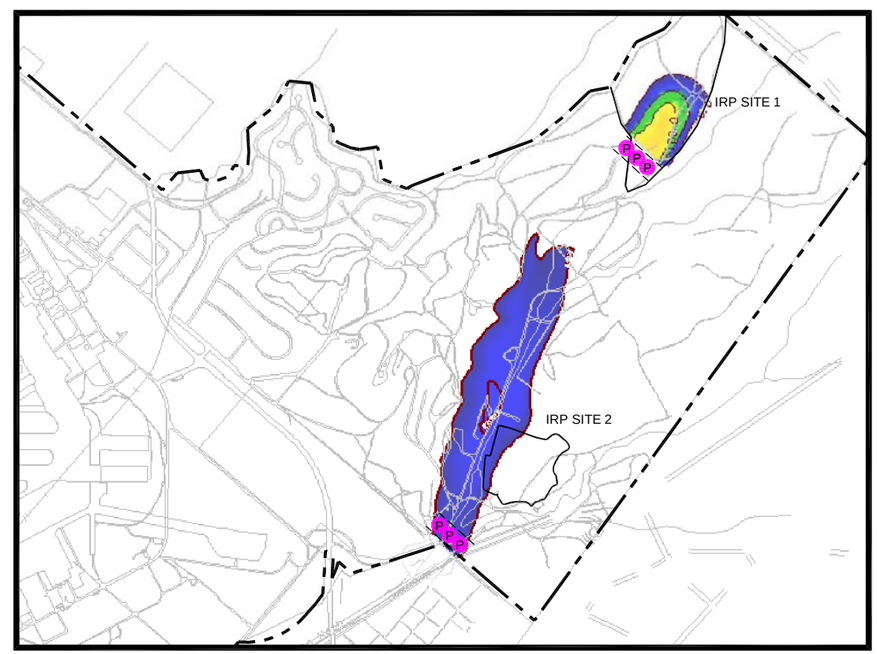
5 YEARS



10 YEARS



15 YEARS



20 YEARS

LEGEND:

- (P) PERMEABLE REACTIVE BARRIER (PRB) NEAR THE STATION BOUNDARY
- FORMER MCAS EL TORO STATION BOUNDARY
- IRP SITE BOUNDARY

PERCHLORATE CONCENTRATIONS (µg/L)

300
100
50
25
6

NOTES:

1. THIS ALTERNATIVE INVOLVES SOURCE AREA TREATMENT USING DIRECT INJECTION OF ELECTRON DONOR OR A PRB.
2. PRB NEAR THE STATION BOUNDARY IS ASSUMED TO BE SUFFICIENT TO REDUCE PERCHLORATE CONCENTRATIONS TO THE CLEANUP GOAL.
3. MODELING RESULTS PRESENTED ARE BASED ON A SIMPLIFIED HYDROGEOLOGICAL MODEL FOR THE COMPARATIVE EVALUATION OF THE VARIOUS GROUNDWATER RESPONSE ALTERNATIVES. THESE RESULTS ARE NOT INTENDED TO BE USED AS PREDICTION OF REQUIRED RESTORATION DURATIONS.

µg/L MICROGRAMS PER LITER
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION

NORTH

0 1200 2400 FEET

APPROXIMATE SCALE: 1" = 2400'

Feasibility Study — Draft Final

Alternative G1-4:
Computed Perchlorate Concentrations

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	E4-3

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix E Figures\FIGURE E4-3.dwg Time: Sep 29, 2010 - 2:31pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
34	**Present Worth Cost[g]: $9,218,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1.4; and Tables 8 and 9. AECOM. April 2011.

Alternative G1-4 would include implementation of in-situ bioremediation at the Source Area and near the Station boundary. The implementation of in-situ bioremediation at the source area would treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize their downgradient migration. The design configurations for the implementation of in-situ bioremediation at the source area may include a PRB, direct injection, or groundwater recirculation as summarized in Section 5 of the main text of the FS.

The implementation of in-situ bioremediation near the Station boundary would minimize the potential for further off-Station migration of perchlorate at concentrations exceeding its CG. The design configurations for the implementation of in-situ bioremediation near the Station boundary may include a PRB or a groundwater recirculation loop, and are summarized in Section 5 of the main text of the FS.

The cost estimate for Alternative G1-4 is based on the assumption that direct injection would be used for in-situ bioremediation of the source area and PRB would be installed near the Station boundary.

Groundwater monitoring would be conducted as a component of Alternative G1-4 to evaluate the effectiveness of in-situ bioremediation and to assess the distribution of perchlorate in the area between the source area and the Station boundary, and beyond due to natural attenuation processes.

To attain the RAOs, Alternative G1-4 would also include implementation of ICs. ICs would be implemented as part of Alternative G1-4 to limit exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG.

Since Alternative G1-4 results in perchlorate remaining at the site above the levels that allow for unlimited use and unrestricted exposure, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. A complete description of Alternative G1-4 is presented in Section 5 of the main text of the FS. The estimated costs for Alternative G1-4 are presented in Table 6. Table 7 presents the assumptions and parameters used for Alternative G1-4 cost estimate.

3.1.4 Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs

Alternative G1-5 consists of the following components:

- In-situ bioremediation of the perchlorate source area,
- In-situ bioremediation of perchlorate-impacted groundwater downgradient of the perchlorate source area using an intermediate PRB between IRP Sites 1 and 2,
- In-situ bioremediation of perchlorate near the Station boundary, and
- Groundwater monitoring and ICs

The implementation of in-situ bioremediation at the source area would treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize their downgradient migration. The design configurations for the implementation of in-situ bioremediation at the source area may include a PRB, direct injection, or groundwater recirculation, and are summarized in Section 5 of the main text of the FS.

The implementation of in-situ bioremediation between IRP Sites 1 and 2 and near the Station boundary would lead to treatment of perchlorate downgradient of the source area and minimize the potential for further off-Station migration of perchlorate at concentrations exceeding its CG.

The cost estimate for Alternative G1-5 is based on the assumption that direct injection would be used for in-situ bioremediation of the source area, and PRBs would be installed between IRP Sites 1 and 2 and near the Station boundary.

Groundwater monitoring would be conducted as a component of Alternative G1-5 to evaluate the effectiveness of in-situ bioremediation in the source area, intermediate area and the Station boundary to treat perchlorate. In addition, groundwater monitoring would also be used to assess the distribution of perchlorate in the saturated sandstone/alluvium between the source area and intermediate PRB, intermediate PRB and the Station boundary, and beyond. To attain the RAOs, Alternative G1-5 would also include implementation of ICs.

Under Alternative G1-5, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. A complete description of Alternative G1-5 is presented in Section 5 of the main text of the FS. The estimated costs for Alternative G1-5 are presented in Table 8. Table 9 presents the assumptions and parameters used for Alternative G1-5 cost estimate.

3.1.5 Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Alternative G1-6 would include installation of groundwater extraction wells along the estimated extent of IRP Site 1 perchlorate-impacted groundwater. Groundwater modeling conducted in support of this FS indicates that approximately 176 groundwater extraction wells would be required to reduce perchlorate concentrations to less than the CG in approximately 49 years. Sustainable extraction rates ranging between 0.3 to 2 gallons per minute (gpm) were assumed for individual extraction wells in the groundwater model based on the aquifer tests conducted at IRP Site 1, and information on the geology between IRP Sites 1 and 2.

For cost estimation purposes, it is assumed that the extracted groundwater would be treated using a fluidized bed reactor (FBR), and the treated groundwater would be discharged to the surface water (Borrego Canyon Wash).

ICs would be implemented until the time perchlorate is reduced to concentrations less than or equal to the CG along the estimated extent of IRP Site 1 perchlorate-impacted groundwater.

A complete description of Alternative G1-6 is presented in Section 5 of the FS. The estimated costs for Alternative G1-6 are presented in Table 10. Table 11 presents the assumptions and parameters used for Alternative G1-6 cost estimate.

Table 8: Estimated Costs for Alternative G1-5

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020
CAPITAL COSTS									
Remedial Design	$293,084								
Institutional Controls Planning Documents	$30,650								
Institutional Controls Implementation		$73,852							
Hydraulic Fracturing - Source Area		$968,108							
Installation of Injection Wells at Fractured Locations - Source Area		$865,289							
Intermediate PRB Injection Well Installation		$237,964							
Intermediate PRB Monitoring Well Installation		$109,898							
Station Boundary PRB Injection Well Installation		$435,595							
Station Boundary PRB Monitoring Well Installation		$150,371							
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring		$202,429							
O&M COSTS									
Institutional Controls Monitoring			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Source Area Direct Injection Performance Monitoring			$98,738	$24,685	$24,685	$24,685	$24,685		
Intermediate PRB Performance Monitoring			$98,831	$24,708	$24,708	$24,708	$24,708	$16,643	$16,643
Station Boundary PRB Performance Monitoring			$160,703	$40,176	$40,176	$40,176	$40,176	$33,263	$33,263
Overall Perchlorate Extent Monitoring			$113,168	$56,584	$56,584	$56,584	$56,584	$28,618	$28,618
PERIODIC COSTS									
Source Area Direct Injection - Substrate Injection Costs		$536,504				$134,126			
Intermediate PRB - Substrate Injection Costs		$136,391				$136,391			
Station Boundary - Substrate Injection Costs		$407,761				$407,761			
Groundwater Monitoring Well Replacement									
Five-Year Reviews						$29,800			
Sub-Total	$323,734	$4,124,164	$492,815	$167,526	$167,526	$875,605	$167,526	$99,899	$99,899
Contingency		$810,062	$98,563	$33,505	$33,505	$169,161	$33,505	$19,980	$19,980
Sub-Total	$323,734	$4,934,226	$591,377	$201,032	$201,032	$1,044,766	$201,032	$119,879	$119,879
Discount Factor	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01
Present Value	$306,339	$4,541,922	$529,532	$175,105	$170,336	$861,127	$161,183	$93,499	$90,952

Table 8: Estimated Costs for Alternative G1-5

Phase Name	Calendar Year 10 2021	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
Hydraulic Fracturing - Source Area									
Installation of Injection Wells at Fractured Locations - Source Area									
Intermediate PRB Injection Well Installation									
Intermediate PRB Monitoring Well Installation									
Station Boundary PRB Injection Well Installation									
Station Boundary PRB Monitoring Well Installation									
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Source Area Direct Injection Performance Monitoring									
Intermediate PRB Performance Monitoring	$16,643	$16,643	$16,643	$16,643	$16,643	$16,643	$16,643	$16,643	$16,643
Station Boundary PRB Performance Monitoring	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263	$33,263
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Source Area Direct Injection - Substrate Injection Costs									
Intermediate PRB - Substrate Injection Costs	$136,391				$136,391				
Station Boundary - Substrate Injection Costs	$407,761				$407,761				$407,761
Groundwater Monitoring Well Replacement		$202,429							
Five-Year Reviews		$29,800					$29,800		
Sub-Total	$644,052	$332,128	$99,899	$99,899	$644,052	$99,899	$129,699	$99,899	$507,661
Contingency	$128,810	$60,466	$19,980	$19,980	$128,810	$19,980	$19,980	$19,980	$101,532
Sub-Total	$772,862	$392,594	$119,879	$119,879	$772,862	$119,879	$149,679	$119,879	$609,193
Discount Factor	7.38E-01	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$570,398	$281,855	$83,721	$81,440	$510,746	$77,064	$93,601	$72,923	$360,484

Table 8: Estimated Costs for Alternative G1-5

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Row Total
CAPITAL COSTS			
Remedial Design			$293,084
Institutional Controls Planning Documents			$30,650
Institutional Controls Implementation			$73,852
Hydraulic Fracturing - Source Area			$968,108
Installation of Injection Wells at Fractured Locations - Source Area			$865,289
Intermediate PRB Injection Well Installation			$237,964
Intermediate PRB Monitoring Well Installation			$109,898
Station Boundary PRB Injection Well Installation			$435,595
Station Boundary PRB Monitoring Well Installation			$150,371
Installation of Monitoring Wells - Overall Perchlorate Extent Monitoring			$202,429
O&M COSTS			
Institutional Controls Monitoring	$21,375	$49,732	$413,099
Source Area Direct Injection Performance Monitoring			$197,477
Intermediate PRB Performance Monitoring	$16,643	$16,643	$414,026
Station Boundary PRB Performance Monitoring	$33,263	$33,263	$753,825
Overall Perchlorate Extent Monitoring	$28,618	$28,618	$711,541
PERIODIC COSTS			
Source Area Direct Injection - Substrate Injection Costs			$670,630
Intermediate PRB - Substrate Injection Costs			$545,564
Station Boundary - Substrate Injection Costs			$2,038,807
Groundwater Monitoring Well Replacement			$202,429
Five-Year Reviews			$89,401
Sub-Total	$99,899	$128,256	$9,404,040
Contingency	$19,980	$25,651	$1,783,411
Sub-Total	$119,879	$153,908	$11,187,451
Discount Factor	5.76E-01	5.60E-01	--
Present Value	$69,005	$86,180	$9,218,000 *

Notes:

* The costs are rounded off to nearest thounsands.

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Table 9: Assumptions / Parameters for Cost Estimation of Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	Assumptions same as Alternative G1-2.
Institutional Controls Implementation	Assumptions same as Alternative G1-2.
Hydraulic Fracturing - Source Area	Assumptions same as Alternative G1-4.
Installation of Injection Wells at Fractured Locations – Source Area	Assumptions same as Alternative G1-4.
Intermediate PRB Injection Well Installation	1. RACER Technology Models Used: Groundwater Monitoring Well, User-Defined Costs, Off-site Transportation and Waste Disposal, and Professional Labor Management 2. Length of PRB = 150 feet 3. Assumed spacing between injection locations = 7.5 feet (estimated base don based on the in-situ bioremediation pilot study results) 4. Number of injection locations/wells = 20 5. Injection screen length per well = 20 feet 6. Diameter of injection wells = 2 inches 7. Well construction material: PVC Schedule 80 8. Depth to groundwater: 40 feet 9. Aquifer thickness requiring treatment = 20 feet 10. Drilling method = Hollow-stem Auger 11. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 12. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Intermediate PRB Performance Monitoring Well Installation	1. RACER Technology Model Used: Groundwater Monitoring Wells 2. Number of monitoring wells for PRB performance assessment: 9 3. Depth to groundwater: 40 feet 4. Average well depth: 60 feet 5. Drilling method: Hollow-stem Auger 6. Well diameter: 2-inch 7. Well construction material: PVC Sch. 40 8. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 9. Analysis for RCRA waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Station Boundary PRB Injection Well Installation	Assumptions same as Alternative G1-3.
Station Boundary PRB Performance Monitoring Well Installation	Assumptions same as Alternative G1-3.
Installation of Monitoring Wells – Overall Perchlorate Extent Monitoring	Assumptions same as Alternative G1-2.
O&M	
Institutional Controls Monitoring	Assumptions same as Alternative G1-2.
Source Area Direct Injection Performance Monitoring	Assumptions same as Alternative G1-4.
Intermediate PRB Performance Monitoring	1. RACER Technology Model Used: Monitoring 2. Total duration of monitoring: 19 years 3. Number of monitoring wells sampled during each event: 10 4. Monitoring frequency from 0 to 6 months = Monthly 5. Monitoring frequency from 7 to 12 months = Quarterly 6. Monitoring frequency from 2nd to 5th year = Semi-annual 7. Monitoring frequency from 6th to 19th year = Annual

Cost Element	Key Assumptions / Parameters
	8. Average Sample Depth = 50 feet 9. Analyses = Perchlorate, nitrate/nitrite, sulfate, pH, and total organic carbon.
Station Boundary PRB Performance Monitoring	Assumptions same as Alternative G1-3.
Overall Perchlorate Extent Monitoring	Assumptions same as Alternative G1-2.
PERIODIC COSTS	
Source Area Direct Injection - Substrate Injection Costs	Assumptions same as Alternative G1-4.
Intermediate PRB - Substrate Injection Costs	1. RACER Technology Model Used: User-Defined Costs 2. Assumed substrate: EOS® 3. Approximate volume of 20 percent by volume EOS® proposed to be injected into each injection well: 1,600 gallons (based on the pilot study data) 4. Design life of substrate: 4 years 5. Assumed injection rate: 5 gpm (based on the pilot study data) 6. Substrate cost = $ 14.5 per gallon (estimate based on vendor quote)
Station Boundary - Substrate Injection Costs	Assumptions same as Alternative G1-3.
Groundwater Monitoring Well Replacement	Assumptions same as Alternative G1-2.
Five-Year Reviews	Assumptions same as Alternative G1-2.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
35	**Timeframe[e]: 19 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.4; Table E5-1; and Figure E4-4. AECOM. April 2011.

downgradient of the source area within the boundary of IRP Site 1 to treat relatively high concentrations of perchlorate. In the transport model, the initial concentration condition includes a plume upgradient from the PRB and a plume downgradient from the PRB, as shown on Figure E4-4. The PRB downgradient from the source area is assumed to reduce the perchlorate to the CG. Therefore, no migration of perchlorate downgradient of the source area above CG is assumed.

The simulation results, as shown on Figure E4-4, estimate that perchlorate at the IRP Site 1 source area would attenuate below 6 µg/L in approximate 93 years. The perchlorate-impacted groundwater downgradient of the source area PRB would continue to migrate downgradient towards Station boundary. The simulation results indicate that it would take more than 200 years for perchlorate downgradient of the source area to attenuate below 6 µg/L.The predicted maximum concentration of perchlorate that would reach the Station boundary is 35 µg/L. The predicted perchlorate distribution for years 5, 10, 15, and 20 are shown on Figure E4-4. The predicted time-frame for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-4 is presented in Table E4-1

E4.4 ALTERNATIVE G1-5: IN-SITU BIOREMEDIATION AT THE SOURCE AREA, DOWNGRADIENT OF THE SOURCE AREA AND NEAR THE STATION BOUNDARY, MONITORING, AND INSTITUTIONAL CONTROLS

Under Alternative G1-5, it is assumed that direct injection is used to remediate perchlorate in the source area and PRBs would be installed downgradient from the source area between IRP Sites 1 and 2, and near the Station boundary. The intermediate PRB between IRP Sites 1 and 2 is simulated near the location of Monitoring Wells 01-MW213 and 01-MW214.

It is assumed that perchlorate degradation via injection of an electron donor in the source area would be rapid and the concentrations are assumed to be reduced to the CG in up to five-years. Groundwater modeling results indicate that source area treatment using direct injection and a PRB in combination with natural attenuation processes would reduce perchlorate concentrations to less than 6 µg/L in approximately 19 years. The predicted perchlorate distribution for years 5 and 10 are shown on Figure E4-6.

E4.5 ALTERNATIVE G1-6: HYDRAULIC CONTAINMENT/TREATMENT, MONITORING, AND ICS

Alternative G1-6 would include installation of groundwater extraction wells in areas with perchlorate concentrations exceeding 6 µg/L. The initial condition is based on the current perchlorate distribution (Figure E4-7). Groundwater modeling results indicate that approximately 176 wells would be required to reduce perchlorate concentrations below 6 µg/L in 49 years. Sustainable extraction rates of 0.3 gallons per minute (gpm) per extraction well (total 167 wells) in the source area, and 2.0 gpm per well between IRP Site 1 and IRP Site 2 (9 wells) were assumed. The predicted perchlorate distribution for years 5, 10, 15, and 20 are shown on Figure E4-7.

The results for all simulations, including number of years for perchlorate-impacted groundwater dissipation below 6 µg/L, are summarized in Table E4-1.

Table E5-1 Modeling Results Summary

Alternative	Approximate Time for Reduction of Source Area to less than 6 µg/L (years)	Approximate Time for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L (years)	Relative Duration for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L With Respect to Alternative G1-5[a]
Alternative G1-1: No Action,	NA	400[b]	26
Alternative G1-2: MNA and ICs	NA	400[b]	26
Alternative G1-3: In-Situ Bioremediation near the Station Boundary, Monitoring, and ICs	NA	400[b]	21
Alternative G1-4: In-Situ Bioremediation at the Source Area and near the Station Boundary using PRB Plus Monitoring and ICs	93[c]	367[d]	19.3
Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	--[e]	19[f]	1
Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs	--[g]	49 [b]	2.6

Notes:

[a] Relative duration was estimated by dividing the estimated time for perchlorate-impacted groundwater to attenuate below 6 µg/L under a particular remedial alternative by the estimated time required for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-5 (19 years). The groundwater modeling results indicate that of all remedial alternatives, Alternative G1-5 would take the shortest time to reduce perchlorate concentrations to less than 6 µg/L at and downgradient of IRP Site 1.

[b] Time required for remediation of the estimated extent of perchlorate-impacted groundwater at and downgradient of IRP Site 1 to concentrations less than 6 µg/L.

[c] The stated time duration for the source area remediation using a PRB. Under Alternative G1-4, source area may also be remediated using direct injection. If direct injection is used, the remediation time frame is expected to be much shorter; however, this time-frame was not estimated using groundwater modeling.

[d] Time required for natural attenuation of perchlorate-impacted groundwater downgradient from the source area at IRP Site 1 to concentrations less than 6 µg/L.

[e] Time required for remediation of the source area using direct injection was not simulated using groundwater modeling.

[f] Time required for remediation of perchlorate-impacted groundwater downgradient from the PRB (proposed near the location of Monitoring Wells 01-MW213 and 01-MW214) to concentrations less than 6 µg/L.

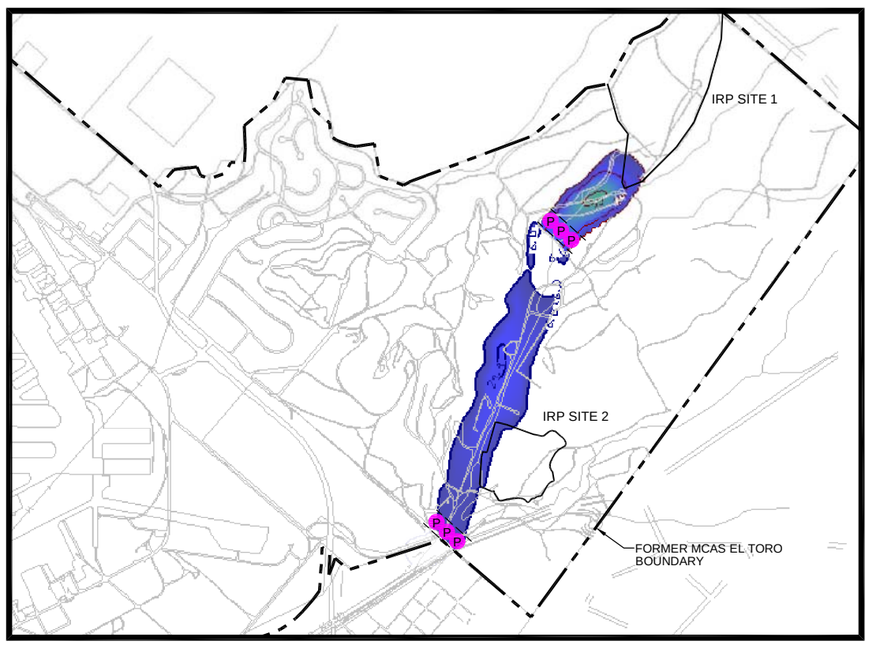
[g] Time required for remediation of perchlorate-impacted groundwater in the source area using direct injection was not separately estimated using groundwater modeling for Alternatives G1-6.

µg/L = micrograms per liter

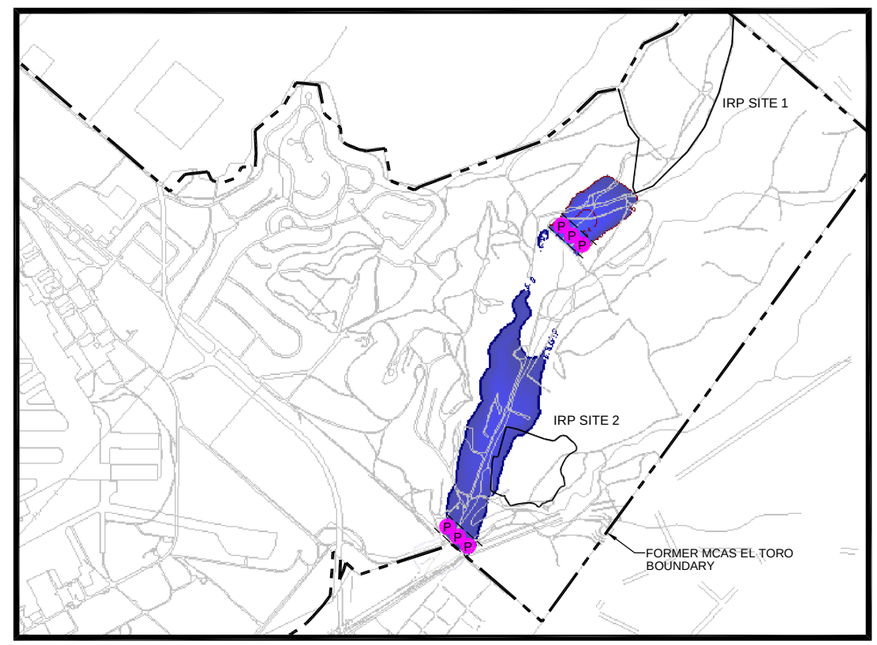
IC = institutional control

MNA = monitored natural attenuation

NA = not applicable



5 YEARS



10 YEARS

LEGEND:

- (P) PERMEABLE REACTIVE BARRIER (PRB) NEAR THE STATION BOUNDARY
- FORMER MCAS EL TORO STATION BOUNDARY
- IRP SITE BOUNDARY

PERCHLORATE CONCENTRATIONS (µg/L)

300
100
50
25
6

NOTES:

1. THIS ALTERNATIVE INCLUDES SOURCE AREA TREATMENT USING DIRECT INJECTION OF ELECTRON DONOR AND INSTALLATION OF A PRB FOR TREATMENT OF PERCHLORATE-IMPACTED GROUNDWATER DOWNGRADIENT FROM THE SOURCE AREA BETWEEN IRP SITES 1 AND 2. THIS PRB MAY BE INSTALLED NEAR THE LOCATION OF MONITORING WELLS 01-MW213 AND 01-MW214.
2. PRB AT THE STATION BOUNDARY IS ASSUMED TO BE SUFFICIENT TO REDUCE PERCHLORATE CONCENTRATIONS TO THE CLEANUP GOAL.
3. MODELING RESULTS PRESENTED ARE BASED ON A SIMPLIFIED HYDROGEOLOGICAL MODEL FOR THE COMPARATIVE EVALUATION OF THE VARIOUS GROUNDWATER RESPONSE ALTERNATIVES. THESE RESULTS ARE NOT INTENDED TO BE USED AS PREDICTION OF REQUIRED RESTORATION DURATIONS.

µg/L MICROGRAMS PER LITER
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION

NORTH

0 1200 2400 FEET

APPROXIMATE SCALE: 1" = 2400'

Feasibility Study		Draft Final
Alternative G1-5: Computed Perchlorate Concentrations IRP Sites 1 & 2		
Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	E4-4

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix E Figures\FIGURE E4-4.dwg Time: Sep 29, 2010 - 2:32pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
36	**Present Worth Cost[i]: $24,280,000**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.1.5; and Tables 10 and 11. AECOM. April 2011.

boundary would lead to treatment of perchlorate downgradient of the source area and minimize the potential for further off-Station migration of perchlorate at concentrations exceeding its CG.

The cost estimate for Alternative G1-5 is based on the assumption that direct injection would be used for in-situ bioremediation of the source area, and PRBs would be installed between IRP Sites 1 and 2 and near the Station boundary.

Groundwater monitoring would be conducted as a component of Alternative G1-5 to evaluate the effectiveness of in-situ bioremediation in the source area, intermediate area and the Station boundary to treat perchlorate. In addition, groundwater monitoring would also be used to assess the distribution of perchlorate in the saturated sandstone/alluvium between the source area and intermediate PRB, intermediate PRB and the Station boundary, and beyond. To attain the RAOs, Alternative G1-5 would also include implementation of ICs.

Under Alternative G1-5, five-year reviews would be conducted to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. A complete description of Alternative G1-5 is presented in Section 5 of the main text of the FS. The estimated costs for Alternative G1-5 are presented in Table 8. Table 9 presents the assumptions and parameters used for Alternative G1-5 cost estimate.

3.1.5 Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Alternative G1-6 would include installation of groundwater extraction wells along the estimated extent of IRP Site 1 perchlorate-impacted groundwater. Groundwater modeling conducted in support of this FS indicates that approximately 176 groundwater extraction wells would be required to reduce perchlorate concentrations to less than the CG in approximately 49 years. Sustainable extraction rates ranging between 0.3 to 2 gallons per minute (gpm) were assumed for individual extraction wells in the groundwater model based on the aquifer tests conducted at IRP Site 1, and information on the geology between IRP Sites 1 and 2.

For cost estimation purposes, it is assumed that the extracted groundwater would be treated using a fluidized bed reactor (FBR), and the treated groundwater would be discharged to the surface water (Borrego Canyon Wash).

ICs would be implemented until the time perchlorate is reduced to concentrations less than or equal to the CG along the estimated extent of IRP Site 1 perchlorate-impacted groundwater.

A complete description of Alternative G1-6 is presented in Section 5 of the FS. The estimated costs for Alternative G1-6 are presented in Table 10. Table 11 presents the assumptions and parameters used for Alternative G1-6 cost estimate.

Table 10: Estimated Costs for Alternative G1-6

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020
CAPITAL COSTS									
Remedial Design	$437,406								
Institutional Controls Planning Documents	$30,650								
Institutional Controls Implementation		$73,852							
Groundwater Extraction Wells Installation		$5,396,299							
Above-Ground Treatment System Installation		$515,042							
Groundwater Monitoring Well Installation		$202,429							
O&M COSTS									
Institutional Controls Monitoring			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
FBR Operation Cost			$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972
Monitoring - Treatment System			$1,731,496	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384
Groundwater Monitoring			$113,168	$56,584	$56,584	$56,584	$56,584	$28,618	$28,618
PERIODIC COSTS									
Groundwater Monitoring Well Replacement									
Five-Year Reviews						$29,800			
Sub-Total	$468,056	$6,187,623	$1,880,010	$539,314	$539,314	$569,115	$539,314	$511,349	$511,349
Contingency		$1,222,754	$376,002	$107,863	$107,863	$107,863	$107,863	$102,270	$102,270
Sub-Total	$468,056	$7,410,377	$2,256,012	$647,177	$647,177	$676,977	$647,177	$613,619	$613,619
Discount Factor (Discount Rate 2.8 percent)	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01
Present Value	$442,906	$6,821,203	$2,020,082	$563,712	$548,358	$557,985	$518,894	$478,587	$465,551

Table 10: Estimated Costs for Alternative G1-6

Phase Name	Calendar Year 10 2021	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
Groundwater Extraction Wells Installation									
Above-Ground Treatment System Installation									
Groundwater Monitoring Well Installation									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
FBR Operation Cost	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972
Monitoring - Treatment System	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384
Groundwater Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Groundwater Monitoring Well Replacement		$202,429							
Five-Year Reviews		$29,800					$29,800		
Sub-Total	$511,349	$743,578	$511,349	$511,349	$511,349	$511,349	$541,149	$511,349	$511,349
Contingency	$102,270	$142,756	$102,270	$102,270	$102,270	$102,270	$102,270	$102,270	$102,270
Sub-Total	$613,619	$886,333	$613,619	$613,619	$613,619	$613,619	$643,419	$613,619	$613,619
Discount Factor (Discount Rate 2.8 percent)	7.38E-01	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$452,871	$636,326	$428,537	$416,864	$405,510	$394,465	$402,356	$373,269	$363,103

Table 10: Estimated Costs for Alternative G1-6

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Calendar Year 21 2032	Calendar Year 22 2033	Calendar Year 23 2034	Calendar Year 24 2035	Calendar Year 25 2036	Calendar Year 26 2037	Calendar Year 27 2038
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
Groundwater Extraction Wells Installation									
Above-Ground Treatment System Installation									
Groundwater Monitoring Well Installation									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
FBR Operation Cost	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972
Monitoring - Treatment System	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384
Groundwater Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Groundwater Monitoring Well Replacement			$202,429						
Five-Year Reviews			$29,800					$29,800	
Sub-Total	$511,349	$511,349	$743,578	$511,349	$511,349	$511,349	$511,349	$541,149	$511,349
Contingency	$102,270	$102,270	$142,756	$102,270	$102,270	$102,270	$102,270	$102,270	$102,270
Sub-Total	$613,619	$613,619	$886,333	$613,619	$613,619	$613,619	$613,619	$643,419	$613,619
Discount Factor (Discount Rate 2.8 percent)	5.76E-01	5.60E-01	5.45E-01	5.30E-01	5.15E-01	5.01E-01	4.88E-01	4.74E-01	4.62E-01
Present Value	$353,213	$343,592	$482,779	$325,130	$316,274	$307,660	$299,280	$305,267	$283,199

Table 10: Estimated Costs for Alternative G1-6

Phase Name	Calendar Year 28 2039	Calendar Year 29 2040	Calendar Year 30 2041	Calendar Year 31 2042	Calendar Year 32 2043	Calendar Year 33 2044	Calendar Year 34 2045	Calendar Year 35 2046	Calendar Year 36 2047
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
Groundwater Extraction Wells Installation									
Above-Ground Treatment System Installation									
Groundwater Monitoring Well Installation									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
FBR Operation Cost	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972
Monitoring - Treatment System	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384
Groundwater Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Groundwater Monitoring Well Replacement				$202,429					
Five-Year Reviews				$29,800					$29,800
Sub-Total	$511,349	$511,349	$511,349	$743,578	$511,349	$511,349	$511,349	$511,349	$541,149
Contingency	$102,270	$102,270	$102,270	$142,756	$102,270	$102,270	$102,270	$102,270	$102,270
Sub-Total	$613,619	$613,619	$613,619	$886,333	$613,619	$613,619	$613,619	$613,619	$643,419
Discount Factor (Discount Rate 2.8 percent)	4.49E-01	4.37E-01	4.25E-01	4.13E-01	4.02E-01	3.91E-01	3.80E-01	3.70E-01	3.60E-01
Present Value	$275,485	$267,982	$260,683	$366,284	$246,675	$239,957	$233,421	$227,063	$231,605

Table 10: Estimated Costs for Alternative G1-6

Phase Name	Calendar Year 37 2048	Calendar Year 38 2049	Calendar Year 39 2050	Calendar Year 40 2051	Calendar Year 41 2052	Calendar Year 42 2053	Calendar Year 43 2054	Calendar Year 44 2055	Calendar Year 45 2056
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
Groundwater Extraction Wells Installation									
Above-Ground Treatment System Installation									
Groundwater Monitoring Well Installation									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
FBR Operation Cost	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972	$13,972
Monitoring - Treatment System	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384	$447,384
Groundwater Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618	$28,618
PERIODIC COSTS									
Groundwater Monitoring Well Replacement					$202,429				
Five-Year Reviews					$29,800				
Sub-Total	$511,349	$511,349	$511,349	$511,349	$743,578	$511,349	$511,349	$511,349	$511,349
Contingency	$102,270	$102,270	$102,270	$102,270	$142,756	$102,270	$102,270	$102,270	$102,270
Sub-Total	$613,619	$613,619	$613,619	$613,619	$886,333	$613,619	$613,619	$613,619	$613,619
Discount Factor (Discount Rate 2.8 percent)	3.50E-01	3.41E-01	3.31E-01	3.22E-01	3.14E-01	3.05E-01	2.97E-01	2.89E-01	2.81E-01
Present Value	$214,862	$209,010	$203,317	$197,779	$277,899	$187,152	$182,055	$177,096	$172,272

Table 10: Estimated Costs for Alternative G1-6

Phase Name	Calendar Year 46 2057	Calendar Year 47 2058	Calendar Year 48 2059	Calendar Year 49 2060	Calendar Year 50 2061	Row Total
CAPITAL COSTS						
Remedial Design						$437,406
Institutional Controls Planning Documents						$30,650
Institutional Controls Implementation						$73,852
Groundwater Extraction Wells Installation						$5,396,299
Above-Ground Treatment System Installation						$515,042
Groundwater Monitoring Well Installation						$202,429
O&M COSTS						
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$49,732	$1,054,336
FBR Operation Cost	$13,972	$13,972	$13,972	$13,972	$13,972	$670,656
Monitoring - Treatment System	$447,384	$447,384	$447,384	$447,384	$447,384	$22,758,540
Groundwater Monitoring	$28,618	$28,618	$28,618	$28,618	$28,618	$1,570,091
PERIODIC COSTS						
Groundwater Monitoring Well Replacement						$809,715
Five-Year Reviews	$29,800					$268,202
Sub-Total	$541,149	$511,349	$511,349	$511,349	$539,706	$33,787,219
Contingency	$102,270	$102,270	$102,270	$102,270	$107,941	$6,595,422
Sub-Total	$643,419	$613,619	$613,619	$613,619	$647,647	$40,382,641
Discount Factor (Discount Rate 2.8 percent)	2.73E-01	2.66E-01	2.58E-01	2.51E-01	2.45E-01	--
Present Value	$175,718	$163,016	$158,575	$154,256	$158,376	$24,280,000 *

Notes:

* The costs are rounded off to nearest thounsands.

Table 11: Assumptions / Parameters for Cost Estimation of Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	Assumptions same as Alternative G1-2.
Institutional Controls Implementation	Assumptions same as Alternative G1-2.
Groundwater Extraction Wells Installation	1. RACER Technology Model Used: Groundwater Monitoring Well, User-Defined Costs, Off-site Transportation and Waste Disposal, and Professional Labor Management. 2. Number of extraction wells = 176 (Based on groundwater modeling) 3. Flow-rate for 167 source area wells = 0.3 gpm 4. Flow-rate for 9 downgradient wells = 2 gpm 5. Diameter of wells = 6 inches 6. Well material = PVC Sch. 80 7. Average depth of wells = 70 feet 8. Screen length = 20 feet 9. Drilling method = Hollow-Stem Auger 10. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 11. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Above-ground Treatment Compound and System Startup	1. RACER Technology Models Used: User-Defined Estimate 2. User-Defined estimate was used to estimate costs for equalization tanks, transfer pumps, flow meters, valves, and fluidized bed reactor. 3. Equalization tank = 12,000-gallon plastic storage tank 4. Number of equalization tanks = 1 5. Capital cost for fluidized bed reactor = $301,560 (Based on a quote)
O&M	
Institutional Controls Monitoring	1. Assumptions same as Alternative G1-2.
FBR Operation Cost	1. RACER Technology Models Used: User-Defined Estimate 2. FBR operation cost per year (including electron donor, carbon, and power) = $11,655 (based on a quote) 3. Total duration of operation = 49 years
Monitoring – Treatment System	1. RACER Technology Models Used: Monitoring 2. Total duration of O&M = 49 years 3. Includes costs for sampling extraction wells and treatment system. 4. Number of extraction wells sampled during each monitoring event= 176 5. Frequency of sampling of extraction wells during first 6 months of operation = Monthly 6. Frequency of sampling of extraction wells from 7th to 12th month = Quarterly 7. Frequency of sampling of extraction wells from 2nd to 49th year = Semi-Annually 8. Analysis of samples from extraction wells = Perchlorate 9. Frequency of sampling of treatment system for first month = Weekly 10. Frequency of sampling of treatment system from 2nd to 6th month = Monthly 11. Frequency of sampling of treatment system from 7th to 12th month = Quarterly 12. Frequency of sampling of treatment system from 2nd to 49th year = Quarterly 13. Number of samples of influent and effluent from the treatment system during each event = 4 14. Analyses for treatment system samples = Perchlorate, nitrate/nitrite, sulfate, pH, total organic carbon, VOCs, methane, ethene, and ethane.
Overall Perchlorate Extent Monitoring	Assumptions same as Alternative G1-2.

Cost Element	Key Assumptions / Parameters
PERIODIC COSTS	
Groundwater Monitoring Well Replacement	Assumptions same as Alternative G1-2.
Five-Year Reviews	Assumptions same as Alternative G1-2.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
37	**Timeframe[e]: 49 years**	**Section 2.8.1.1, Table 2-6**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix E, Section E4.5; Table E5-1; and Figure E4-5. AECOM. April 2011.

downgradient of the source area within the boundary of IRP Site 1 to treat relatively high concentrations of perchlorate. In the transport model, the initial concentration condition includes a plume upgradient from the PRB and a plume downgradient from the PRB, as shown on Figure E4-4. The PRB downgradient from the source area is assumed to reduce the perchlorate to the CG. Therefore, no migration of perchlorate downgradient of the source area above CG is assumed.

The simulation results, as shown on Figure E4-4, estimate that perchlorate at the IRP Site 1 source area would attenuate below 6 µg/L in approximate 93 years. The perchlorate-impacted groundwater downgradient of the source area PRB would continue to migrate downgradient towards Station boundary. The simulation results indicate that it would take more than 200 years for perchlorate downgradient of the source area to attenuate below 6 µg/L.The predicted maximum concentration of perchlorate that would reach the Station boundary is 35 µg/L. The predicted perchlorate distribution for years 5, 10, 15, and 20 are shown on Figure E4-4. The predicted time-frame for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-4 is presented in Table E4-1

E4.4 Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and Institutional Controls

Under Alternative G1-5, it is assumed that direct injection is used to remediate perchlorate in the source area and PRBs would be installed downgradient from the source area between IRP Sites 1 and 2, and near the Station boundary. The intermediate PRB between IRP Sites 1 and 2 is simulated near the location of Monitoring Wells 01-MW213 and 01-MW214.

It is assumed that perchlorate degradation via injection of an electron donor in the source area would be rapid and the concentrations are assumed to be reduced to the CG in up to five-years. Groundwater modeling results indicate that source area treatment using direct injection and a PRB in combination with natural attenuation processes would reduce perchlorate concentrations to less than 6 µg/L in approximately 19 years. The predicted perchlorate distribution for years 5 and 10 are shown on Figure E4-6.

E4.5 Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Alternative G1-6 would include installation of groundwater extraction wells in areas with perchlorate concentrations exceeding 6 µg/L. The initial condition is based on the current perchlorate distribution (Figure E4-7). Groundwater modeling results indicate that approximately 176 wells would be required to reduce perchlorate concentrations below 6 µg/L in 49 years. Sustainable extraction rates of 0.3 gallons per minute (gpm) per extraction well (total 167 wells) in the source area, and 2.0 gpm per well between IRP Site 1 and IRP Site 2 (9 wells) were assumed. The predicted perchlorate distribution for years 5, 10, 15, and 20 are shown on Figure E4-7.

The results for all simulations, including number of years for perchlorate-impacted groundwater dissipation below 6 µg/L, are summarized in Table E4-1.

Table E5-1 Modeling Results Summary

Alternative	Approximate Time for Reduction of Source Area to less than 6 µg/L (years)	Approximate Time for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L (years)	Relative Duration for Perchlorate-Impacted Groundwater to Attenuate Below 6 µg/L With Respect to Alternative G1-5[a]
Alternative G1-1: No Action,	NA	400[b]	26
Alternative G1-2: MNA and ICs	NA	400[b]	26
Alternative G1-3: In-Situ Bioremediation near the Station Boundary, Monitoring, and ICs	NA	400[b]	21
Alternative G1-4: In-Situ Bioremediation at the Source Area and near the Station Boundary using PRB Plus Monitoring and ICs	93[c]	367[d]	19.3
Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	--[e]	19[f]	1
Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs	--[g]	49 [b]	2.6

Notes:

[a] Relative duration was estimated by dividing the estimated time for perchlorate-impacted groundwater to attenuate below 6 µg/L under a particular remedial alternative by the estimated time required for perchlorate-impacted groundwater to attenuate below 6 µg/L under Alternative G1-5 (19 years). The groundwater modeling results indicate that of all remedial alternatives, Alternative G1-5 would take the shortest time to reduce perchlorate concentrations to less than 6 µg/L at and downgradient of IRP Site 1.

[b] Time required for remediation of the estimated extent of perchlorate-impacted groundwater at and downgradient of IRP Site 1 to concentrations less than 6 µg/L.

[c] The stated time duration for the source area remediation using a PRB. Under Alternative G1-4, source area may also be remediated using direct injection. If direct injection is used, the remediation time frame is expected to be much shorter; however, this time-frame was not estimated using groundwater modeling.

[d] Time required for natural attenuation of perchlorate-impacted groundwater downgradient from the source area at IRP Site 1 to concentrations less than 6 µg/L.

[e] Time required for remediation of the source area using direct injection was not simulated using groundwater modeling.

[f] Time required for remediation of perchlorate-impacted groundwater downgradient from the PRB (proposed near the location of Monitoring Wells 01-MW213 and 01-MW214) to concentrations less than 6 µg/L.

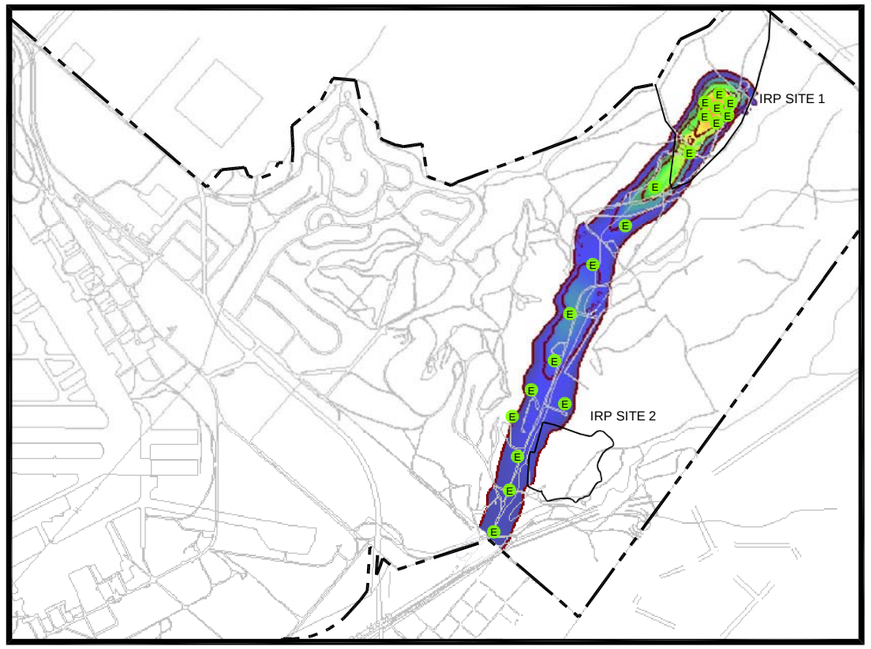
[g] Time required for remediation of perchlorate-impacted groundwater in the source area using direct injection was not separately estimated using groundwater modeling for Alternatives G1-6.

µg/L = micrograms per liter

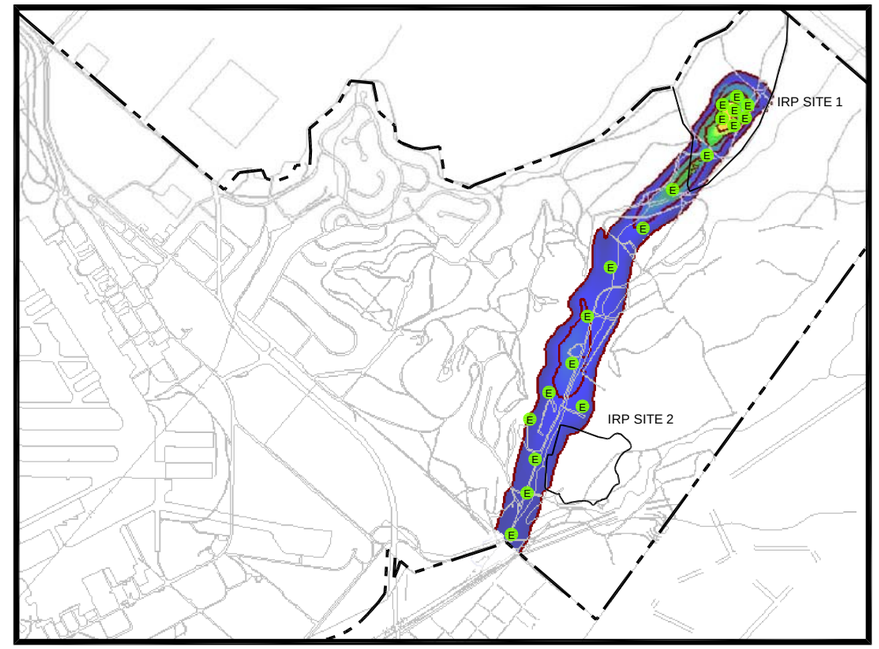
IC = institutional control

MNA = monitored natural attenuation

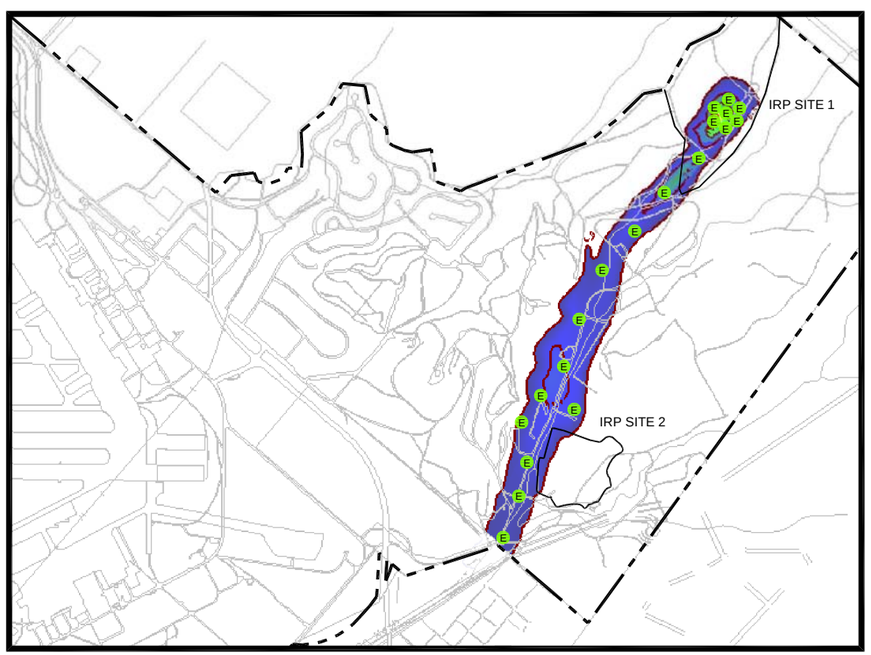
NA = not applicable



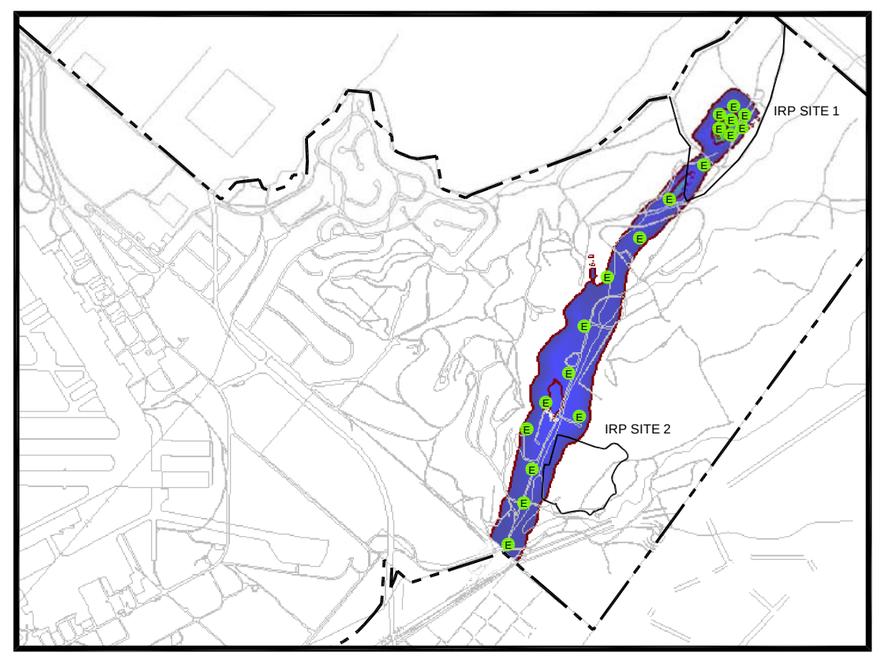
5 YEARS



10 YEARS



15 YEARS



20 YEARS

LEGEND:

- EXTRACTION WELLS (CONCEPTUAL LOCATION)
- FORMER MCAS EL TORO STATION BOUNDARY
- IRP SITE BOUNDARY

PERCHLORATE CONCENTRATIONS (µg/L)

300
100
50
25
6

NOTES:

1. THIS ALTERNATIVE WOULD INCLUDE INSTALLATION OF GROUNDWATER EXTRACTION WELLS ALONG THE ENTIRE AQUIFER INCLUDING THE SOURCE AREA AND THE AREA BETWEEN IRP SITE 1 AND IRP SITE 2 WITH PERCHLORATE CONCENTRATIONS GREATER THAN 6 µg/L.
2. MODELING RESULTS PRESENTED ARE BASED ON A SIMPLIFIED HYDROGEOLOGICAL MODEL FOR THE COMPARATIVE EVALUATION OF THE VARIOUS GROUNDWATER RESPONSE ALTERNATIVES. THESE RESULTS ARE NOT INTENDED TO BE USED AS PREDICTION OF REQUIRED RESTORATION DURATIONS.

µg/L MICROGRAMS PER LITER
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION

NORTH

0 1200 2400 FEET

APPROXIMATE SCALE: 1" = 2400'

Feasibility Study — Draft Final

Alternative G1-6:
Computed Perchlorate Concentrations

IRP Sites 1 & 2

Date: 09-10

Former MCAS El Toro

Project No. 95653

AECOM

Figure E4-5

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix E Figures\FIGURE E4-5.dwg Time: Sep 29, 2010 - 3:45pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
38	**remedial alternatives developed for IRP Site 2 VOC-impacted groundwater**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 5.2 and Figures 5-9 and 5-10. AECOM. April 2011.

Extracted groundwater would be treated using one of the two technologies described in the following subsections. Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation. ICs would be implemented until the time perchlorate is reduced to concentrations less than or equal to its CG as described in Section 5.1.2.1. The conceptual design of Alternative G1-6 is presented on Figure 5-6.

Some of the extraction wells under this alternative may be located in areas with MEC and/or naphthalene-impacted soil. Therefore, implementation of remedial actions using Alternative G1-6 may need to be coordinated with implementation of remedial actions for MEC and/or naphthalene-impacted soil. The nature of this coordination (if required) would be addressed during the Remedial Design/Remedial Action phase.

5.1.6.1 Ex-Situ Treatment with Fluidized Bed Reactor

Under this option, perchlorate in extracted groundwater would be treated using a fluidized bed reactor (FBR). The FBR is a reactor that fosters the growth of microorganisms on a hydraulically fluidized bed of media, usually sand or activated carbon. Perchlorate is used by bacteria as a terminal electron acceptor under anaerobic conditions, and is completely transformed into chloride, an innocuous end product. Field application of FBRs for perchlorate treatment usually consists of a cylindrical reactor with granular activated carbon (GAC) media, electron donor (ethanol, acetate etc.) feed system, nutrient feed system, and pH adjustment system (Guarini 2002).

5.1.6.2 Ex-Situ Treatment with Ion Exchange

Under this option, perchlorate in extracted groundwater would be treated using ion exchange resin (IX). IX is a physical/chemical process by which an ion on the solid phase (synthetic resin) is exchanged for an ion in the feed water. The synthetic resin is chosen to preferentially adsorb the particular COC. As water flows through the resin beds, ions with higher affinity (perchlorate) are collected by the resin and replace the chloride ions, which enter the water stream and become part of the effluent stream. Exhaustion occurs when entire surface of the resin beads has been filled by contaminant ions. At this point, the bed is either replaced or regenerated by rinsing the ion exchange column with a regenerant – a concentrated solution of ions initially exchanged from the resin.

5.1.6.3 Estimated Time Frames for Remediation

Groundwater modeling conducted in support of this FS indicates that assuming 176 extraction wells are installed capable of extracting groundwater at the rate of 0.3-gpm to 2 gpm, perchlorate concentrations would be reduced to less than its CG for the estimated extent of IRP Site 1 perchlorate-impacted groundwater in approximately 49 years (see Section 5.3 and Appendix E).

Since Alternative G1-6 is expected to require more than 5 years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of 5-year reviews. The 5-year reviews would include review of the collected data, interviews, and site-inspections to evaluate if the remedy remains protective of human-health and the environment.

5.2 VOC-Impacted Groundwater – IRP Site 2

Similar to perchlorate-impacted groundwater at IRP Site 1, the remedial action alternatives for VOC-impacted groundwater at IRP Site 2 were developed by combining different technologies and process options corresponding to different GRAs developed in Section 4.3 (see Figure 5-7). The target remediation area was also considered while developing the alternatives. This process resulted in the development of alternatives representing a range of treatment and containment combinations. The

following remedial alternatives were developed for perchlorate-impacted groundwater, two of which have options:

- Alternative G2-1: No Action
- Alternative G2-2: MNA and ICs
- Alternative G2-3: In-Plume Treatment, Monitoring, and ICs
- Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

Each of these alternatives is described in detail in the following sections.

5.2.1 Alternative G2-1: No Action

The NCP (40 CFR 300.430[e][6]) requires that a "no action" alternative (Alternative G2-1) be evaluated to provide a baseline condition if no remedial action is taken. Under Alternative G2-1, no ICs, containment, removal, disposal, in-situ treatment, or ex-situ treatment of the VOC-impacted groundwater are provided to reduce potential risks to human-health or the environment. Alternative G2-1 provides no monitoring, treatment, or remediation for groundwater. Under Alternative G2-1, COCs would continue to have the potential to migrate in the groundwater. Natural processes would be the only mechanism acting to reduce the concentrations of COCs in groundwater; however, these mechanisms would not be monitored under this alternative.

5.2.2 Alternative G2-2: Monitored Natural Attenuation and Institutional Controls

The U.S. EPA's definition of MNA is presented in Section 5.1.2. Alternative G2-2 would rely on natural attenuation processes and monitoring for remediation of IRP Site 2 VOC-impacted groundwater. Based on the methodology presented in the *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (U.S. EPA 1998), inadequate evidence exists to confirm anaerobic biodegradation of VOCs (primarily TCE) is occurring (Earth Tech 2004b). However, the consistent presence of cis-1,2-DCE in wells with elevated TCE concentrations indicates that some biodegradation may have occurred within the TCE impacted groundwater.

Since the extent of the TCE-impacted groundwater has remained relatively stable and the concentrations of TCE have decreased over time it appears that the TCE-impacted groundwater is contained to a relatively small area within IRP Site 2 and is slowly naturally attenuating. In addition to anaerobic biodegradation, natural attenuation processes, such as dispersion, dilution, sorption, and volatilization, may be contributing to the containment and slow reduction of the TCE-impacted groundwater.

The historic concentrations of PCE show that the extent of the PCE-impacted groundwater and concentrations have declined over time. Similar to the TCE-impacted groundwater, natural attenuation processes, such as dispersion, dilution, sorption, and volatilization, may be contributing to the containment and slow reduction of the PCE-impacted groundwater. As indicated in the Contaminant Distribution in Groundwater & Microcosm Study Findings (ECS 2005), reductive dechlorination is not an active natural attenuation process; the impacted groundwater has remained stable and dilution is the primary concentration reduction mechanism.

Groundwater modeling conducted in support of this FS indicates that it would take more than 32 years for TCE to dissipate to less than its MCL of 5 μg/L in IRP Site 2 groundwater using Alternative G2-2 (see Section 5.4 and Appendix F).

U.S. EPA guidance on MNA (U.S. EPA 1999c) recommends the identification of a contingency remedy. The contingency remedy is a cleanup technology or approach that functions as a backup

remedy if MNA fails to perform as anticipated. If MNA is selected as the remedy for IRP Site 2 VOC-impacted groundwater, the protectiveness of the remedy will be evaluated as part of the 5-year review and as data from monitoring are collected. If this evaluation concludes that the selected remedy is not protective (e.g., a consistent exceedence of the MCLs for the COCs at the point of compliance or a documented unacceptable risk to human-health or the environment), an evaluation of the application of a contingency remedy will be conducted. In accordance with the U.S. EPA guidance, the details of the contingency remedy will be presented in the site remedy decision document if Alternative G2-2 is selected as the final remedy.

ICs would be implemented as part of Alternative G2-2 to attain the RAOs. ICs would include non-engineered mechanisms established to limit potential human exposure to VOC-impacted groundwater until concentrations of COCs are reduced to less than their respective CGs.

The following sections discuss the implementation mechanisms for ICs and potential groundwater use restrictions for VOC-impacted groundwater. A detailed discussion of implementation mechanisms for ICs and groundwater use restrictions will be presented in the Land-Use Control Remedial Design if Alternative G2-2 is selected as the final remedy for IRP Site 2 VOC-impacted groundwater.

The tentative boundaries of the ARICs based on the current extent of groundwater impacted with COCs are presented on Figure 5-8. The final boundaries of ARICs will be presented in the Land-Use Control Remedial Design.

5.2.2.1 IMPLEMENTATION MECHANISMS

The DON in consultation with other FFA signatories, would implement and enforce ICs to minimize the potential for existing and future use of IRP Site 2 VOC-impacted groundwater in a manner that presents unacceptable risk, protect the remedial system components such as monitoring wells, and to allow for potential future monitoring and maintenance activities by DON and oversight of those activities by the FFA signatories.

The mechanisms for implementation of ICs for impacted groundwater at IRP Site 2 are the same as those for IRP Site 1 perchlorate-impacted groundwater and are discussed in Section 5.1.2.1.

5.2.2.2 LAND-USE RESTRICTIONS

The ARICs for IRP Site 2 VOC-impacted groundwater currently or in future may consist of the following (see Figure 5-8):

- Property currently owned by FAA
- Leased property consisting of Carve-outs II-V and II-F
- Off-Station property

The land-use restrictions pertaining to each of these are discussed in the following sections.

Property Owned by FAA

The major portion of property overlying VOC-impacted groundwater at IRP Site 1 is owned by the FAA. The DON transferred this property to the FAA in accordance with the MOU finalized on 3 December 2001. The discussion of ICs included in the MOU for this property is presented in Section 5.1.2.2.

Leased Property

Portion of VOC-impacted groundwater presently or may in future be overlain by Carve-outs II-V and/or II-F (Figure 5-8). Carve-outs II-V and II-F are portions of former MCAS El Toro that were leased in 2005 to Heritage Fields, LLC (Orange County Great Park Corporation and Lennar Corporation), a private developer. The interim land-use restrictions pertaining to Carve-outs II-V and II-F are incorporated in the LIFOC and are discussed in detail in Section 5.1.2.2. These interim land-use restrictions will be in effect, until the time Carve-outs II-V and II-F are conveyed by deed to the Lessee.

Following transfer of the leased property, ICs would be implemented using the mechanisms discussed in Section 5.1.2.1 to protect of human-health and the environment. These ICs would achieve the objectives and would contain restrictions discussed under subsection "IRP Site 1 Property" in Section 5.1.2.2.

Off-Station Property

ICs would be implemented to provide protection of human-health for the potential off-Station receptors. The ICs for the off-Station portion of the aquifer would likely be based on local permit programs administered by the OCHCA and OCWD. The details of these ICs will be presented in the ROD and/or remedial design/remedial action work plan.

5.2.3 Alternative G2-3: In-Plume Treatment, Monitoring, and ICs

Alternative G2-3 would include active remediation of the hot-spot defined by relatively elevated concentrations of TCE (exceeding 40 µg/L) in groundwater. Based on the recent groundwater monitoring results, this area is limited to a small area centered around the former location of Well 02DGMW60 (see Figure 3-8).

The hot-spot treatment option would treat relatively elevated concentrations of VOCs including TCE and would minimize the downgradient migration. The hot-spot treatment option would be implemented using in-situ bioremediation, in-situ chemical oxidation (ISCO), or in-situ chemical reduction using ZVI, as summarized in the subsections below.

Groundwater monitoring would be conducted to evaluate the effectiveness of active remediation technologies to treat VOCs, and to track the distribution of COCs in the area between the Source Area and the Station Boundary, and beyond due to natural attenuation processes.

Alternative G2-3 would also include implementation of ICs to attain the RAOs. ICs would be implemented as part of Alternative G2-3 to minimize exposure of potential receptors to VOC-impacted groundwater until the concentrations of COCs are reduced below their respective CGs. The implementation of ICs for Alternative G2-3 would be as described in Section 5.1.2.1.

The hot-spot area can be actively treated to remove a major portion of the mass of contaminants present in the subsurface. Natural attenuation processes may be able to reduce the residual concentrations of the COCs below their respective CGs. The hot-spot treatment can be performed using the technologies described in the following sections.

The conceptual design for Alternative G2-3 is presented on Figure 5-9.

5.2.3.1 IN-SITU BIOREMEDIATION

Most COCs (TCE, PCE, and cis-1,2-DCE) in IRP Site 2 groundwater are readily amenable to anaerobic biodegradation; therefore, implementation of bioremediation may include injection of

electron donor/organic substrate and specific strains of microorganisms (if required) into the subsurface to create a biologically active zone. The injection would be implemented using direct-push technology, groundwater wells, or other specialized technology (hydraulic or pneumatic fracturing) to cover the lateral extent of relatively elevated concentrations of TCE (above 40 μg/L). An alternative strategy for emplacement of bioremediation amendments is through groundwater recirculation using injection and extraction wells. The extracted groundwater is treated to reduce TCE concentrations to less than 5 μg/L and is then amended with bioremediation amendments aboveground and reinjected into the aquifer using injection wells.

The pilot tests conducted in the IRP Site 2 area have indicated that injection of substrate under pressure using wells and hydraulic fracturing are effective in distribution of bioremediation substrate into the saturate bedrock/alluvium (AECOM and ECS 2010). The substrate injected may include slow-release substrate such as EOS® or EHC®, or soluble carbon substrates such as molasses or lactate. The nature of substrate and substrate injection strategy would be ascertained during the design phase.

The pilot studies in IRP Site 2 area have shown that the addition of substrate would stimulate indigenous microorganisms to grow and multiply by using injected substrate as carbon and an energy source. In this process, the DO and other terminal electron acceptors (e.g., nitrate and sulfate) are depleted, and the ORP of groundwater is lowered, thereby stimulating conditions conducive to anaerobic degradation processes. The VOCs reported in IRP Site 2 groundwater including PCE, TCE, and cis-1,2-DCE are amenable to direct anaerobic reductive dechlorination. The pilot studies have shown that complete biological reductive dechlorination of TCE to ethene/ethane is possible at IRP Site 2. However, repeated injections of bioremediation substrate may be required to develop and sustain highly-reducing conditions conducive of complete reductive dechlorination of TCE.

Monitoring would be conducted to evaluate the performance of in-situ bioremediation using existing and/or newly-installed monitoring wells/piezometers. The monitoring would include collection of groundwater samples from wells and analyses of these samples for COCs. In addition, groundwater monitoring may also be conducted for process parameters such as TOC, DO, ORP, nitrate, sulfate, and pH.

5.2.3.2 IN-SITU CHEMICAL OXIDATION

The implementation of ISCO at the IRP Site 2 groundwater hot-spot would include injection of chemical reagent/oxidant into the subsurface using direct-push technology, groundwater wells, or other specialized technology to cover the lateral extent of relatively elevated concentrations of TCE (above 40 μg/L). The injected oxidant would oxidize the COCs into innocuous products such as carbon dioxide and water. The commonly used chemical oxidants include hydrogen peroxide, potassium/sodium permanganate, and sodium persulfate. The selection of chemical oxidant would be made during the remedial design stage and would be such that it is capable of oxidizing the COCs in shallow groundwater requiring treatment.

Monitoring would be conducted to evaluate the performance of ISCO using existing and/or newly-installed monitoring wells/piezometers. The monitoring would include collection of groundwater samples from wells and analyses of these samples for COCs. In addition, groundwater monitoring may also be conducted for process parameters such as DO, ORP, and pH.

5.2.3.3 IN-SITU CHEMICAL REDUCTION USING ZERO-VALENT IRON INJECTION

The implementation of in-situ chemical reduction at the IRP Site 2 groundwater hot-spot would include injection of ZVI into the subsurface using direct-push technology, or other specialized

technology to cover the lateral extent of relatively elevated concentrations of TCE (above 40 μg/L). ZVI is expected to be effective in treating chlorinated COCs present in the hot-spots such as TCE, and cis-DCE through chemical reduction to potentially non-toxic products such as ethene, ethane, and chloride. An advanced type of ZVI, nano-scale zero-valent iron (NZVI), can also be used as an in-situ chemical reduction reagent.

Monitoring would be conducted to evaluate the performance of the Source Area treatment using existing and/or newly-installed monitoring wells/piezometers. The monitoring would include collection of groundwater samples from wells in the Source Area and analyses of these samples for VOCs. In addition, groundwater monitoring would also be conducted for process parameters such as DO, ORP, and pH.

5.2.3.4 Estimated Time Frames for Remediation

Groundwater modeling conducted in support of this FS indicates that it would take approximately 29 years for TCE to dissipate to less than its MCL of 5 μg/L in IRP Site 2 groundwater using Alternative G2-3 (see Section 5.4 and Appendix F).

Since Alternative G2-3 is expected to require more than 5 years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of 5-year reviews. The 5-year reviews would include review of the collected data, interviews, and site-inspections to evaluate if the remedy remains protective of human-health and the environment.

5.2.4 Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

This alternative would involve installation of groundwater extraction wells to extract and hydraulically contain the VOC-impacted groundwater. Based on the capture zone evaluation conducted during the long-term aquifer test, three extraction wells placed within the TCE-impacted groundwater would effectively contain the impacted groundwater (Earth Tech 2006b). Extracted groundwater would be treated using appropriate treatment technology such as GAC or air stripping. Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation.

ICs would be implemented until the time COCs are reduced to concentrations less than or equal to their respective CGs as described in Section 5.1.2.

Groundwater modeling conducted in support of this FS indicates that it would take approximately 21 years for TCE to dissipate to less than its MCL of 5 μg/L in IRP Site 2 groundwater using Alternative G2-4 (see Section 5.4 and Appendix F).

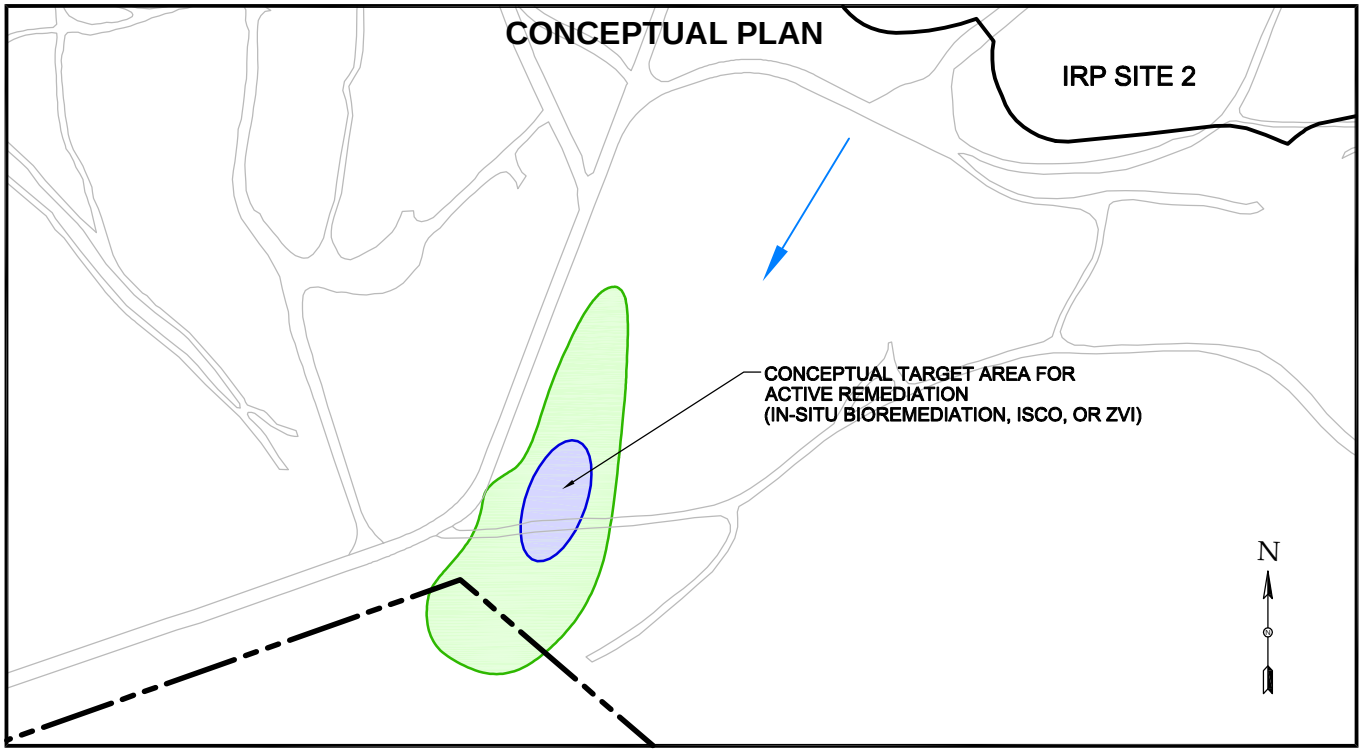
Since Alternative G2-4 is expected to require more than 5 years to achieve the RAOs, the protectiveness of the remedy will be evaluated as part of 5-year reviews. The 5-year reviews would include review of the collected data, interviews, and site-inspections to evaluate if the remedy remains protective of human-health and the environment.

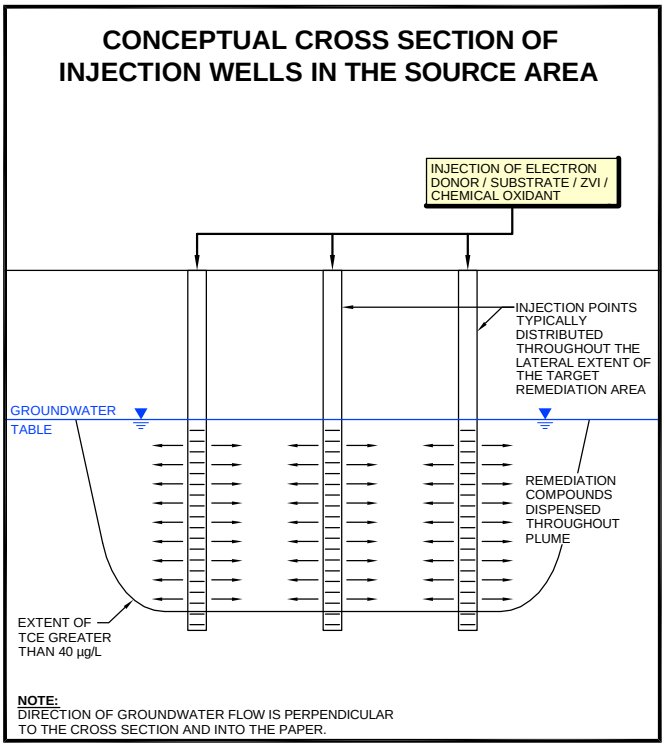
The conceptual design for Alternative G2-4 is presented on Figure 5-10.

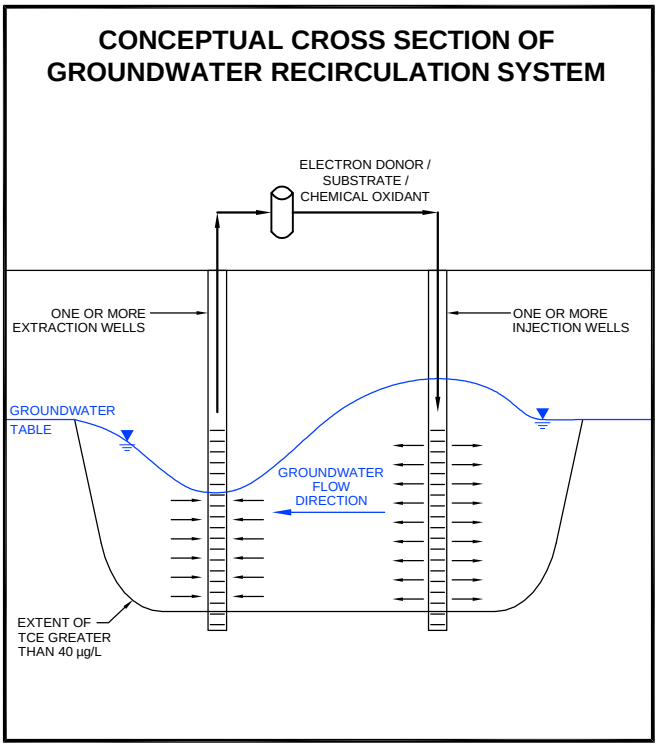
5.3 Groundwater Modeling Results Summary

5.3.1 IRP Site 1

A flow and transport model was developed to evaluate the remedial alternatives for perchlorate-impacted groundwater (see Appendix E). The United States Geological Survey's (USGS') Modular Three-dimensional Finite-difference Groundwater Flow Model (MODFLOW), a finite-difference







ALTERNATIVE IN-SITU BIOREMEDIATION/ISCO/ZVI DESIGN CONFIGURATIONS

LEGEND:

- CONCEPTUAL EXTENT OF TCE GREATER THAN 40 µg/L
- CONCEPTUAL EXTENT OF COCs EXCEEDING TCGs
- GENERAL GROUNDWATER FLOW DIRECTION

NOTES:

µg/L	MICROGRAMS PER LITER
COCs	CONTAMINANTS OF CONCERN
IC	INSTITUTIONAL CONTROL
ISCO	IN-SITU CHEMICAL OXIDATION
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE
TCGs	TARGET CLEANUP GOALS
ZVI	ZERO-VALENT IRON

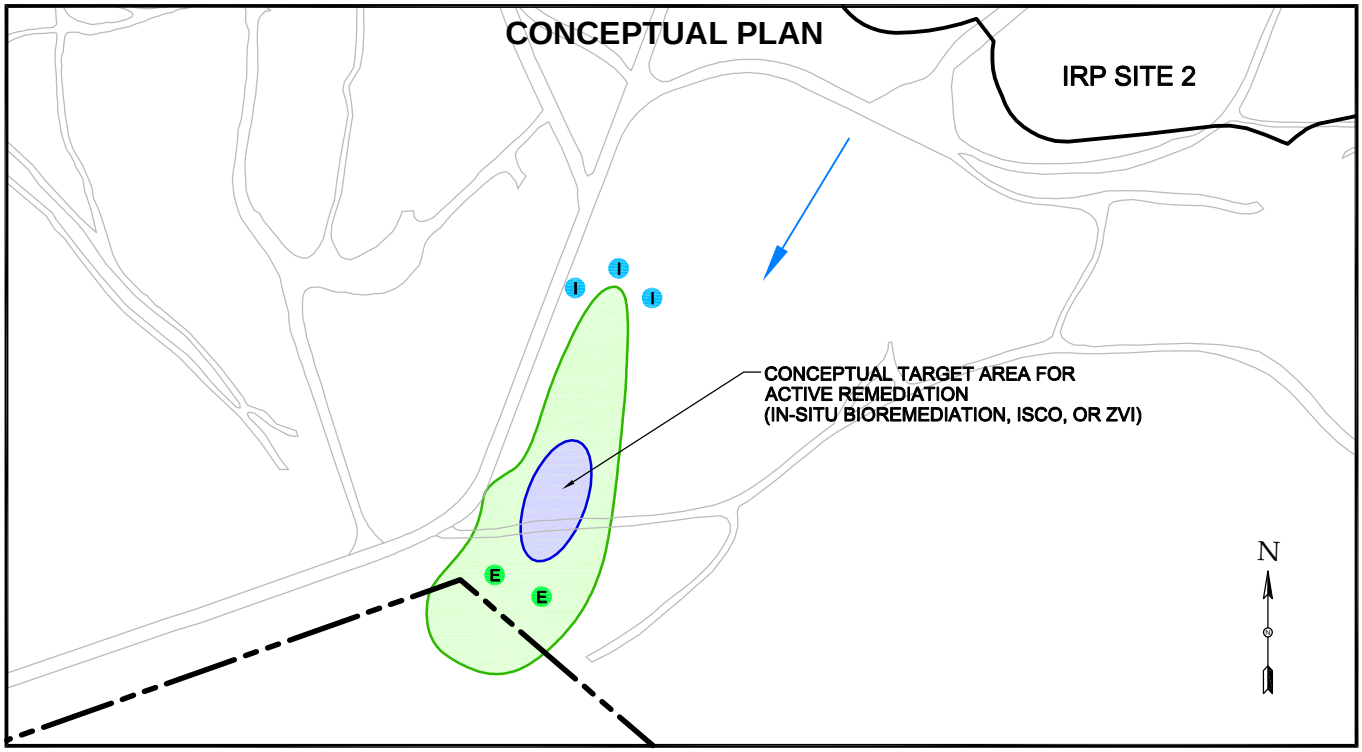
Feasibility Study — Draft Final

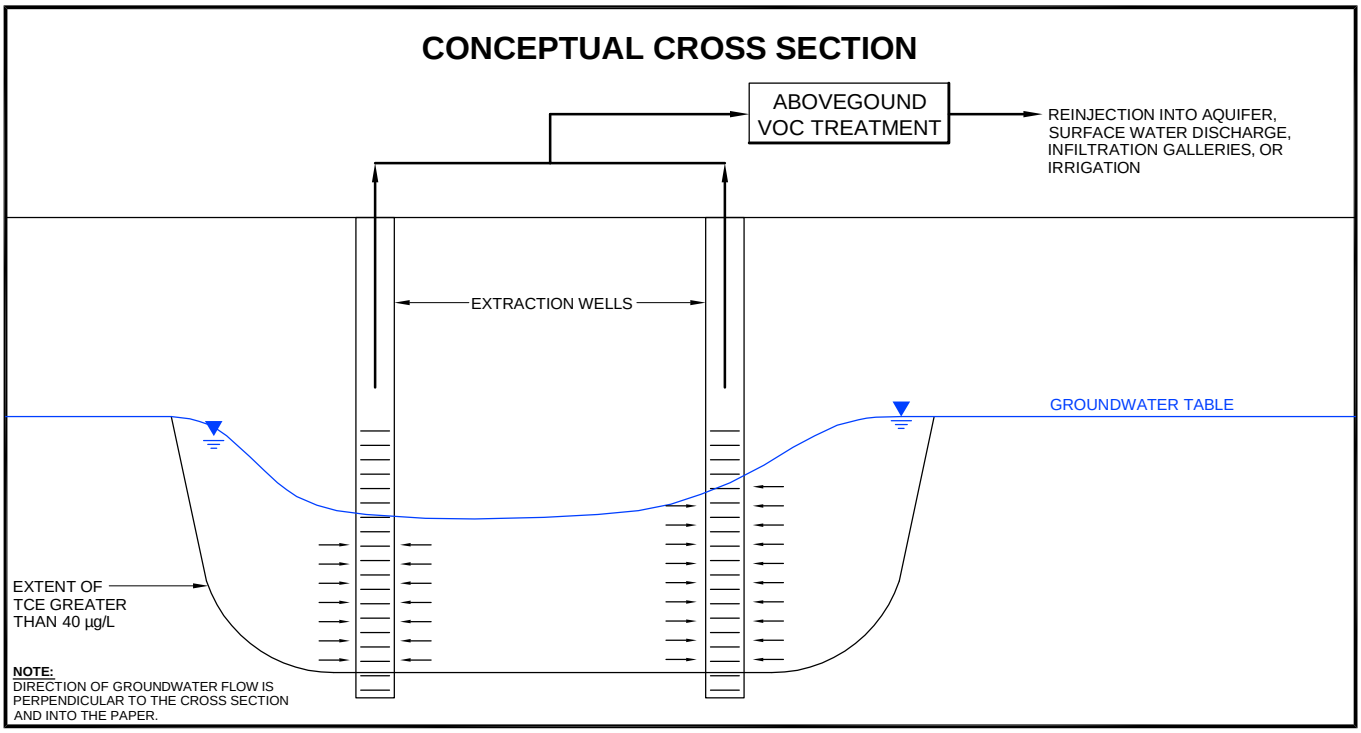
Conceptual Design: Alternative G2-3
In Plume Treatment Monitoring and ICs

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-9

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-9.dwg Time: Sep 27, 2010 - 4:32pm





LEGEND:

- E — EXTRACTION WELL CONCEPTUAL LOCATION FOR EVALUATION ONLY. FINAL LOCATION TO BE DETERMINED IN THE REMEDIAL DESIGN.
- I — INJECTION WELL CONCEPTUAL LOCATION FOR EVALUATION ONLY. FINAL LOCATION TO BE DETERMINED IN THE REMEDIAL DESIGN.
- CONCEPTUAL EXTENT OF TCE GREATER THAN 40 µg/L
- CONCEPTUAL EXTENT OF COCs EXCEEDING TCGs
- GENERAL GROUNDWATER FLOW DIRECTION

NOTES:

µg/L	MICROGRAMS PER LITER
COCs	CONTAMINANTS OF CONCERN
IC	INSTITUTIONAL CONTROL
ISCO	IN-SITU CHEMICAL OXIDATION
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE
TCGs	TARGET CLEANUP GOALS
ZVI	ZERO-VALENT IRON
VOC	VOLATILE ORGANIC COMPOUND

Feasibility Study — Draft Final

Conceptual Design: Alternative G2-4
Hydraulic Containment/Treatment, Monitoring, and ICs

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-10

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-10.dwg Time: Sep 30, 2010 – 3:30pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
39	**Present Worth Cost[d]: $1,755,000**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.2.1; and Tables 12 and 13. AECOM. April 2011.

3.2.1 Alternative G2-2: Monitored Natural Attenuation and Institutional Controls

Alternative G2-2 consists of natural attenuation monitoring and institutional controls to attain the RAOs for VOC-impacted groundwater are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce concentrations of constituents of concern (COCs) in groundwater. Monitoring would also assess migration of COCs off-Station at concentrations exceeding their respective CGs.

Institutional controls under Alternative G-2 would include non-engineered controls to limit human exposure to VOC-impacted groundwater. Restrictions on future groundwater use would be to protect potential on-site and off-site receptors, and protect the MNA system components. Alternative G2-2 would include five-year reviews to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G2-2 are presented in Table 12. Table 13 presents the assumptions and parameters used for Alternative G2-2 cost estimate.

3.2.2 Alternative G2-3: In-Plume Treatment, Monitoring, and ICs

Alternative G2-3 would include active remediation of the hot-spot defined by relatively high concentrations of TCE (above 40 µg/L) in groundwater. Active remediation of hot-spot would treat relatively high concentrations of VOCs including TCE and minimize their downgradient migration. Active remediation of hot-spot may be implemented using in-situ bioremediation, ISCO, or in-situ chemical reduction using ZVI.

For cost estimating purposes, it is assumed that hot-spot remediation would be conducted using in-situ bioremediation. As part of in-situ bioremediation implementation, substrate would be injected into the hot-spot area using hydraulic fracturing.

Groundwater monitoring would be conducted to evaluate the effectiveness of active remediation technology to treat VOCs, and to assess the distribution of COCs in the area between the source area and the Station boundary, and beyond due to natural attenuation processes.

To attain the RAOs, Alternative G2-3 would also include implementation of ICs. ICs would be implemented as part of Alternative G2-3 to limit exposure of potential receptors to COC-impacted groundwater until the concentrations of COCs are reduced below their respective CGs.

Alternative G2-3 would include five-year reviews to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G2-3 are presented in Table 14. Table 15 presents the assumptions and parameters used for Alternative G2-3 cost estimate.

3.2.3 Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

This alternative would involve installation of groundwater extraction wells to extract and capture the COC-impacted groundwater. Based on the capture zone evaluation conducted during the long-term aquifer test, three extraction wells would effectively capture the VOC-impacted groundwater. The extracted groundwater would be treated using appropriate treatment technology such as granular activated carbon or air stripping. Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation.

Table 12: Estimated Costs for Alternative G2-2

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020	Calendar Year 10 2021
CAPITAL COSTS										
Remedial Design	$10,000									
Institutional Controls Planning Documents (Capital)	$30,650									
Institutional Controls Implementation (Capital)		$73,852								
Groundwater Monitoring Well Installation (Capital)		$96,404								
O&M COSTS										
Institutional Controls Monitoring (O&M)			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Overall COC Extent Monitoring (O&M)			$73,864	$36,932	$36,932	$36,932	$36,932	$19,410	$19,410	$19,410
PERIODIC COSTS										
Groundwater Monitoring Well Replacement (Periodic)										
Five-Year Reviews (Periodic)						$29,800				
Sub-Total	$40,650	$170,256	$95,238	$58,307	$58,307	$88,107	$58,307	$40,785	$40,785	$40,785
Contingency		$19,281	$19,048	$11,661	$11,661	$11,661	$11,661	$8,157	$8,157	$8,157
Sub-Total	$40,650	$189,537	$114,286	$69,968	$69,968	$99,768	$69,968	$48,941	$48,941	$48,941
Discount Factor (Discount Rate 2.8 percent)	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01	7.38E-01
Present Value	$38,466	$174,467	$102,334	$60,944	$59,284	$82,232	$56,099	$38,171	$37,132	$36,120

Table 12: Estimated Costs for Alternative G2-2

Phase Name	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS								
Remedial Design								
Institutional Controls Planning Documents (Capital)								
Institutional Controls Implementation (Capital)								
Groundwater Monitoring Well Installation (Capital)								
O&M COSTS								
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Overall COC Extent Monitoring (O&M)	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410
PERIODIC COSTS								
Groundwater Monitoring Well Replacement (Periodic)	$182,836							
Five-Year Reviews (Periodic)	$29,800					$29,800		
Sub-Total	$253,421	$40,785	$40,785	$40,785	$40,785	$70,585	$40,785	$40,785
Contingency	$44,724	$8,157	$8,157	$8,157	$8,157	$8,157	$8,157	$8,157
Sub-Total	$298,145	$48,941	$48,941	$48,941	$48,941	$78,742	$48,941	$48,941
Discount Factor (Discount Rate 2.8 percent)	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$214,047	$34,180	$33,249	$32,343	$31,462	$49,240	$29,771	$28,961

Table 12: Estimated Costs for Alternative G2-2

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Calendar Year 21 2032	Calendar Year 22 2033	Calendar Year 23 2034	Calendar Year 24 2035	Calendar Year 25 2036
CAPITAL COSTS							
Remedial Design							
Institutional Controls Planning Documents (Capital)							
Institutional Controls Implementation (Capital)							
Groundwater Monitoring Well Installation (Capital)							
O&M COSTS							
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Overall COC Extent Monitoring (O&M)	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410
PERIODIC COSTS							
Groundwater Monitoring Well Replacement (Periodic)			$182,836				
Five-Year Reviews (Periodic)			$29,800				
Sub-Total	$40,785	$40,785	$253,421	$40,785	$40,785	$40,785	$40,785
Contingency	$8,157	$8,157	$44,724	$8,157	$8,157	$8,157	$8,157
Sub-Total	$48,941	$48,941	$298,145	$48,941	$48,941	$48,941	$48,941
Discount Factor (Discount Rate 2.8 percent)	5.76E-01	5.60E-01	5.45E-01	5.30E-01	5.15E-01	5.01E-01	4.88E-01
Present Value	$28,172	$27,404	$162,397	$25,932	$25,226	$24,539	$23,870

Table 12: Estimated Costs for Alternative G2-2

Phase Name	Calendar Year 26 2037	Calendar Year 27 2038	Calendar Year 28 2039	Calendar Year 29 2040	Calendar Year 30 2041	Calendar Year 31 2042	Calendar Year 32 2043	Calendar Year 33 2044	Row Total
CAPITAL COSTS									
Remedial Design									$10,000
Institutional Controls Planning Documents (Capital)									$30,650
Institutional Controls Implementation (Capital)									$73,852
Groundwater Monitoring Well Installation (Capital)									$96,404
O&M COSTS									
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$49,732	$690,968
Overall COC Extent Monitoring (O&M)	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$726,251
PERIODIC COSTS									
Groundwater Monitoring Well Replacement (Periodic)						$182,836			$548,508
Five-Year Reviews (Periodic)	$29,800					$29,800			$178,801
Sub-Total	$70,585	$40,785	$40,785	$40,785	$40,785	$253,421	$40,785	$69,142	$2,355,434
Contingency	$8,157	$8,157	$8,157	$8,157	$8,157	$44,724	$8,157	$13,828	$412,426
Sub-Total	$78,742	$48,941	$48,941	$48,941	$48,941	$298,145	$48,941	$82,970	$2,767,861
Discount Factor (Discount Rate 2.8 percent)	4.74E-01	4.62E-01	4.49E-01	4.37E-01	4.25E-01	4.13E-01	4.02E-01	3.91E-01	--
Present Value	$37,359	$22,588	$21,972	$21,374	$20,792	$123,210	$19,675	$32,446	$1,755,000 *

Notes:

* The costs are rounded off to nearest thounsands.

Table 13: Assumptions / Parameters for Cost Estimation of Alternative G2-2: Monitored Natural Attenuation and Institutional Controls

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	1. RACER Technology Model Used: Administrative Land Use Controls 2. Includes costs for planning documents and meetings for Land Use Control Plan and accompanying site maps.
Institutional Controls Implementation	1. RACER Technology Model Used: Administrative Land Use Controls 2. Includes costs for preparation of legal documents, and access control signs.
Groundwater Monitoring Well Installation	1. RACER Technology Model Used: Groundwater Monitoring Well 2. Number of monitoring wells assumed for additional assessment of perchlorate migration and natural attenuation: 5 3. Depth to groundwater: 60 feet 4. Average well depth: 80 feet 5. Drilling method: Hollow-stem Auger 6. Well diameter: 4-inch 7. Well construction material: PVC Schedule 40 8. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 9. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
O&M	
Groundwater Monitoring	1. RACER Technology Model Used: Monitoring 2. Total duration of monitoring: 32 years 3. Number of monitoring wells sampled during each event: 10 4. Frequency of monitoring for first year: Quarterly 5. Frequency of monitoring for second to fifth year = Semi-Annually 6. Frequency of monitoring for sixth to 32nd year = Annually 7. Average Sample Depth = 70 feet 8. Analyses = Perchlorate, VOCs, nitrate/nitrite, sulfate, pH, DO/ORP, total acidity/alkalinity, methane, ethene, and ethane
Institutional Controls Monitoring	1. RACER Technology Model Used: Administrative Land Use Controls 2. Includes costs for monitoring and enforcement, and modification/termination. 3. Frequency of inspection = Annual
PERIODIC COSTS	
Groundwater Monitoring Well Replacement	1. RACER Technology Model Used: Groundwater Monitoring Well 2. Monitoring wells assumed to be replaced every 10 years. 3. Number of monitoring wells replaced during each event: 10 4. Depth to groundwater: 60 feet 5. Average well depth: 80 feet 6. Drilling method: Hollow-stem Auger 7. Well diameter: 4-inch 8. Well construction material: PVC Schedule 40 9. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 10. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Five-Year Reviews	1. RACER Technology Model Used = Five-year review 2. Reviews assumed to occur every five years. 3. Tasks included = Document review, interviews, site inspection, and reports.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
40	**Timeframe[e]: 30 years**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix F, Section F3, pages F3-1 and F3-2; Table F3-1; and Figures F3-4 through F3-6. AECOM. April 2011.

This appendix presents updated results of groundwater flow and transport models developed as part of the FS Addendum (Earth Tech 2005) to evaluate remedial alternatives for VOC-impacted groundwater at IRP Site 2. Both flow and transport model assumptions and input parameter values used during the FS Addendum (Earth Tech 2005) are assumed to be still valid. The detailed descriptions for model development and calibration are presented in Section F2. Updated transport simulations were performed with current TCE-impacted groundwater configuration, which are based on groundwater sampling results between 2007 and 2009.

Five remedial alternatives are proposed in this FS for IRP Site 2 groundwater. Detailed description for each alternative is presented in Section 4 of the main text of the FS.

First-order decay rate of 0.0967/year was calculated using historical TCE concentrations in well 02DGMW60. This rate may result from the effect of all or some of the following processes: advection, dispersion, diffusion, biodegradation, etc. However, in the following simulations, this rate is assumed to be the sole result of biodegradation.

A review of the literature by Wiedemier et al. (1996) reported the first-order degradation rate for TCE ranges from 0.6935/year to 97.82/year. The biodegradation rate of 97.82/year is considered to be very high and not a realistic biodegradation rate at Site 2. Therefore, for sensitivity analysis, three different rates were used for each alternative: the calculated rate of 0.0967/year, the minimum published rate of 0.6935/year, and 6.935/year (one-order magnitude higher than the minimum published rate). Therefore, for comparison purposes, three scenarios were simulated for each alternative, using the calculated first-order biodegradation rate for IRP Site 2 (0.0967/year), the lowest rate published in the literature (0.6935/year), and a rate of one order magnitude higher than the lowest published rate (6.935/year).

The following is a description of each model scenario and a summary of the results. A summary of the scenarios is also presented in Table F3-1. The estimated size and concentrations of the TCE-impacted groundwater using the calculated first-order biodegradation rate for IRP Site 2 (0.0967/year) is graphically shown in Figures F3-1 through F3-15. Due to the number of figures, additional figures showing the other biodegradation rates were not prepared. The figures show the relative difference between each scenario for comparison purposes only. Other scenarios would show a relatively similar changes, although, due to the higher biodegradation rate the impacted groundwater would decrease at a more rapid rate, as shown in Table F3-1.

- **Baseline**

  A baseline scenario was simulated with no biodegradation for comparison purpose. The only processes that would influence the fate and transport of the TCE-impacted groundwater are advection, dispersion, diffusion, and sorption. In this scenario, it will take more than 50 years for the TCE-impacted groundwater to dissipate to MCL. The predicted plumes of 5, 10, 20 years are shown in Figures F3-1, F3-2, and F3-3. No significant change is found for baseline scenario.

- **Alternative G2-1 -** No action, **and Alternative G2-2**: Monitored Natural Attenuation and Institutional Controls

  No active remedial action will be involved in these two alternatives. Processes that would influence the fate and transport of the TCE plume are advection, dispersion, diffusion, sorption, and biodegradation. The model predicts the TCE plume will dissipate to the MCL

in approximately 32 years. The predicted plumes of 5, 10, 20 years are shown in Figures F3-4, F3-5, and F3-6.

- **Alternative G2-3** - In-Plume Treatment, Monitoring, and ICs

  In this scenario the TCE "hot spot" will be treated using one of the technologies described in Section 5.2 of the main text of the FS. Following treatment the TCE plume will be monitored under natural attenuation processes. The initial concentrations used in this simulation were assumed to be below 40 μg/L (reduced due to hot spot treatment). The model predicts the TCE plume will dissipate to the MCL in approximately 29 years. The predicted plumes of 5, 10, 20 years are shown in Figures F3-7, F3-8, and F3-9 respectively.

  Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs.

  This alternative consists of active groundwater extraction, treatment and injection to achieve groundwater containment/treatment. It is assumed that three pumping wells will be installed down-gradient of the TCE plume, and five injection wells will be located up-gradient of the TCE plume. The pumping rate and injections rates were assumed to be 0.3 gallon per minute in the simulation. The model predicts the TCE plume will dissipate to the MCL in approximately 21 years. The pathline simulation is presented in Figure F3-10. The predicted plume after 5, 10, 20 years of implementing this remedy are shown in Figures F3-11, F3-12, and F3-13.

F3.1 UNCERTAINTIES OF MODEL ASSUMPTION AS A PREDICTIVE TOOL

There are potential errors resulting from the assumptions listed in subsection F2.4. Also limitations inherent in any model of the subsurface are applicable. Conceptualization and simplification of the subsurface may result in some discrepancy between predicted and actual results.

Table F2-1 Calibration Statistics

Description	Results
Number of Wells	41
Number of Observations	535
Mean Absolute Residual (feet)	5.15
Root Mean Square of Residuals	6.78
Relative Error[1] (percent)	1.69

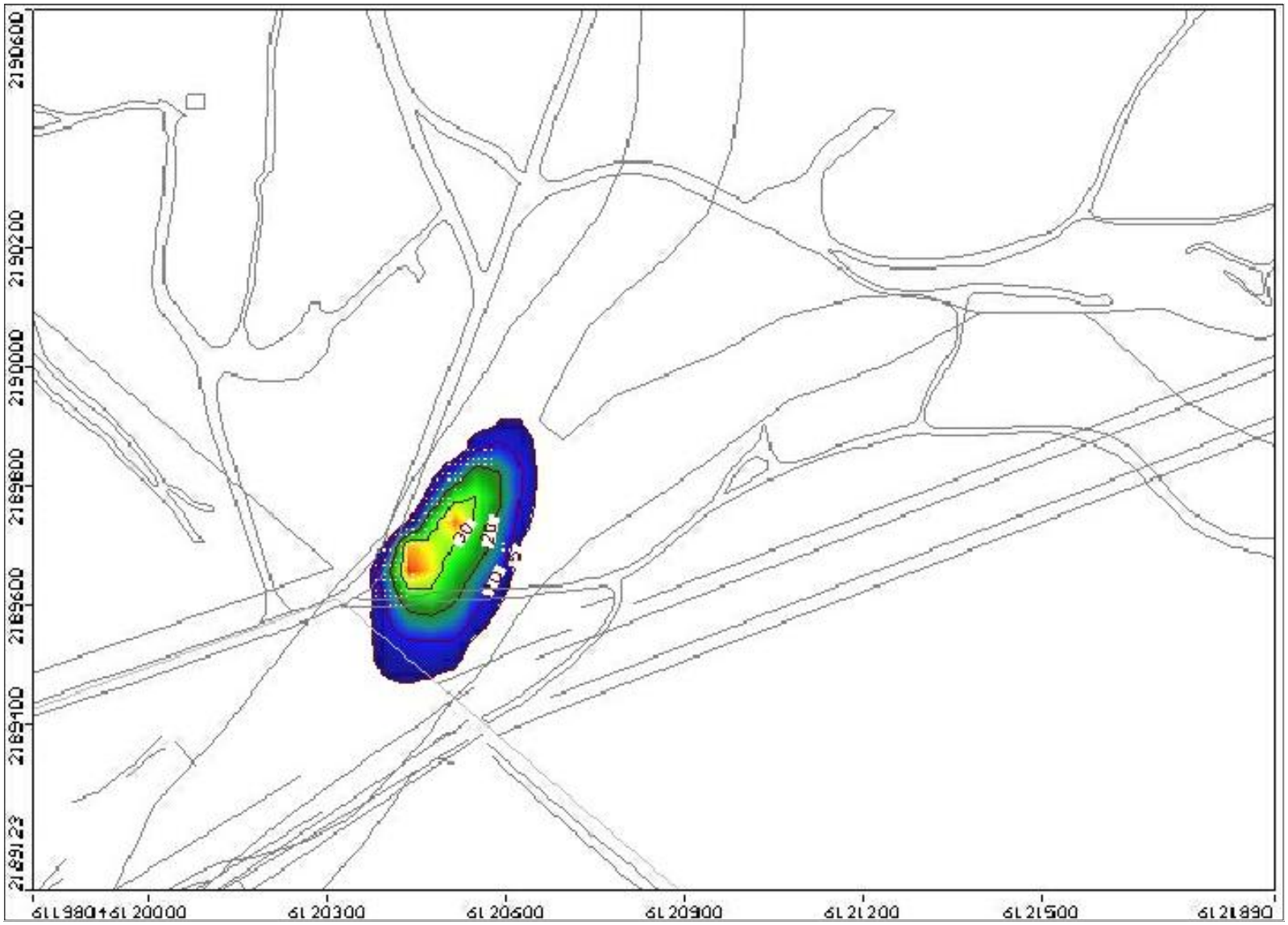
Notes:
[1] relative error is the standard deviation of the residual (the difference between measured head and simulated head) divided by the observed head range.

Table F3-1 Modeling Results Summary institutional

Alternatives	Biodegradation Rate (per year)	Percent Reduction in Impacted Groundwater Area[a]						No. of Years to Dissipate to MCL
		50 μg/L			5 μg/L			
		5yr	10yr	20yr	5yr	10yr	20yr	
Baseline	0	62.2	83.2	99.0	0	0	0	Over 50
Alternatives G2-1 (No Action) & G2-2 (MNA and ICs)	0.0967	100	-	-	9.8	15.8	59.6	32[b]
	0.6935	100	-	-	86.5	100	-	6.0[a]
	6.935	100	-	-	100	-	-	1[a]
Alternative G2-3 (In-Plume Treatment, Monitoring, and ICs)	0.0967	100	-	-	10.4	26.9	62.8	29[b]
	0.6935	100	-	--	100	-	-	5[a]
	6.935	100	-	-	100	-	-	0.5[a]
Alternative G2-4 (Hydraulic Containment/Treatment, Monitoring, and ICs)	0.0967	100	-	-	9.6	29.8	99.7	210[b]
	0.6935	100	-	-	95.8	-	-	6[a]
	6.935	100	-	-	100	-	-	1[a]

Notes:
- No VOC concentration above listed value.
[a] Results based on simulations performed during the preparation of Draft FS Addendum (Earth Tech 2005).
[b] Results based on updated model and simulation performed as part of preparation of this FS.

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-4.dwg Time: Sep 23, 2010 - 10:30am



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study — Draft Final

Alternatives G2-1 & G2-2:
Computed TCE Concentrations - 5 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-4

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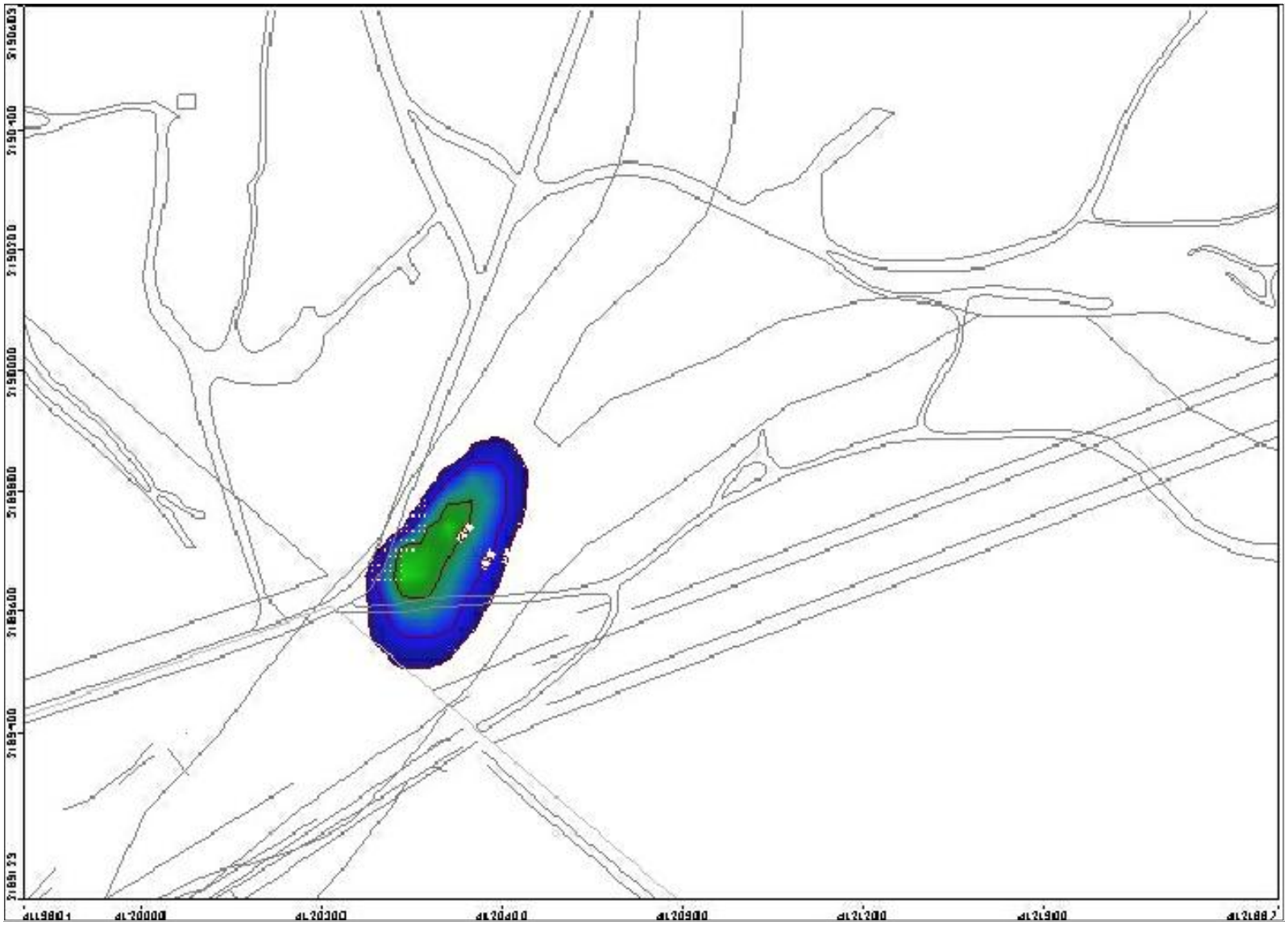
File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-5.dwg Time: Sep 23, 2010 - 10:30am



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study

Draft Final

Alternatives G2-1 & G2-2:
Computed TCE Concentrations - 10 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-5

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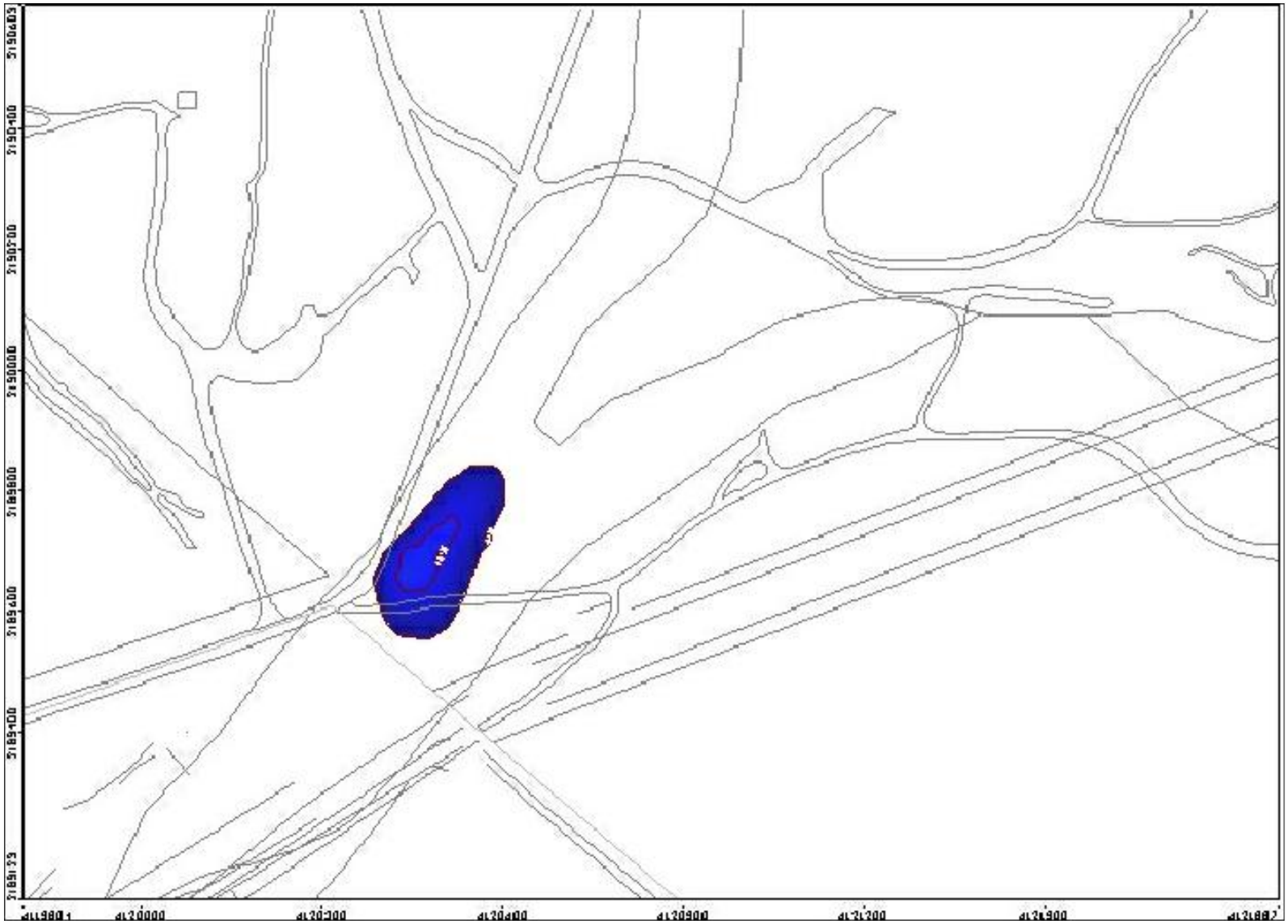
File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-6.dwg Time: Sep 23, 2010 - 10:31am



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study

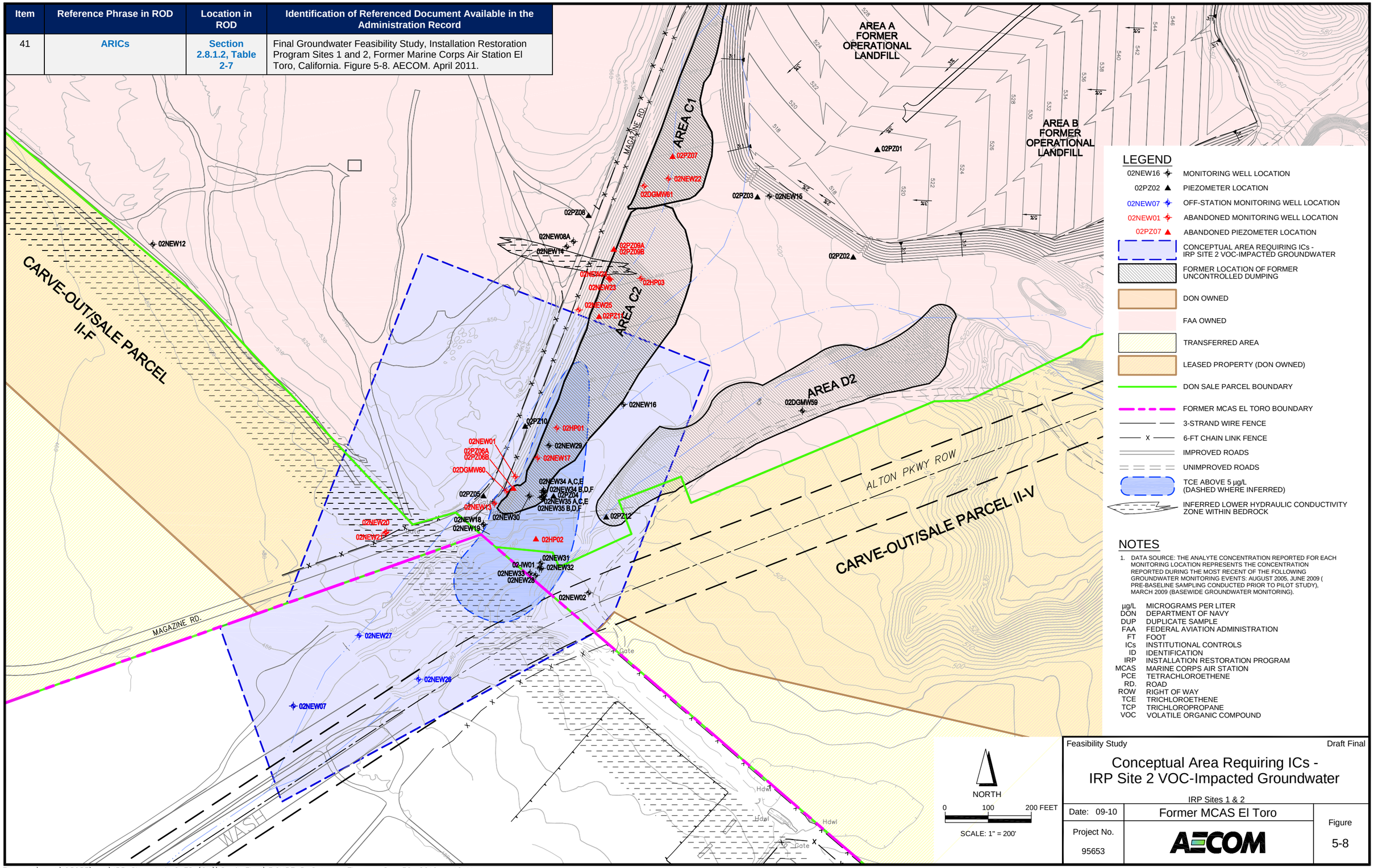
Draft Final

Alternatives G2-1 & G2-2:
Computed TCE Concentrations - 20 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-6

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
41	ARICs	Section 2.8.1.2, Table 2-7	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 5-8. AECOM. April 2011.



File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-8.dwg Time: Sep 30, 2010 – 10:11am

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
42	**Present Worth Cost[9]: $3,665,000**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.2.2; and Tables 14 and 15. AECOM. April 2011.

3.2.1 Alternative G2-2: Monitored Natural Attenuation and Institutional Controls

Alternative G2-2 consists of natural attenuation monitoring and institutional controls to attain the RAOs for VOC-impacted groundwater are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce concentrations of constituents of concern (COCs) in groundwater. Monitoring would also assess migration of COCs off-Station at concentrations exceeding their respective CGs.

Institutional controls under Alternative G-2 would include non-engineered controls to limit human exposure to VOC-impacted groundwater. Restrictions on future groundwater use would be to protect potential on-site and off-site receptors, and protect the MNA system components. Alternative G2-2 would include five-year reviews to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G2-2 are presented in Table 12. Table 13 presents the assumptions and parameters used for Alternative G2-2 cost estimate.

3.2.2 Alternative G2-3: In-Plume Treatment, Monitoring, and ICs

Alternative G2-3 would include active remediation of the hot-spot defined by relatively high concentrations of TCE (above 40 µg/L) in groundwater. Active remediation of hot-spot would treat relatively high concentrations of VOCs including TCE and minimize their downgradient migration. Active remediation of hot-spot may be implemented using in-situ bioremediation, ISCO, or in-situ chemical reduction using ZVI.

For cost estimating purposes, it is assumed that hot-spot remediation would be conducted using in-situ bioremediation. As part of in-situ bioremediation implementation, substrate would be injected into the hot-spot area using hydraulic fracturing.

Groundwater monitoring would be conducted to evaluate the effectiveness of active remediation technology to treat VOCs, and to assess the distribution of COCs in the area between the source area and the Station boundary, and beyond due to natural attenuation processes.

To attain the RAOs, Alternative G2-3 would also include implementation of ICs. ICs would be implemented as part of Alternative G2-3 to limit exposure of potential receptors to COC-impacted groundwater until the concentrations of COCs are reduced below their respective CGs.

Alternative G2-3 would include five-year reviews to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G2-3 are presented in Table 14. Table 15 presents the assumptions and parameters used for Alternative G2-3 cost estimate.

3.2.3 Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

This alternative would involve installation of groundwater extraction wells to extract and capture the COC-impacted groundwater. Based on the capture zone evaluation conducted during the long-term aquifer test, three extraction wells would effectively capture the VOC-impacted groundwater. The extracted groundwater would be treated using appropriate treatment technology such as granular activated carbon or air stripping. Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation.

Table 14: Estimated Costs for Alternative G2-3

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020	Calendar Year 10 2021
CAPITAL COSTS										
Remedial Design	$122,332									
Institutional Controls Planning Documents (Capital)	$30,650									
Institutional Controls Implementation (Capital)		$73,852								
Hydraulic Fracturing - In-Plume Remediation		$284,618								
Injection Well Installation - In-Plume Remediation		$524,201								
Groundwater Monitoring Well Installation (Capital)		$96,404								
O&M COSTS										
Institutional Controls Monitoring (O&M)			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Overall COC Extent Monitoring (O&M)			$73,864	$36,932	$36,932	$36,932	$36,932	$19,410	$19,410	$19,410
Hot-Spot Remediation Monitoring (O&M)			$90,987	$45,494	$45,494	$45,494	$45,494			
PERIODIC COSTS										
Substrate Injection Cost		$498,966			$249,483					
Groundwater Monitoring Well Replacement (Periodic)										
Five-Year Reviews (Periodic)						$29,800				
Sub-Total	$152,982	$1,478,041	$186,226	$103,800	$353,283	$133,600	$103,800	$40,785	$40,785	$40,785
Contingency		$280,838	$37,245	$20,760	$70,657	$20,760	$20,760	$8,157	$8,157	$8,157
Sub-Total	$152,982	$1,758,879	$223,471	$124,560	$423,940	$154,360	$124,560	$48,941	$48,941	$48,941
Discount Factor (Discount Rate 2.8 percent)	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01	7.38E-01
Present Value	$144,762	$1,619,036	$200,101	$108,496	$359,208	$127,228	$99,870	$38,171	$37,132	$36,120

Table 14: Estimated Costs for Alternative G2-3

Phase Name	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS								
Remedial Design								
Institutional Controls Planning Documents (Capital)								
Institutional Controls Implementation (Capital)								
Hydraulic Fracturing - In-Plume Remediation								
Injection Well Installation - In-Plume Remediation								
Groundwater Monitoring Well Installation (Capital)								
O&M COSTS								
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Overall COC Extent Monitoring (O&M)	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410
Hot-Spot Remediation Monitoring (O&M)								
PERIODIC COSTS								
Substrate Injection Cost								
Groundwater Monitoring Well Replacement (Periodic)	$182,836							
Five-Year Reviews (Periodic)	$29,800					$29,800		
Sub-Total	$253,421	$40,785	$40,785	$40,785	$40,785	$70,585	$40,785	$40,785
Contingency	$44,724	$8,157	$8,157	$8,157	$8,157	$8,157	$8,157	$8,157
Sub-Total	$298,145	$48,941	$48,941	$48,941	$48,941	$78,742	$48,941	$48,941
Discount Factor (Discount Rate 2.8 percent)	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$214,047	$34,180	$33,249	$32,343	$31,462	$49,240	$29,771	$28,961

Table 14: Estimated Costs for Alternative G2-3

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Calendar Year 21 2032	Calendar Year 22 2033	Calendar Year 23 2034	Calendar Year 24 2035	Calendar Year 25 2036
CAPITAL COSTS							
Remedial Design							
Institutional Controls Planning Documents (Capital)							
Institutional Controls Implementation (Capital)							
Hydraulic Fracturing - In-Plume Remediation							
Injection Well Installation - In-Plume Remediation							
Groundwater Monitoring Well Installation (Capital)							
O&M COSTS							
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Overall COC Extent Monitoring (O&M)	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410
Hot-Spot Remediation Monitoring (O&M)							
PERIODIC COSTS							
Substrate Injection Cost							
Groundwater Monitoring Well Replacement (Periodic)			$182,836				
Five-Year Reviews (Periodic)			$29,800				
Sub-Total	$40,785	$40,785	$253,421	$40,785	$40,785	$40,785	$40,785
Contingency	$8,157	$8,157	$44,724	$8,157	$8,157	$8,157	$8,157
Sub-Total	$48,941	$48,941	$298,145	$48,941	$48,941	$48,941	$48,941
Discount Factor (Discount Rate 2.8 percent)	5.76E-01	5.60E-01	5.45E-01	5.30E-01	5.15E-01	5.01E-01	4.88E-01
Present Value	$28,172	$27,404	$162,397	$25,932	$25,226	$24,539	$23,870

Table 14: Estimated Costs for Alternative G2-3

Phase Name	Calendar Year 26 2037	Calendar Year 27 2038	Calendar Year 28 2039	Calendar Year 29 2040	Calendar Year 30 2041	Row Total
CAPITAL COSTS						
Remedial Design						$122,332
Institutional Controls Planning Documents (Capital)						$30,650
Institutional Controls Implementation (Capital)						$73,852
Hydraulic Fracturing - In-Plume Remediation						$284,618
Injection Well Installation - In-Plume Remediation						$524,201
Groundwater Monitoring Well Installation (Capital)						$96,404
O&M COSTS						
Institutional Controls Monitoring (O&M)	$21,375	$21,375	$21,375	$21,375	$21,375	$598,487
Overall COC Extent Monitoring (O&M)	$19,410	$19,410	$19,410	$19,410	$19,410	$668,021
Hot-Spot Remediation Monitoring (O&M)						$272,962
PERIODIC COSTS						
Substrate Injection Cost						$748,449
Groundwater Monitoring Well Replacement (Periodic)						$365,672
Five-Year Reviews (Periodic)	$29,800					$149,001
Sub-Total	$70,585	$40,785	$40,785	$40,785	$40,785	$3,934,650
Contingency	$8,157	$8,157	$8,157	$8,157	$8,157	$711,763
Sub-Total	$78,742	$48,941	$48,941	$48,941	$48,941	$4,646,412
Discount Factor (Discount Rate 2.8 percent)	4.74E-01	4.62E-01	4.49E-01	4.37E-01	4.25E-01	--
Present Value	$37,359	$22,588	$21,972	$21,374	$20,792	$3,665,000 *

Notes:

* The costs are rounded off to nearest thounsands.

Table 15: Assumptions / Parameters for Cost Estimation of Alternative G2-3: In-Plume Treatment, Monitoring, and ICs

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	Assumptions same as Alternative G2-2.
Institutional Controls Implementation	Assumptions same as Alternative G2-2.
Hydraulic Fracturing – In-Plume Remediation	1. RACER Technology Models Used: User-Defined Estimate 2. Technology used for injecting substrate into the source area: Hydraulic fracturing 3. Area to be treated = 21,000 square feet 4. Total number of fracturing/injection locations = 17 5. Fracturing interval = 60 to 100 feet bgs 6. Cost of fracturing = $2,000 per injection well (based on a quote) 7. Cost of mobilizing fracturing equipment = $12,500 (based on a quote)
Injection Well Installation – In-Plume Remediation	1. RACER Technology Models Used: Groundwater Monitoring Well, User-Defined Costs, Off-site Transportation and Waste Disposal, and Professional Labor Management 2. Number of injection locations = 17 3. Number of injection wells = 34 (2 injection wells at each injection location since length of each injection well screen is restricted to 20 feet to uniformly distribute substrate across the vertical treatment interval) 4. Injection screen length per well = 20 feet 5. Diameter of injection wells = 2 inches 6. Well construction material: PVC Schedule 80 7. Depth to groundwater: 40 feet 8. Aquifer thickness requiring treatment = 40 feet 9. Drilling method = Hollow-stem Auger 10. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 11. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Groundwater Monitoring Well Installation	Assumptions same as Alternative G2-2.
O&M	
Hot-Spot Remediation Performance Monitoring	1. RACER Technology Model Used: Monitoring 2. Total duration of monitoring: 5 years 3. Number of monitoring wells sampled during each event: 10 4. Monitoring frequency from 0 to 6 months = Monthly 5. Monitoring frequency from 7 to 12 months = Quarterly 6. Monitoring frequency from 2nd to 5th year = Semi-annual 7. Average Sample Depth = 80 feet 1. Analyses = Perchlorate, VOCs, nitrate/nitrite, sulfate, pH, DO/ORP, total acidity/alkalinity, total organic carbon, methane, ethene, and ethane.
Overall COC Extent Monitoring	Assumptions same as Alternative G2-2.
Institutional Controls Monitoring	Assumptions same as Alternative G2-2.
PERIODIC COSTS	
Substrate Injection Costs	1. RACER Technology Model Used: User-Defined Costs 2. Assumed substrate: EOS® 3. Approximate volume of 20 percent by volume EOS® proposed to be injected into each injection well: 1,600 gallons (based on the pilot study data) 4. Number of substrate injection events: 2 5. It is assumed that substrate is injected into all the wells during the first injection event. During the second injection event, the substrate is assumed to be injected into half of the total number of wells.

Cost Element	Key Assumptions / Parameters
	6. Assumed injection rate: 5 gpm (based on the pilot study data) 7. Substrate cost = $ 14.5 per gallon (estimate based on vendor quote)
Groundwater Monitoring Well Replacement	Assumptions same as Alternative G2-2.
Five-Year Reviews	Assumptions same as Alternative G2-2.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
43	Timeframe[e]: 29 Years	Section 2.8.1.2, Table 2-7	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix F, Section F3, page F3-2; Table F3-1; and Figures F3-7 through F3-9. AECOM. April 2011.

- **Alternative G2-3** - In-Plume Treatment, Monitoring, and ICs

  In this scenario the TCE "hot spot" will be treated using one of the technologies described in Section 5.2 of the main text of the FS. Following treatment the TCE plume will be monitored under natural attenuation processes. The initial concentrations used in this simulation were assumed to be below 40 µg/L (reduced due to hot spot treatment). The model predicts the TCE plume will dissipate to the MCL in approximately 29 years. The predicted plumes of 5, 10, 20 years are shown in Figures F3-7, F3-8, and F3-9 respectively.

  Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs.

  This alternative consists of active groundwater extraction, treatment and injection to achieve groundwater containment/treatment. It is assumed that three pumping wells will be installed down-gradient of the TCE plume, and five injection wells will be located up-gradient of the TCE plume. The pumping rate and injections rates were assumed to be 0.3 gallon per minute in the simulation. The model predicts the TCE plume will dissipate to the MCL in approximately 21 years. The pathline simulation is presented in Figure F3-10. The predicted plume after 5, 10, 20 years of implementing this remedy are shown in Figures F3-11, F3-12, and F3-13.

F3.1 UNCERTAINTIES OF MODEL ASSUMPTION AS A PREDICTIVE TOOL

There are potential errors resulting from the assumptions listed in subsection F2.4. Also limitations inherent in any model of the subsurface are applicable. Conceptualization and simplification of the subsurface may result in some discrepancy between predicted and actual results.

Table F2-1 Calibration Statistics

Description	Results
Number of Wells	41
Number of Observations	535
Mean Absolute Residual (feet)	5.15
Root Mean Square of Residuals	6.78
Relative Error[1] (percent)	1.69

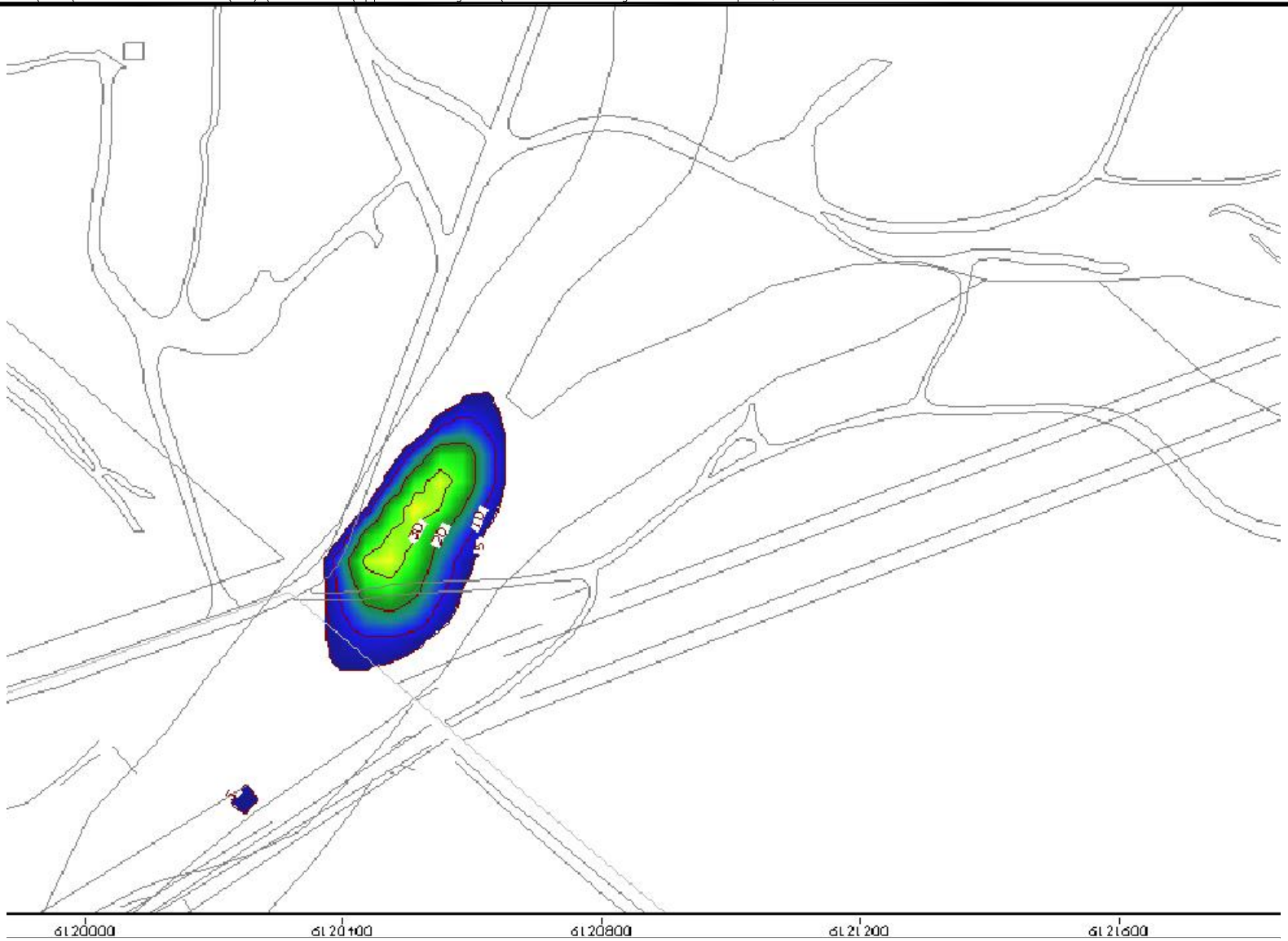
Notes:
[1] relative error is the standard deviation of the residual (the difference between measured head and simulated head) divided by the observed head range.

Table F3-1 Modeling Results Summary institutional

Alternatives	Biodegradation Rate (per year)	Percent Reduction in Impacted Groundwater Area[a]						No. of Years to Dissipate to MCL
		50 μg/L			5 μg/L			
		5yr	10yr	20yr	5yr	10yr	20yr	
Baseline	0	62.2	83.2	99.0	0	0	0	Over 50
Alternatives G2-1 (No Action) & G2-2 (MNA and ICs)	0.0967	100	-	-	9.8	15.8	59.6	32[b]
	0.6935	100	-	-	86.5	100	-	6.0[a]
	6.935	100	-	-	100	-	-	1[a]
Alternative G2-3 (In-Plume Treatment, Monitoring, and ICs)	0.0967	100	-	-	10.4	26.9	62.8	29[b]
	0.6935	100	-	--	100	-	-	5[a]
	6.935	100	-	-	100	-	-	0.5[a]
Alternative G2-4 (Hydraulic Containment/Treatment, Monitoring, and ICs)	0.0967	100	-	-	9.6	29.8	99.7	210[b]
	0.6935	100	-	-	95.8	-	-	6[a]
	6.935	100	-	-	100	-	-	1[a]

Notes:
- No VOC concentration above listed value.
[a] Results based on simulations performed during the preparation of Draft FS Addendum (Earth Tech 2005).
[b] Results based on updated model and simulation performed as part of preparation of this FS.

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-7.dwg Time: Sep 23, 2010 - 10:31am



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study — Draft Final

Alternative G2-3:
Computed TCE Concentrations - 5 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-7

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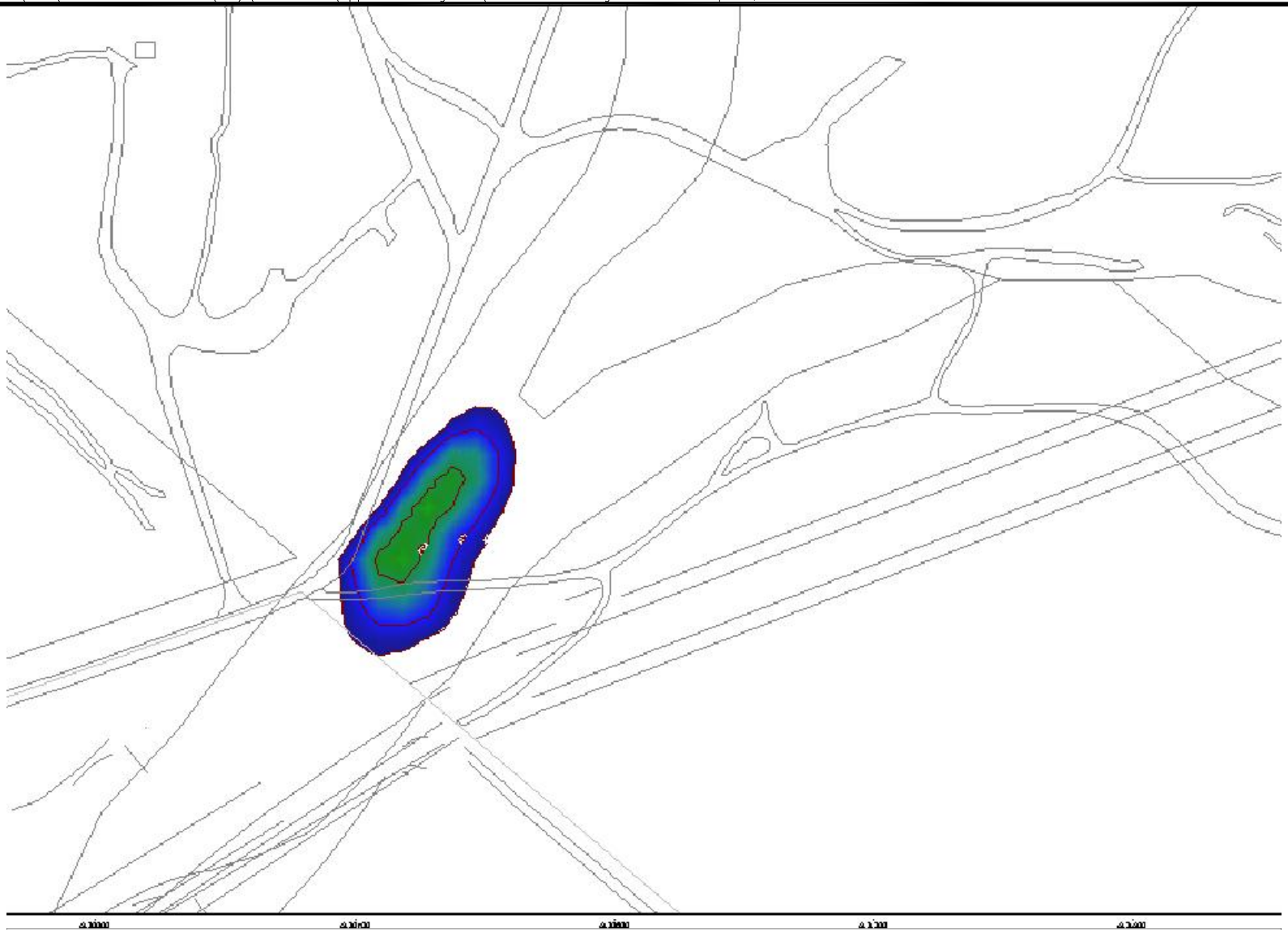
File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-8.dwg Time: Sep 23, 2010 - 10:31am



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study — Draft Final

Alternative G2-3:
Computed TCE Concentrations - 10 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-8

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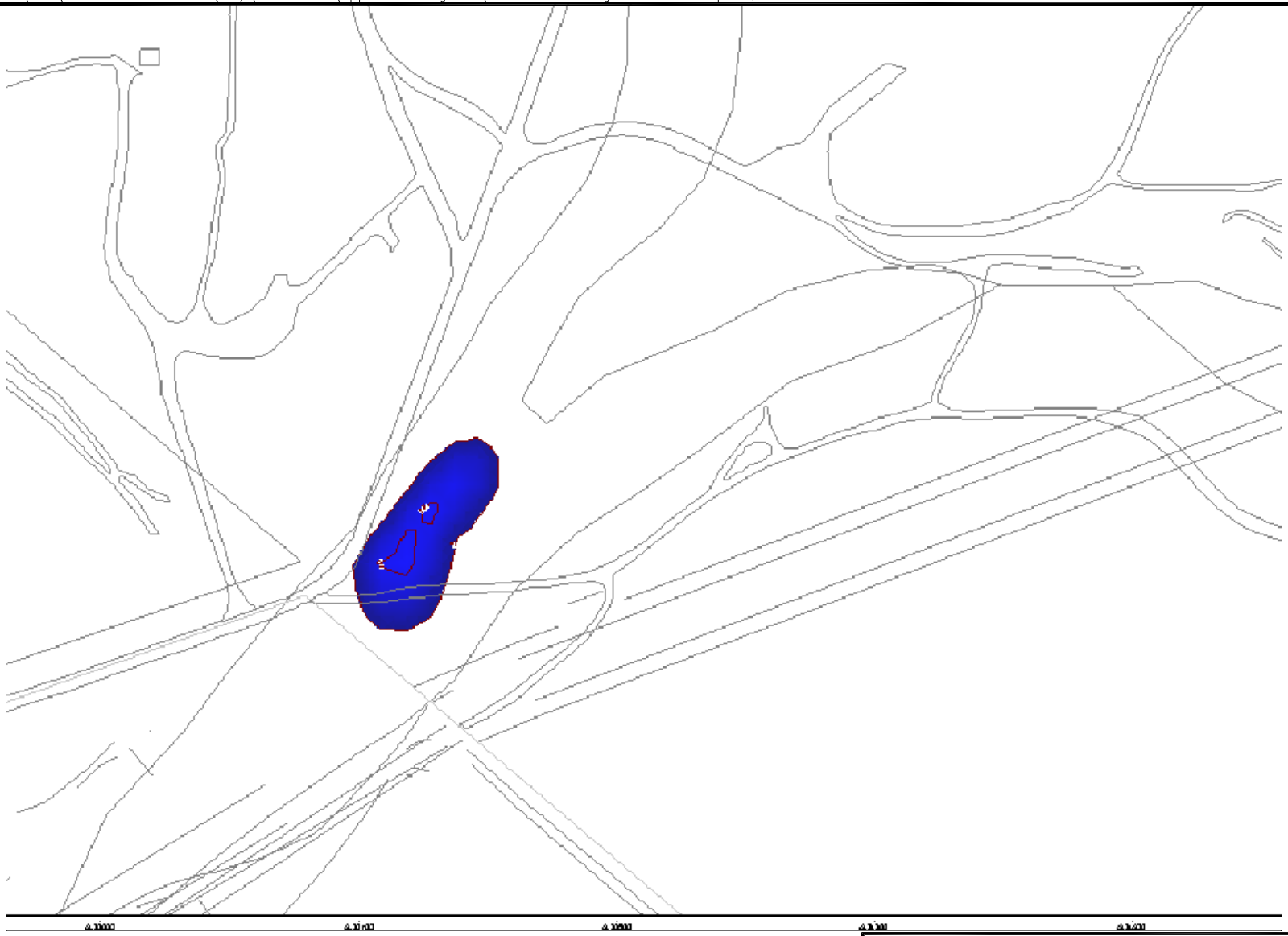
File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-9.dwg Time: Sep 23, 2010 - 10:31am



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study

Draft Final

Alternative G2-3:
Computed TCE Concentrations - 20 Years

IRP Sites 1 & 2

Date: 09-10

Former MCAS El Toro

Project No.
95653

AECOM

Figure
F3-9

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
44	**Present Worth Cost[i]: $2,167,000**	**Section 2.8.1.2, Table 2-7**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Section 3.2.3; and Tables 16 and 17. AECOM. April 2011.

3.2.1 Alternative G2-2: Monitored Natural Attenuation and Institutional Controls

Alternative G2-2 consists of natural attenuation monitoring and institutional controls to attain the RAOs for VOC-impacted groundwater are achieved. Periodic sampling of groundwater would be performed from selected locations to assess the effectiveness of natural attenuation processes to reduce concentrations of constituents of concern (COCs) in groundwater. Monitoring would also assess migration of COCs off-Station at concentrations exceeding their respective CGs.

Institutional controls under Alternative G-2 would include non-engineered controls to limit human exposure to VOC-impacted groundwater. Restrictions on future groundwater use would be to protect potential on-site and off-site receptors, and protect the MNA system components. Alternative G2-2 would include five-year reviews to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G2-2 are presented in Table 12. Table 13 presents the assumptions and parameters used for Alternative G2-2 cost estimate.

3.2.2 Alternative G2-3: In-Plume Treatment, Monitoring, and ICs

Alternative G2-3 would include active remediation of the hot-spot defined by relatively high concentrations of TCE (above 40 µg/L) in groundwater. Active remediation of hot-spot would treat relatively high concentrations of VOCs including TCE and minimize their downgradient migration. Active remediation of hot-spot may be implemented using in-situ bioremediation, ISCO, or in-situ chemical reduction using ZVI.

For cost estimating purposes, it is assumed that hot-spot remediation would be conducted using in-situ bioremediation. As part of in-situ bioremediation implementation, substrate would be injected into the hot-spot area using hydraulic fracturing.

Groundwater monitoring would be conducted to evaluate the effectiveness of active remediation technology to treat VOCs, and to assess the distribution of COCs in the area between the source area and the Station boundary, and beyond due to natural attenuation processes.

To attain the RAOs, Alternative G2-3 would also include implementation of ICs. ICs would be implemented as part of Alternative G2-3 to limit exposure of potential receptors to COC-impacted groundwater until the concentrations of COCs are reduced below their respective CGs.

Alternative G2-3 would include five-year reviews to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G2-3 are presented in Table 14. Table 15 presents the assumptions and parameters used for Alternative G2-3 cost estimate.

3.2.3 Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

This alternative would involve installation of groundwater extraction wells to extract and capture the COC-impacted groundwater. Based on the capture zone evaluation conducted during the long-term aquifer test, three extraction wells would effectively capture the VOC-impacted groundwater. The extracted groundwater would be treated using appropriate treatment technology such as granular activated carbon or air stripping. Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation.

ICs would be implemented until the time COCs are reduced to concentrations less than or equal to their respective CGs along the estimated extent of impacted groundwater.

Alternative G2-4 would include five-year reviews to evaluate the implementation and performance of the remedy. These five-year reviews would assess if the remedy is or will be protective of human health and the environment. The estimated costs for Alternative G2-4 are presented in Table 16. Table 17 presents the assumptions and parameters used for Alternative G2-4 cost estimate.

Table 16: Estimated Costs for Alternative G2-4

Phase Name	Calendar Year 1 2012	Calendar Year 2 2013	Calendar Year 3 2014	Calendar Year 4 2015	Calendar Year 5 2016	Calendar Year 6 2017	Calendar Year 7 2018	Calendar Year 8 2019	Calendar Year 9 2020
CAPITAL COSTS									
Remedial Design	$26,765								
Institutional Controls Planning Documents	$30,650								
Institutional Controls Implementation		$73,852							
Groundwater Extraction Wells Installation		$134,077							
Groundwater Injection Wells Installation		$131,990							
Above-Ground Treatment System (GAC) Installation		$16,289							
Groundwater Monitoring Well Installation		$96,404							
O&M COSTS									
Institutional Controls Monitoring			$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Above-Ground Treatment System (GAC) O&M			$8,247	$8,247	$8,247	$8,247	$8,247	$8,247	$8,247
Extraction Wells Sampling and Analysis			$60,242	$15,061	$15,061	$15,061	$15,061	$15,061	$15,061
Overall COC Extent Monitoring			$73,864	$36,932	$36,932	$36,932	$36,932	$19,410	$19,410
PERIODIC COSTS									
Groundwater Monitoring Well Replacement									
Five-Year Reviews						$29,800			
Sub-Total	$57,415	$452,611	$163,728	$81,614	$81,614	$111,415	$81,614	$64,092	$64,092
Contingency		$75,752	$32,746	$16,323	$16,323	$16,323	$16,323	$12,818	$12,818
Sub-Total	$57,415	$528,363	$196,474	$97,937	$97,937	$127,738	$97,937	$76,911	$76,911
Discount Factor (Discount Rate 2.8 percent)	9.46E-01	9.20E-01	8.95E-01	8.71E-01	8.47E-01	8.24E-01	8.02E-01	7.80E-01	7.59E-01
Present Value	$54,330	$486,355	$175,927	$85,307	$82,983	$105,285	$78,524	$59,986	$58,352

Table 16: Estimated Costs for Alternative G2-4

Phase Name	Calendar Year 10 2021	Calendar Year 11 2022	Calendar Year 12 2023	Calendar Year 13 2024	Calendar Year 14 2025	Calendar Year 15 2026	Calendar Year 16 2027	Calendar Year 17 2028	Calendar Year 18 2029
CAPITAL COSTS									
Remedial Design									
Institutional Controls Planning Documents									
Institutional Controls Implementation									
Groundwater Extraction Wells Installation									
Groundwater Injection Wells Installation									
Above-Ground Treatment System (GAC) Installation									
Groundwater Monitoring Well Installation									
O&M COSTS									
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375	$21,375
Above-Ground Treatment System (GAC) O&M	$8,247	$8,247	$8,247	$8,247	$8,247	$8,247	$8,247	$8,247	$8,247
Extraction Wells Sampling and Analysis	$15,061	$15,061	$15,061	$15,061	$15,061	$15,061	$15,061	$15,061	$15,061
Overall COC Extent Monitoring	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410	$19,410
PERIODIC COSTS									
Groundwater Monitoring Well Replacement		$182,836							
Five-Year Reviews		$29,800					$29,800		
Sub-Total	$64,092	$276,729	$64,092	$64,092	$64,092	$64,092	$93,893	$64,092	$64,092
Contingency	$12,818	$49,386	$12,818	$12,818	$12,818	$12,818	$12,818	$12,818	$12,818
Sub-Total	$76,911	$326,114	$76,911	$76,911	$76,911	$76,911	$106,711	$76,911	$76,911
Discount Factor (Discount Rate 2.8 percent)	7.38E-01	7.18E-01	6.98E-01	6.79E-01	6.61E-01	6.43E-01	6.25E-01	6.08E-01	5.92E-01
Present Value	$56,763	$234,128	$53,713	$52,250	$50,827	$49,442	$66,731	$46,786	$45,511

Table 16: Estimated Costs for Alternative G2-4

Phase Name	Calendar Year 19 2030	Calendar Year 20 2031	Calendar Year 21 2032	Calendar Year 22 2033	Row Total
CAPITAL COSTS					
Remedial Design					$26,765
Institutional Controls Planning Documents					$30,650
Institutional Controls Implementation					$73,852
Groundwater Extraction Wells Installation					$134,077
Groundwater Injection Wells Installation					$131,990
Above-Ground Treatment System (GAC) Installation					$16,289
Groundwater Monitoring Well Installation					$96,404
O&M COSTS					
Institutional Controls Monitoring	$21,375	$21,375	$21,375	$49,732	$455,848
Above-Ground Treatment System (GAC) O&M	$8,247	$8,247	$8,247	$8,247	$164,948
Extraction Wells Sampling and Analysis	$15,061	$15,061	$15,061	$15,061	$346,392
Overall COC Extent Monitoring	$19,410	$19,410	$19,410	$19,410	$512,741
PERIODIC COSTS					
Groundwater Monitoring Well Replacement			$182,836		$365,672
Five-Year Reviews			$29,800		$119,201
Sub-Total	$64,092	$64,092	$276,729	$92,450	$2,474,829
Contingency	$12,818	$12,818	$49,386	$18,490	$444,872
Sub-Total	$76,911	$76,911	$326,114	$110,940	$2,919,701
Discount Factor (Discount Rate 2.8 percent)	5.76E-01	5.60E-01	5.45E-01	5.30E-01	--
Present Value	$44,272	$43,066	$177,632	$58,782	$2,167,000 *

Notes:

* The costs are rounded off to nearest thousands.

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Table 17: Assumptions / Parameters for Cost Estimation of Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

Cost Element	Key Assumptions / Parameters
CAPITAL COSTS	
Institutional Controls Planning Documents	Assumptions same as Alternative G2-2.
Institutional Controls Implementation	Assumptions same as Alternative G2-2.
Groundwater Extraction Wells Installation	1. RACER Technology Model Used: Groundwater Monitoring Well, User-Defined Costs, Off-site Transportation and Waste Disposal, and Professional Labor Management. 2. Number of extraction wells = 3 (Based on groundwater modeling) 3. Extraction flow rate for each well = 0.5 gpm 4. Diameter of wells = 6 inches 5. Well material = PVC Sch. 80 6. Depth to the base of contamination = 100 feet 7. Screen length = 20 feet 8. Drilling method = Hollow-Stem Auger 9. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 10. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Groundwater Injection Wells Installation	1. RACER Technology Models Used: Groundwater Monitoring Well, User-Defined Costs, Off-site Transportation and Waste Disposal, and Professional Labor Management 2. Number of injection wells = 5 (Based on groundwater modeling) 3. Diameter of injection wells = 2 inches 4. Well construction material: PVC Schedule 80 5. Depth to groundwater: 60 feet 6. Aquifer thickness requiring treatment = 40 feet 7. Drilling method = Hollow-stem Auger 8. Number of samples of drill cuttings analyzed for RCRA waste characterization for off-site disposal: 1 11. Analysis for waste characterization: Perchlorate, TAL metals, TCLP, SVOCs, VOCs, and pH.
Above-Ground Treatment System (GAC) Installation	1. RACER Technology Models Used: Carbon Adsorption (Liquid) 2. It is assumed that granular activated carbon (GAC) would be used for above-ground treatment of VOC-impacted groundwater 3. Total influent flow rate = 1 gallon per minute 4. It is assumed that two modular carbon adsorbers in series would be used for treatment of groundwater.
O&M	
Institutional Controls Monitoring	1. Assumptions same as Alternative G2-2.
Above-Ground Treatment System (GAC) O&M	1. RACER Technology Models Used: Operation and Maintenance 2. Total duration of monitoring: 21 years 3. Frequency of sampling treatment system: Quarterly 4. Analyses: VOCs
Extraction Wells Sampling and Analysis	1. RACER Technology Models Used: Monitoring 2. Total duration of O&M = 21 years 3. Includes costs for sampling extraction wells and treatment system. 4. Number of extraction wells sampled during each monitoring event= 3 5. Frequency of sampling of extraction wells during first 6 months of operation = Monthly 6. Frequency of sampling of extraction wells from 7th to 12th month = Quarterly 7. Frequency of sampling of extraction wells from 2nd to 21st year = Semi-Annually 8. Analysis of samples from extraction wells = VOCs

Cost Element	Key Assumptions / Parameters
Overall COC Extent Monitoring	Assumptions same as Alternative G2-2.
PERIODIC COSTS	
Groundwater Monitoring Well Replacement	Assumptions same as Alternative G2-2.
Five-Year Reviews	Assumptions same as Alternative G2-2.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
45	Timeframe[e]: 21 Years	Section 2.8.1.2, Table 2-7	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix F, Section F3, page F3-2; Table F3-1; and Figures F3-11 through F3-13. AECOM. April 2011.

- **Alternative G2-3** - In-Plume Treatment, Monitoring, and ICs

  In this scenario the TCE "hot spot" will be treated using one of the technologies described in Section 5.2 of the main text of the FS. Following treatment the TCE plume will be monitored under natural attenuation processes. The initial concentrations used in this simulation were assumed to be below 40 µg/L (reduced due to hot spot treatment). The model predicts the TCE plume will dissipate to the MCL in approximately 29 years. The predicted plumes of 5, 10, 20 years are shown in Figures F3-7, F3-8, and F3-9 respectively.

  Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs.

  This alternative consists of active groundwater extraction, treatment and injection to achieve groundwater containment/treatment. It is assumed that three pumping wells will be installed down-gradient of the TCE plume, and five injection wells will be located up-gradient of the TCE plume. The pumping rate and injections rates were assumed to be 0.3 gallon per minute in the simulation. The model predicts the TCE plume will dissipate to the MCL in approximately 21 years. The pathline simulation is presented in Figure F3-10. The predicted plume after 5, 10, 20 years of implementing this remedy are shown in Figures F3-11, F3-12, and F3-13.

F3.1 UNCERTAINTIES OF MODEL ASSUMPTION AS A PREDICTIVE TOOL

There are potential errors resulting from the assumptions listed in subsection F2.4. Also limitations inherent in any model of the subsurface are applicable. Conceptualization and simplification of the subsurface may result in some discrepancy between predicted and actual results.

Table F2-1 Calibration Statistics

Description	Results
Number of Wells	41
Number of Observations	535
Mean Absolute Residual (feet)	5.15
Root Mean Square of Residuals	6.78
Relative Error[1] (percent)	1.69

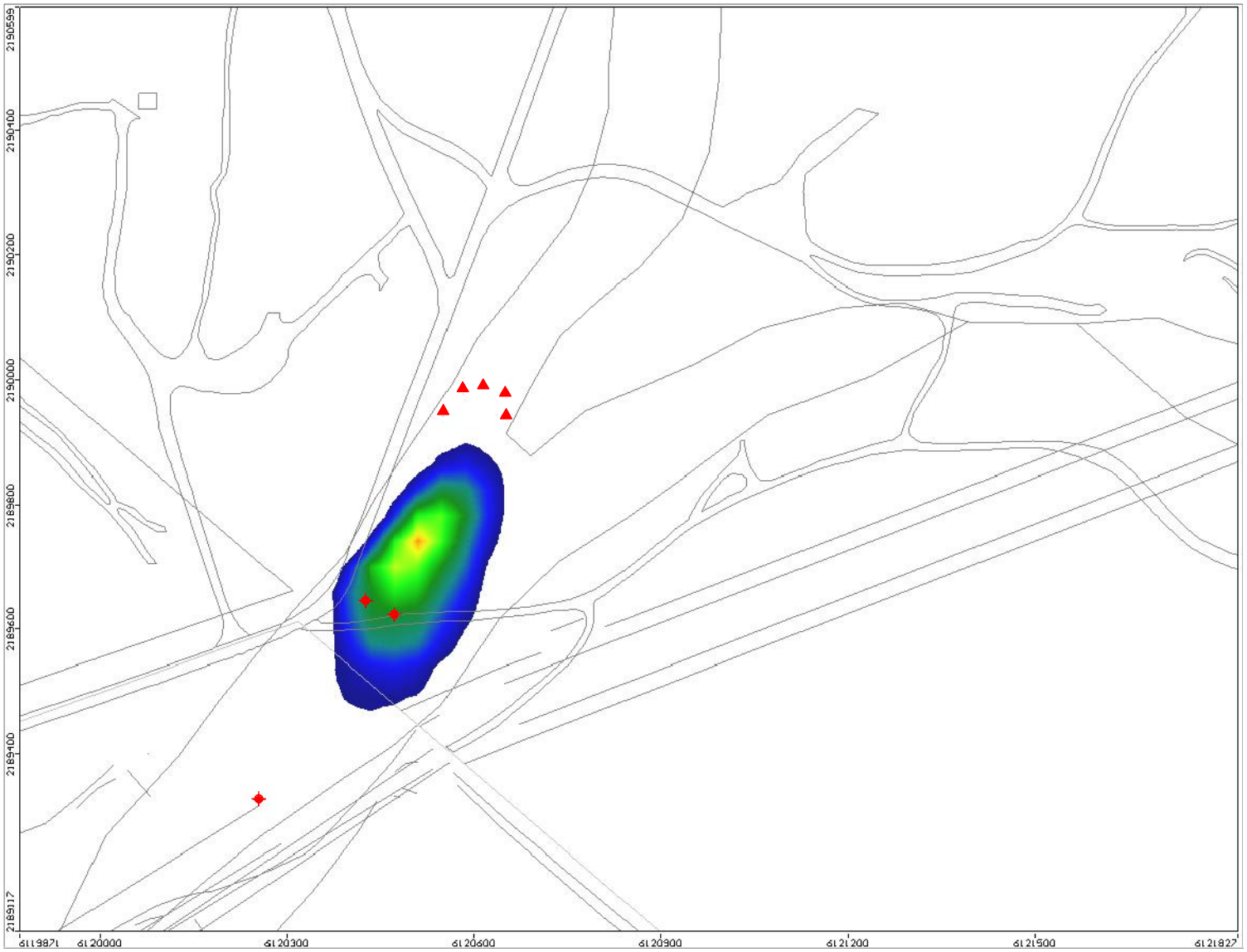
Notes:
[1] relative error is the standard deviation of the residual (the difference between measured head and simulated head) divided by the observed head range.

Table F3-1 Modeling Results Summary institutional

Alternatives	Biodegradation Rate (per year)	Percent Reduction in Impacted Groundwater Area[a]						No. of Years to Dissipate to MCL
		50 μg/L			5 μg/L			
		5yr	10yr	20yr	5yr	10yr	20yr	
Baseline	0	62.2	83.2	99.0	0	0	0	Over 50
Alternatives G2-1 (No Action) & G2-2 (MNA and ICs)	0.0967	100	-	-	9.8	15.8	59.6	32[b]
	0.6935	100	-	-	86.5	100	-	6.0[a]
	6.935	100	-	-	100	-	-	1[a]
Alternative G2-3 (In-Plume Treatment, Monitoring, and ICs)	0.0967	100	-	-	10.4	26.9	62.8	29[b]
	0.6935	100	-	--	100	-	-	5[a]
	6.935	100	-	-	100	-	-	0.5[a]
Alternative G2-4 (Hydraulic Containment/Treatment, Monitoring, and ICs)	0.0967	100	-	-	9.6	29.8	99.7	210[b]
	0.6935	100	-	-	95.8	-	-	6[a]
	6.935	100	-	-	100	-	-	1[a]

Notes:
- No VOC concentration above listed value.
[a] Results based on simulations performed during the preparation of Draft FS Addendum (Earth Tech 2005).
[b] Results based on updated model and simulation performed as part of preparation of this FS.

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-11.dwg Time: Sep 29, 2010 - 2:29pm



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE
✦	GROUNDWATER EXTRACTION WELL
▲	GROUNDWATER INJECTION WELL

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study — Draft Final

Alternative G2-4: Computed TCE Concentrations - 5 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-11

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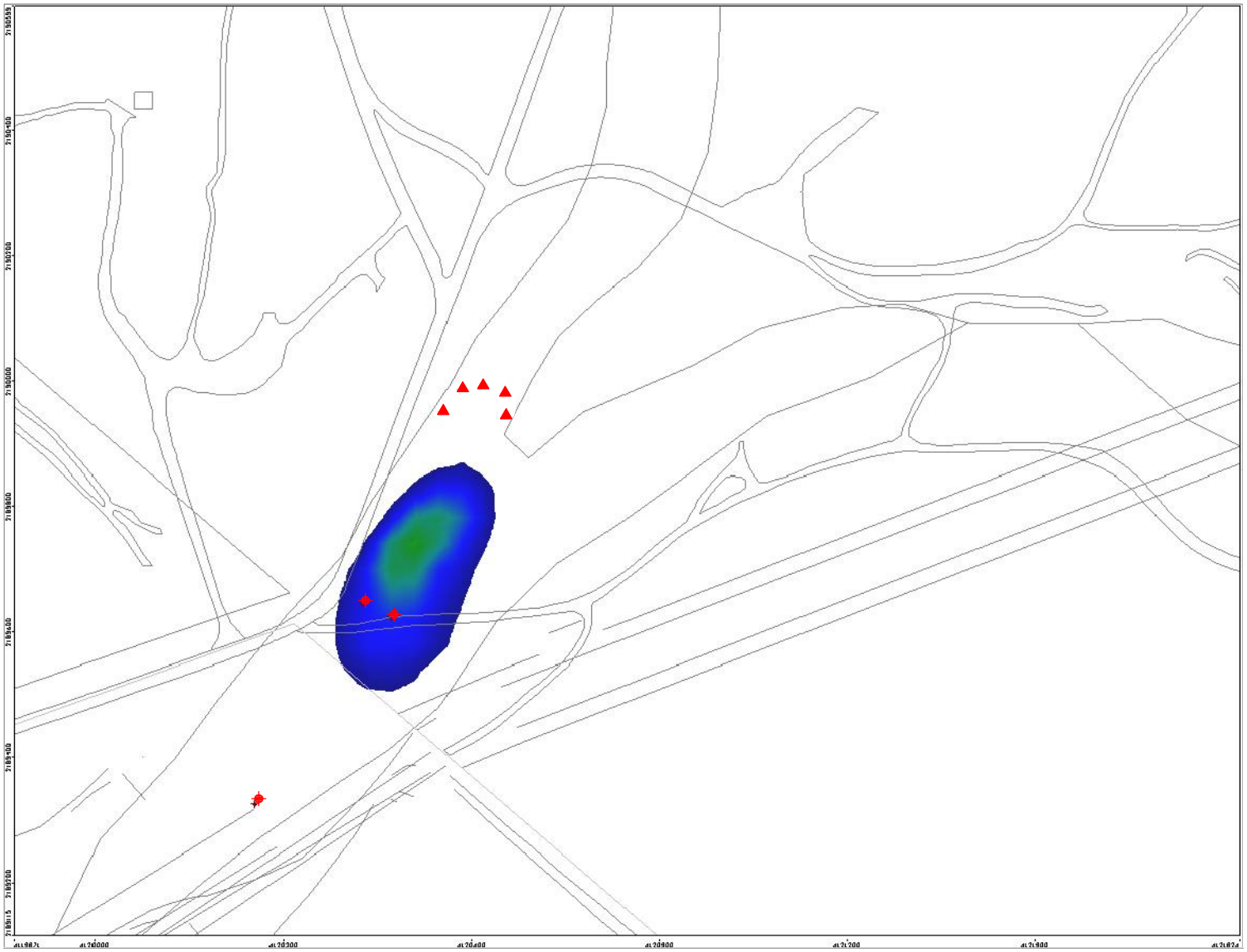
File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-12.dwg Time: Sep 29, 2010 - 2:29pm



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE
✦	GROUNDWATER EXTRACTION WELL
▲	GROUNDWATER INJECTION WELL

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study — Draft Final

Alternative G2-4: Computed TCE Concentrations - 10 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-12

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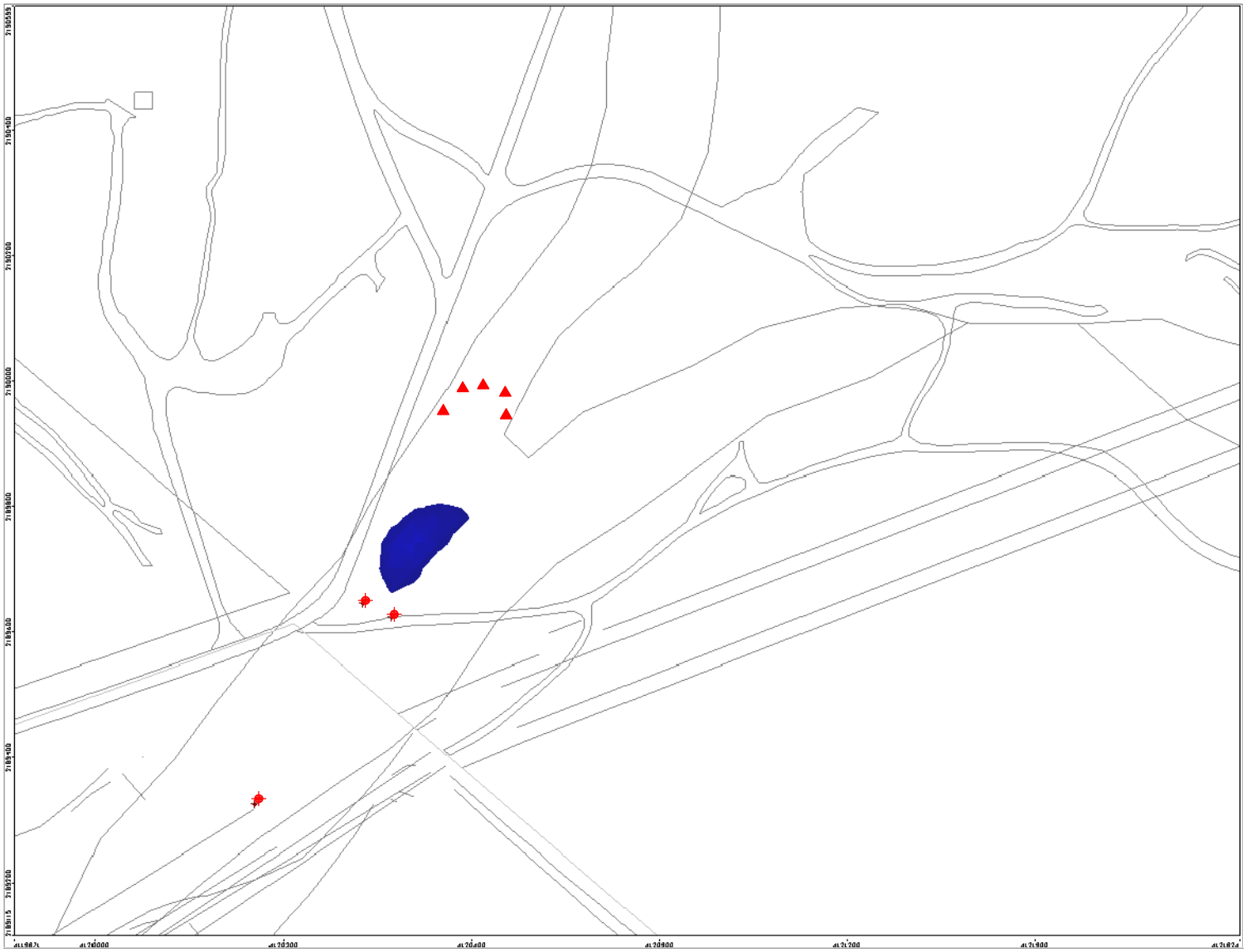
File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\Appendix F Figures\FIGURE F3-13.dwg Time: Sep 29, 2010 - 2:29pm



NOTES

µg/L	MICROGRAMS PER LITER
IRP	INSTALLATION RESTORATION PROGRAM
MCAS	MARINE CORPS AIR STATION
TCE	TRICHLOROETHENE
●	GROUNDWATER EXTRACTION WELL
▲	GROUNDWATER INJECTION WELL

TCE CONCENTRATIONS (µg/L)

5 10 20 30 50

Feasibility Study — Draft Final

Alternative G2-4: Computed TCE Concentrations - 20 Years

IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	F3-13

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
46	**Individual and comprehensive analyses of IRP Site 1 groundwater remedial alternatives**	**Section 2.8.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Sections 6.2.1 and 6.3.1, and Table 6-1. AECOM. April 2011.

- The State's position and key concerns related to the preferred alternative and other alternatives; and
- State comments on ARARs or the proposed use of waivers.

6.1.9 Community Acceptance

This evaluation includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This evaluation may not be completed until comments on the Proposed Plan are received.

6.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

6.2.1 Perchlorate-Impacted Groundwater at IRP Site 1

6.2.1.1 ALTERNATIVE G1-1: NO ACTION

Under the No Action Alternative, no deliberate actions would be undertaken to address IRP Site 1 perchlorate-impacted groundwater. Naturally attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of perchlorate in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, perchlorate would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to perchlorate-impacted groundwater. This alternative would allow continued migration of perchlorate-impacted groundwater towards the Station Boundary. Groundwater modeling indicates that in the absence of active remediation/containment measures, perchlorate would likely migrate off-Station at concentrations exceeding its CG and posing unacceptable risk to human-health. In addition, under the No Action Alternative there would be no way to evaluate fate of perchlorate including its potential migration off-Station and to take necessary protective measures for potential off-Station receptors. Alternative G1-1 does not reduce risks to potential on-site receptors due to exposure to perchlorate-impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with ARARs

Since Alternative G1-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G1-1 affords little long-term effectiveness and permanence since it includes no controls for minimizing or reducing exposure to perchlorate-impacted groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce perchlorate concentrations in groundwater. However, there would be no way to evaluate the effectiveness of these mechanisms in reducing perchlorate concentrations.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative G1-1 would not be effective in reducing perchlorate toxicity, mobility and/or volume in groundwater through treatment. Natural processes such as dilution and dispersion would be the primary processes acting to reduce perchlorate concentrations in groundwater. However, there would be no way to evaluate fate of perchlorate including its migration off-Station.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community, or the environment impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G1-1 would have no short-term impact on site risks. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact. Since Alternative G1-1 includes no remedial action, sustainable environmental remediation (SER) analysis was not conducted for this alternative.

Implementability

Alternative G1-1 requires no effort, services, supplies, or technology. There are no implementability concerns associated with Alternative G1-1 since no action would be taken.

Cost

There are no direct costs associated with Alternative G1-1.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G1-1 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.1.2 ALTERNATIVE G1-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G1-2 consists of natural attenuation monitoring and ICs to attain the RAOs for perchlorate-impacted groundwater. Periodic sampling of groundwater would be performed from selected locations to evaluate the effectiveness of natural processes to reduce perchlorate concentrations in groundwater. Monitoring would also evaluate potential migration of perchlorate off-Station at concentrations exceeding its CG.

ICs under Alternative G1-2 would include non-engineered controls to minimize the potential for human exposure to perchlorate-impacted groundwater. Restrictions on groundwater use would be to protect potential on-site and off-site receptors, and to protect the MNA system components. A complete description of Alternative G1-2 is presented in Section 5.1.2.

Overall Protection of Human-Health and the Environment

Alternative G1-2 provides protection of human-health and the environment. This alternative restricts on-site use of groundwater; thereby protecting human-health by minimizing the potential for exposure to perchlorate-impacted groundwater. Groundwater modeling indicates that in the absence of active remediation/containment measures, perchlorate would migrate off-Station at concentrations exceeding its CG and posing unacceptable risk to human-health. However, groundwater use restrictions implemented for the off-Station portion of the aquifer would minimize the potential exposure of off-Station receptors to perchlorate-impacted groundwater. Effective implementation of ICs would be necessary for Alternative G1-2 to be protective of human-health. Since MNA would likely take a relatively long period of time to reduce perchlorate concentrations to less than its CG for the estimated extent of IRP Site 1 perchlorate-impacted groundwater, ICs would have to be implemented for a relatively long period of time to protect human-health.

Compliance with ARARs

Alternative G1-2 complies with all identified ARARs.

Long-Term Effectiveness and Permanence

Alternative G1-2 would provide long-term effectiveness in minimizing the potential for exposure to perchlorate-impacted groundwater posing unacceptable risk to human-health provided ICs are implemented effectively. Effective implementation of ICs for the on-Station portion of perchlorate-impacted groundwater can be accomplished using the mechanisms summarized in Section 5.1.2.1. However, implementation of ICs for the off-Station portion of the aquifer with perchlorate concentrations exceeding its CG may require careful coordination with State and local agencies.

It would take relatively longer for MNA to remediate perchlorate-impacted groundwater to concentrations less than the CG. Therefore, ICs would have to be implemented for a relatively long period of time. Once MNA reduces perchlorate concentrations to less than its CG, residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health, and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume through Treatment

Natural processes such as dilution and dispersion would slowly reduce perchlorate toxicity by reducing its concentration in groundwater. MNA relies on natural processes and would not be as effective in reducing mobility, volume or mass of perchlorate in groundwater.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community, or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G1-2 would have a short-term impact on site risks at IRP Site 1 if it is determined that additional monitoring wells or other installations are needed for monitoring of groundwater. Well drilling would present a short-term risk of exposure of work crews to perchlorate-impacted groundwater and the inherent physical risk of using mechanized well drilling equipment.

Alternative G1-2 would have a low degree of environmental impact as evaluated through the qualitative SER analysis. The impacts to the environment for Alternative G1-2 are primarily expected due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/green house gas (GHG) emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for a relatively long time), when compared to other activities.

Groundwater modeling conducted in support of this FS indicates it would take more than approximately 200 years for MNA to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG.

Implementability

MNA is relatively easy to implement. Well drilling (if needed) and well maintenance are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data interpretation. Access to monitoring wells for implementation of MNA can be ensured through effective implementation of ICs.

The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of the aquifer with perchlorate concentrations exceeding its CG may require additional administrative effort since it may require careful coordination with State and local agencies. Access to monitoring wells for implementing MNA would be ensured using ICs.

Cost

RACER™ 2010 system Version 10.3.0 was used to generate a cost estimate for Alternative G1-2. The detailed costs for implementation of Alternative G1-2 are presented in Appendix G. The estimated net present-worth of Alternative G1-2 is approximately $3,223,000. The present-worth analysis assumed an O&M period of 100 years and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G1-2 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.1.3 Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and Institutional Controls

Alternative G1-3 would include in-situ bioremediation of perchlorate-impacted groundwater near the Station Boundary to minimize the potential for off-Station migration of perchlorate at concentrations exceeding its CG. The design configurations for the implementation of in-situ bioremediation near the Station Boundary may include a PRB or a groundwater recirculation loop.

Alternative G1-3 would also include implementation of ICs to attain the RAOs. ICs would be implemented as part of Alternative G1-3 to minimize exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG. Groundwater monitoring would be implemented to evaluate the effectiveness of in-situ bioremediation and to track the distribution of perchlorate in the area between the perchlorate Source Area and the Station Boundary.

A complete description of Alternative G1-3 is presented in Section 5.1.3.

Overall Protection of Human-Health and the Environment

Alternative G1-3 provides protection of human-health and the environment. The implementation of in-situ bioremediation using a PRB or a groundwater recirculation loop near the Station Boundary would minimize the potential for off-Station migration of perchlorate at concentrations exceeding its CG. The ICs implemented as a part of Alternative G1-3 would include groundwater use restrictions, thereby protecting human-health by minimizing the potential for exposure to perchlorate-impacted groundwater. The groundwater use restrictions would be implemented until perchlorate concentrations are reduced to less than it's CG.

Groundwater modeling conducted in support of this FS indicates that Alternative G1-3 may take a relatively long period of time to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG. Therefore, ICs would have to be implemented for a long time to protect human-health.

Compliance with ARARs

Alternative G1-3 would comply with all identified ARARs.

Long-Term Effectiveness and Permanence

The implementation of in-situ bioremediation near the Station Boundary would provide long-term effectiveness in reducing perchlorate concentrations in groundwater migrating off-Station. Therefore, in-situ bioremediation near the Station Boundary would minimize unacceptable risks to potential off-Station receptors in the long term. It would take a relatively long time for Alternative G1-3 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than 6 μg/L. Therefore, ICs including groundwater use restrictions would have to be implemented for a relatively long period of time in order for Alternative G1-3 to be effective in the long term. Once in-situ bioremediation near the Station Boundary reduces perchlorate concentrations to less than it's CG , residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health, and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume through Treatment

If properly designed and operated, the in-situ bioremediation implemented as part of Alternative G1-3 near the Station Boundary would completely destroy perchlorate in groundwater into innocuous products. Therefore, in-situ bioremediation near the Station Boundary would reduce toxicity, mobility, and volume of perchlorate through treatment.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community, or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G1-3 would have a short-term impact on site risks since installation of injection/extraction or monitoring wells would be required for implementation of in-situ bioremediation and groundwater monitoring. Well drilling would present a short-term risk of exposure of work crews to perchlorate-impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. The risks to on-site workers during the O&M phase of Alternative G1-3 are expected to be minimal; however, workers may get exposed to perchlorate-impacted groundwater if pumped aboveground. Adherence to standard health and safety procedures would minimize exposure to impacted groundwater.

The impacts to the environment due to implementation of Alternative G1-3 were evaluated through the qualitative SER analysis. This analysis indicated that environmental impacts associated with implementation of Alternative G1-3 are primarily expected due to activities such as drilling/installation of wells, subsurface injection of bioremediation reagent, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/GHG emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for a relatively long time), when compared to other activities.

Groundwater modeling conducted in support of this FS indicates it would take more than approximately 200 years for Alternative G1-3 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG.

Implementability

In-situ bioremediation using a PRB or a groundwater recirculation system is a mature, well-known technology and relatively easy to implement. Well drilling and well maintenance are routine activities and present little or no technical difficulties. The substrate and equipment required for

implementing in-situ bioremediation are also commercially available from many vendors. The pilot studies conducted at IRP Site 1 provide valuable data to optimize the design of the full-scale in-situ bioremediation.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analyses and data analysis required for in-situ bioremediation performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of the aquifer (if needed due to potential migration of untreated perchlorate) may require additional administrative effort since it may require careful coordination with State and local agencies.

Cost

RACER™ 2010 system Version 10.3.0 was used to generate a cost estimate for Alternative G1-3. The detailed costs for implementation of Alternative G1-3 are presented in Appendix G. The estimated net present-worth of Alternative G1-3 is approximately $9,378,000. The present-worth analysis assumed an O&M period of 100 years and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G1-3 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.1.4 Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and Institutional Controls

Alternative G1-4 would include implementation of in-situ bioremediation at the Source Area and near the Station Boundary. The implementation of in-situ bioremediation at the Source Area would treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize downgradient migration. The design configurations for the implementation of in-situ bioremediation at the Source Area may include a PRB, direct injection, or a groundwater recirculation system.

The implementation of in-situ bioremediation near the Station Boundary would minimize the potential for off-Station migration of perchlorate at concentrations exceeding its CG.

To attain the RAOs, Alternative G1-4 would also include implementation of ICs and groundwater monitoring. Groundwater monitoring would be conducted to evaluate the effectiveness of in-situ bioremediation and to track the distribution of perchlorate in the area between the Source Area and the Station Boundary. ICs would be implemented as part of Alternative G1-4 to minimize the potential for exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG.

A complete description of Alternative G1-4 is presented in Section 5.1.4.

Overall Protection of Human-Health and the Environment

Alternative G1-4 provides protection of human-health and the environment. Bioremediation of the perchlorate Source Area would reduce and minimize migration of relatively high concentrations of

perchlorate downgradient. In addition, in-situ bioremediation near the Station Boundary would minimize the potential for further off-Station migration of perchlorate at concentrations exceeding its CG.

Alternative G1-4 would rely on groundwater movement between the Source Area and the areas downgradient of the Source Area to the Station Boundary for remediation of perchlorate-impacted groundwater. ICs including groundwater use restrictions would minimize the potential for exposure to perchlorate posing unacceptable risk to human-health until the time perchlorate concentrations are reduced to less than it's CG.

Compliance with ARARs

Alternative G1-4 would comply with all identified ARARs.

Long-Term Effectiveness and Permanence

In-situ bioremediation at the Source Area would provide long-term effectiveness in reducing relatively high concentrations of perchlorate in the central portion of IRP Site 1. Alternative G1-4 would also include implementation of in-situ bioremediation near the Station Boundary, which is expected to provide long-term effectiveness in minimizing off-Station migration of perchlorate at concentrations exceeding its CG.

Groundwater modeling indicates that Alternative G1-4 would require a relatively long time-frame to remediate the perchlorate-impacted groundwater to concentrations less than the CG. Therefore, ICs including groundwater use restrictions would have to be implemented for a relatively long period of time in order for Alternative G1-4 to be effective in the long term. Once in-situ bioremediation at the Source Area and near the Station Boundary reduce perchlorate concentrations to less than, residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health, and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume through Treatment

If properly designed and implemented, bioremediation would completely destroy perchlorate in the Source Area and near the Station Boundary. Therefore, Alternative G1-4 would be effective in reducing toxicity, mobility, and volume of perchlorate in the Source Area and near the Station Boundary through treatment.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community, or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G1-4 would have a short-term impact on site risks, since installation of injection/extraction or monitoring wells would be required for implementation of in-situ bioremediation and groundwater monitoring. Well drilling would present a short-term risk of exposure of work crews to perchlorate-impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. The risks to on-site workers during the O&M phase of Alternative G1-4 are expected to be minimal; however, workers may get exposed to perchlorate-impacted groundwater if pumped aboveground. However, adherence to standard health and safety procedures would minimize exposure to impacted groundwater.

The impacts to the environment due to implementation of Alternative G1-4 were evaluated through the qualitative SER analysis. This analysis indicated that environmental impacts associated with implementation of Alternative G1-4 are primarily expected due to activities such as

drilling/installation of wells, subsurface injection of bioremediation reagent, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/GHG emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for a relatively long time), when compared to other activities.

Groundwater modeling conducted in support of this FS indicates it would take more than approximately 200 years for Alternative G1-4 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG.

Implementability

In-situ bioremediation using a PRB, a groundwater recirculation system, or direct injection is a mature, well-known technology and relatively easy to implement. Well drilling and well maintenance are routine activities and present little or no technical difficulties. The substrate and equipment required for implementing in-situ bioremediation are also commercially available from many vendors. The pilot studies conducted at IRP Site 1 provide valuable data to optimize the design of the full-scale in-situ bioremediation.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analyses and data analysis required for in-situ bioremediation performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of the aquifer (if needed due to potential migration of untreated perchlorate) may require additional administrative effort since it may require careful coordination with State and local agencies.

Cost

RACER™ 2010 system Version 10.3.0 was used to generate a cost estimate for Alternative G1-4. The detailed costs for implementation of Alternative G1-4 are presented in Appendix G. The estimated net present-worth of Alternative G1-4 is approximately $12,479,000. The present-worth analysis assumed an overall O&M period of 100 years, and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G1-4 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.1.5 Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and Institutional Controls

Alternative G1-5 consists of the following components:

- In-situ bioremediation at the perchlorate Source Area to treat and/or contain relatively high concentrations of perchlorate in groundwater and minimize their downgradient migration.
- In-situ bioremediation of perchlorate-impacted groundwater downgradient of the perchlorate Source Area between IRP Sites 1 and 2.

- In-situ bioremediation of perchlorate near the Station Boundary to minimize the potential for off-Station migration of perchlorate at concentrations exceeding its CG.
- Groundwater monitoring to evaluate the effectiveness of in-situ bioremediation and distribution of perchlorate along the estimated extent of perchlorate-impacted groundwater.
- ICs to minimize exposure of potential receptors to perchlorate-impacted groundwater until the concentrations of perchlorate are reduced below its CG.

A complete description of Alternative G1-5 is presented in Section 5.1.5.

Overall Protection of Human-Health and the Environment

Alternative G1-5 provides protection of human-health and the environment. The implementation of in-situ bioremediation at the perchlorate Source Area, downgradient of the Source Area, and near the Station Boundary would reduce perchlorate concentrations and minimize off-Station migration of perchlorate at concentrations exceeding its CG.

ICs including groundwater use restrictions would minimize the potential for exposure to perchlorate-impacted groundwater until perchlorate concentrations are reduced to less than it's CG.

Periodic groundwater monitoring would be conducted under Alternative G1-5 to evaluate the effectiveness of bioremediation in reducing perchlorate concentrations and to verify that perchlorate does not migrate off-Station at concentrations posing unacceptable risk. Therefore, Alternative G1-5 is protective of both potential on-Station and off-Station receptors.

Compliance with ARARs

Alternative G1-5 would comply with all identified ARARs.

Long-Term Effectiveness and Permanence

In-situ bioremediation of the Source Area would remediate relatively high concentrations of perchlorate. In addition, in-situ bioremediation in an area between IRP Sites 1 and 2 and near the Station Boundary would provide long-term effectiveness in further reducing perchlorate concentrations and minimizing its off-Station migration at concentrations exceeding its CG.

ICs including groundwater use restrictions would be required to protect potential receptors until the time perchlorate is remediated to concentrations less than it's CG.. Once Alternative G1-5 reduces perchlorate concentrations to less than it's CG, residual concentrations of perchlorate are not expected to pose unacceptable risk to human health, and ICs would not be needed.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative G1-5 includes in-situ bioremediation of perchlorate-impacted groundwater in the Source Area, downgradient of the Source Area, and near the Station Boundary. If properly designed and implemented, bioremediation would completely destroy perchlorate. Therefore, Alternative G1-5 would achieve a high degree of reduction in toxicity, mobility, or volume/mass of perchlorate through treatment.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community, or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G1-5 would have a short-term impact on site risks at IRP Site 1,

since installation of injection/extraction or monitoring wells would be required for implementation of in-situ bioremediation and groundwater monitoring. Well drilling would present a short-term risk of exposure of work crews to perchlorate-impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. The risks to on-site workers during the O&M phase of Alternative G1-5 are expected to be minimal; however, workers may get exposed to perchlorate-impacted groundwater if pumped aboveground. However, adherence to standard health and safety procedures would minimize exposure to impacted groundwater.

The impacts to the environment due to implementation of Alternative G1-5 were evaluated through the qualitative SER analysis. This analysis indicated that environmental impacts associated with implementation of Alternative G1-5 are primarily expected due to activities such as drilling/installation of wells, subsurface injection of bioremediation reagent, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/GHG emissions/energy use are expected to be the highest for drilling/installation of wells, when compared to other activities.

Groundwater modeling conducted in support of this FS indicates it would take approximately 19 years for Alternative G1-5 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG.

Implementability

In-situ bioremediation using a PRB, a groundwater recirculation system, or direct injection is a mature, well-known technology and relatively easy to implement. Well drilling and well maintenance are routine activities and present little or no technical difficulties. The substrate and equipment required for implementing in-situ bioremediation are also commercially available from many vendors. The pilot studies conducted at IRP Site 1 provide valuable data to optimize the design of the full-scale in-situ bioremediation.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analyses and data analysis required for in-situ bioremediation performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs. The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of the aquifer (if needed due to potential migration of untreated perchlorate) may require additional administrative effort since it may require careful coordination with State and local agencies.

Cost

RACER ™ 2010 system Version 10.3.0 was used to generate a cost estimate for Alternative G1-5. The detailed costs for implementation of Alternative G1-5 are presented in Appendix G. The estimated net present-worth of Alternative G1-5 is approximately $9,218,000. The present-worth analysis assumed an overall O&M period of 19 years, and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G1-5 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.1.6 ALTERNATIVE G1-6: HYDRAULIC CONTAINMENT/TREATMENT, MONITORING, AND INSTITUTIONAL CONTROLS

Alternative G1-6 would include installation of groundwater extraction wells along the estimated extent of IRP Site 1 perchlorate-impacted groundwater. Extracted groundwater would be treated using either of two technologies (i.e., FBR or IX). Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation. To attain the RAOs, ICs would be implemented until the time perchlorate is reduced to concentrations less than or equal to it's CG .

A complete description of Alternative G1-6 is presented in Section 5.1.6.

Overall Protection of Human-Health and the Environment

Alternative G1-6 would be protective of human-health and the environment. Extraction of perchlorate impacted groundwater and its ex-situ treatment would reduce perchlorate concentrations in groundwater and minimize its potential migration off-Station at concentrations exceeding its CG. Therefore, Alternative G1-6 would result in protection of potential off-Station receptors.

Alternative G1-6 would include implementation of ICs until the time perchlorate is reduced to concentrations less than or equal to it's CG. Therefore, Alternative G1-6 would minimize the potential for exposure of on-site receptors to perchlorate concentrations exceeding its CG.

Compliance with ARARs

Alternative G1-6 would comply with all identified ARARs.

Long-Term Effectiveness and Permanence

Although ex-situ treatment using FBR or IX is a proven technology for perchlorate, long-term effectiveness of Alternative G1-6 for remediation of perchlorate-impacted groundwater would largely depend on groundwater extraction rates. Aquifer tests conducted at IRP Sites 1 and 2 indicate that low groundwater extraction rates are expected at both sites. However, with a relatively large number of extraction wells, Alternative G1-6 would effectively remediate perchlorate-impacted groundwater and minimize its off-Station migration.

Effective implementation of ICs would be required to protect both potential on-Station and off-Station receptors until the time IRP Site 1 perchlorate-impacted groundwater is remediated to concentrations less than the CG. Once Alternative G1-6 reduces perchlorate concentrations to less than it's CG, residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health, and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume through Treatment

The groundwater extraction and ex-situ treatment using a FBR would completely destroy perchlorate in groundwater into innocuous end products and minimize its migration. Ex-situ treatment of perchlorate by IX would also reduce toxicity, mobility, and volume/mass of perchlorate in groundwater; however, perchlorate is not destroyed in the process but is merely transferred from groundwater into resin. Following exhaustion of capacity, spent resin would need disposal or regeneration. Operation of the FBR may also generate a small amount of waste in the form of biological solids. These wastes may be potentially disposed by discharging them into a sanitary sewer.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G1-6 would have a short-term impact on site risks at IRP Site 1, since installation of extraction wells, and groundwater conveyance and treatment systems would be required for groundwater extraction. Well drilling would present a short-term risk of exposure of work crews to perchlorate-impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. There is a risk for exposure of site workers to perchlorate-impacted groundwater when it is extracted and treated aboveground. However, adherence to standard health and safety procedures would minimize exposure to impacted groundwater.

The impacts to the environment due to implementation of Alternative G1-6 were evaluated through the qualitative SER analysis. This analysis indicated that environmental impacts associated with implementation of Alternative G1-6 are primarily expected due to activities such as drilling/installation of wells, construction of groundwater conveyance system, operation of groundwater extraction/conveyance/treatment system, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/GHG emissions/energy use are expected to be the highest for the operation of groundwater extraction, conveyance and treatment system, when compared to other activities.

Groundwater modeling conducted in support of this FS indicates that it would take 176 wells extracting groundwater at flow rates ranging from 0.3-gpm to 2 gpm to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG, in approximately 49 years.

Implementability

Groundwater extraction, ex-situ treatment, reinjection, and infiltration are all mature, well-known technologies. Well drilling and maintenance present little or no technical difficulties. FBR and IX have been used for ex-situ treatment of perchlorate at several sites across the Nation; therefore, equipment and materials for its implementation are readily available. Field tests may be required to determine design parameters for implementation of infiltration (if used for treated groundwater discharge).

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analyses and data analysis required for performance monitoring. Access to the site during the O&M phase can be through effective implementation of ICs.

Cost

RACER™ 2010 system Version 10.3.0 was used to generate a cost estimate for Alternative G1-6. The detailed costs for implementation of Alternative G1-6 are presented in Appendix G. The estimated net present-worth of Alternative G1-6 is approximately $24,280,000. The present-worth analysis assumed an O&M period of 49 years and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G1-6 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.3 COMPARATIVE ANALYSES OF ALTERNATIVES

The comparative analysis of remedial alternatives developed for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater is presented in the following sections. A ranking (poor, poor to fair, fair, fair to good, or good) is assigned to each alternative as a result of the evaluation. Tables 6-1 and 6-2 present a summary of individual and comparative analyses for IRP Sites 1 and 2, respectively.

6.3.1 Perchlorate-Impacted Groundwater at IRP Site 1

6.3.1.1 OVERALL PROTECTION OF HUMAN-HEALTH AND THE ENVIRONMENT

All alternatives, except Alternative G1-1 (No Action) provide adequate protection of human-health and the environment. Alternatives G1-2 through G1-6 protect human-health by providing varying degrees of treatment to reduce perchlorate concentrations in groundwater, and ICs and monitoring to minimize the potential for exposure to perchlorate-impacted groundwater.

Alternative G1-2 would rely on natural attenuation processes to reduce concentrations of perchlorate in groundwater. Alternative G1-3 includes implementation of in-situ bioremediation near the Station Boundary to minimize further off-Station migration of perchlorate at concentrations exceeding its CG. In addition to bioremediation near the Station Boundary, Alternatives G1-4 and G1-5 include the treatment of perchlorate Source Area to reduce and minimize downgradient migration of relatively high concentrations of perchlorate. Alternative G1-5 also includes implementation of in-situ bioremediation for remediation of perchlorate between the Source Area and the Station Boundary. Alternatives G1-6 would protect human-health by extraction and treatment of perchlorate-impacted groundwater.

All active alternatives (Alternatives G1-2 through G1-6) would include implementation of ICs including groundwater use restrictions until the remedial alternatives reduce concentrations of perchlorate to less than it's CG.

6.3.1.2 COMPLIANCE WITH ARARS

Since Alternative G1-1 entails no remedial action, ARARs would not be triggered. Alternatives G1-2 through G1-6 would comply with all identified ARARs.

6.3.1.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

This criterion evaluates the residual risk at the completion of remedial actions along with the adequacy and reliability of remedial alternatives for ensuring the continued protection of human-health and the environment. The more active remedial alternatives such as Alternatives G1-5 and G1-6 would provide a high degree of long-term effectiveness since they include comprehensive remediation of the IRP Site 1 perchlorate-impacted groundwater. Alternatives G1-5 and G1-6 are also expected to be more reliable and minimize off-Station migration of perchlorate-impacted groundwater at concentrations exceeding the CG. Groundwater modeling suggests that active remediation measures implemented as part of Alternatives G1-5 and G1-6 would significantly shorten the time required to remediate perchlorate-impacted groundwater to concentrations less than the CG compared to other remedial alternatives. Alternatives G1-3 and G1-4 include a relatively lesser degree of active remediation than Alternatives G1-5 and G1-6 and attain perchlorate CG in a much longer time period. Similarly, Alternative G1-2 relies on natural processes to reduce the risk and does not actively control the migration of perchlorate. As a result, Alternatives G1-2, G1-3, and G1-4 rely more on ICs to protect human-health and the environment as compared to Alternatives G1-5 and G1-6. The ICs are generally adequate and reliable; however, they do not offer the same degree of certainty, reliability and long-term protectiveness as afforded by active remedial technologies like

those proposed under Alternatives G1-5 and G1-6. Alternative G1-1 is expected to be the least effective in the long-term since it includes no monitoring or controls for minimizing or reducing exposure to perchlorate-impacted groundwater.

6.3.1.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternatives G1-5 and G1-6 are expected to achieve a higher degree of reduction in toxicity, mobility, or volume/mass of perchlorate as compared to the other alternatives since they include remediation at the Source Area, the area between IRP Sites 1 and 2, and the area near the Station Boundary. For Alternative G1-5, in-situ bioremediation would destroy perchlorate into innocuous end products. Alternative G1-6 includes comprehensive ex-situ treatment of the IRP Site 1 perchlorate-impacted groundwater and would achieve a high degree of reduction in toxicity, mobility, or volume/mass of perchlorate. However, the type and quantity of treatment residuals generated under Alternative G1-6 would be greater, compared to Alternative G1-5.

Alternatives G1-3 and G1-4 would provide a lesser degree of reduction in toxicity, mobility, or volume/mass of perchlorate compared to Alternatives G1-5 and G1-6 since these alternatives involve less aggressive remediation options. Since Alternative G1-4 includes in-situ bioremediation of relatively high concentrations of perchlorate in the Source Area, it is expected to reduce toxicity, mobility, and volume/mass of perchlorate to a greater degree compared to Alternative G1-3. Alternatives G1-2 would rely primarily on natural attenuation mechanisms to reduce perchlorate concentrations and toxicity in groundwater.

6.3.1.5 SHORT-TERM EFFECTIVENESS

The short-term effectiveness criterion includes risks to workers/community, or the environmental impacts during the construction and implementation phase of the remedial action, and the time required to achieve protectiveness. Since no remedial action would be implemented as part of Alternative G1-1, there would be no short-term risks to workers/community, or adverse environmental impacts due to remedial action implementation. For the remaining alternatives, the short-term effectiveness would be a function of risks to workers/community and environmental impacts during the remedial construction phase (e.g., drilling and substrate injection), and the O&M phase (e.g., transportation of personnel/equipment, treatment system operation, and potential for exposure to impacted groundwater). The risks to workers and environmental impacts associated with the alternatives were evaluated through a qualitative SER analysis. The scope of construction operations would be the largest for Alternative G1-6 as compared to other alternatives. In addition, environmental impacts during the O&M phase are also expected to be relatively high for Alternative G1-6 due to the operation of groundwater extraction, conveyance, and treatment systems. The short-term risks, associated with Alternatives G1-2 through G1-4 during the O&M phase are expected to be similar since they have similar O&M operations, and remediation time-frames. Based on the scope of remedial construction operations and resultant potential risks to workers/community and environmental impacts, Alternatives G1-2 would have relatively less impact as compared to Alternatives G1-3 and G1-4. Alternative G1-5 would have relatively less impact (i.e., provide a higher degree of short-term effectiveness) compared to all other active remediation alternatives (i.e., Alternatives G1-2 through G1-4, and Alternative G1-6). Although the scale of construction operations for Alternative G1-5 would be larger compared to Alternative G1-2 through G1-4, the risks to workers and environmental impacts during the O&M phase are expected to be considerably less due to a much shorter remediation time frame.

6.3.1.6 IMPLEMENTABILITY

This criterion primarily addresses the ability to construct and operate the alternative, the reliability and ability to monitor the alternative, and the availability of equipment and specialists necessary to

implement the alternatives. There is no action associated with Alternative G1-1 therefore implementation considerations are deemed to be good. For the active alternatives, Alternative G1-2 would be the simplest to construct and operate. Alternatives G1-3, G1-4, and G1-5 include in-situ bioremediation of perchlorate. Alternative G1-6 includes ex-situ treatment of perchlorate-impacted groundwater using a FBR or IX. Groundwater modeling indicates that a large number of extraction wells would be required under Alternative G1-6 for the treatment of perchlorate-impacted groundwater. Therefore, Alternative G1-6 is expected to be more complex to construct and operate compared to alternatives proposing in-situ bioremediation (Alternatives G1-3 through G1-5). The in-situ pilot studies provided valuable data for full-scale design and implementation of in-situ bioremediation proposed under Alternatives G1-3 through G1-5. Since the implementation of Alternative G1-5 involves more components and construction activities it would be more complex compared to Alternatives G1-3 and G1-4.

6.3.1.7 Cost

There are no costs associated with Alternative G1-1. A comparison of present-worth costs for the remaining alternatives indicates that the remedial alternative involving ex-situ treatment (i.e., Alternative G1-6) is most expensive. In comparison, the present-worth costs for in-situ treatment Alternatives (i.e., G1-3 through G1-5) that are expected to remediate perchlorate-impacted groundwater to concentrations less than the CG are relatively cheaper. The present-worth costs for Alternative G1-2 are the lowest.

6.3.1.8 State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

6.3.1.9 Community Acceptance

Community acceptance will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.3.2 VOC-Impacted Groundwater at IRP Site 2

6.3.2.1 Overall Protection of Human-Health and the Environment

All alternatives, except Alternative G2-1 (No Action) provide adequate protection of human-health and the environment. Alternatives G2-2 through G2-4 protect human-health by providing varying degrees of treatment and/or MNA to reduce VOC concentrations in groundwater, and ICs to minimize the potential for exposure to VOC-impacted groundwater.

Alternative G2-2 would rely on natural attenuation mechanisms such as dispersion, dilution, sorption, volatilization, and biodegradation to reduce concentrations of VOCs in groundwater. Alternatives G2-3 and G2-4 include implementation of in-situ remediation and ex-situ treatment of extracted groundwater, respectively, to treat VOCs in groundwater. All active alternatives (Alternatives G2-2 through G2-4) would include implementation of ICs including groundwater use restrictions until the remedial alternatives reduce concentrations of VOCs to less than their respective CGs.

6.3.2.2 Compliance with Applicable or Relevant and Appropriate Requirements

Since Alternative G2-1 entails no remedial action, ARARs would not be triggered. Alternatives G2-2 through G2-4 would comply with all identified ARARs.

Table 6-1: Summary of Individual and Comparative Analysis of Alternatives – IRP Site 1 Perchlorate-Impacted Groundwater[a]

Criterion	Alternative G1-1: No Action	Alternative G1-2: MNA and ICs	Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs	Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs	Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs
Overall Protection of Human-Health and the Environment	*Does not Meet the Criterion* Does not include provisions to evaluate fate of perchlorate including its migration off-Station and to take necessary protective measures for potential off-Station receptors. Additionally, this alternative does not reduce risks to potential on-site receptors due to potential exposure to perchlorate-impacted groundwater since no restrictions are imposed on the groundwater use.	*Meets the Criterion* Groundwater use restrictions implemented as part of this alternative would protect human-health by minimizing the potential for exposure to groundwater with perchlorate concentrations exceeding 6 μg/L. These restrictions would be implemented for the on-Station and off-Station portions of perchlorate-impacted groundwater until natural attenuation processes reduce perchlorate concentrations to less than the CG.	*Meets the Criterion* In-situ bioremediation near the Station Boundary would minimize the potential for further off-Station migration of perchlorate at concentrations exceeding 6 μg/L. The ICs including groundwater use restrictions would protect human-health by minimizing the potential for exposure to perchlorate-impacted groundwater. The groundwater use restrictions would be implemented until perchlorate concentrations are reduced to less than the CG the CG.	*Meets the Criterion* In-situ bioremediation of the perchlorate Source Area would reduce and minimize migration of relatively high concentrations of perchlorate downgradient. In addition, in-situ bioremediation near the Station Boundary would remediate perchlorate-impacted groundwater downgradient of the Source Area and minimize its off-Station migration at concentrations exceeding perchlorate CG. ICs including groundwater use restrictions would minimize the potential for exposure to perchlorate-impacted groundwater until perchlorate concentrations are reduced to less than the CG.	*Meets the Criterion* The implementation of in-situ bioremediation at the perchlorate Source Area, downgradient of the Source Area, and near the Station Boundary would reduce perchlorate concentrations and minimize potential off-Station migration of perchlorate at concentrations exceeding its CG. ICs including groundwater use restrictions would minimize the potential for exposure to perchlorate-impacted groundwater until perchlorate concentrations are reduced to less than the CG.	*Meets the Criterion* Extraction of perchlorate-impacted groundwater and its treatment using a FBR or IX would reduce perchlorate concentrations in groundwater and minimize potential off-Station migration of perchlorate at concentrations exceeding 6 μg/L. ICs including groundwater use restrictions would protect human-health until perchlorate concentrations are reduced to less than the CG.
Compliance with ARARs	*Not Applicable* Since no-action entails no remedial action, ARARs are not triggered.	*Meets the Criterion* Complies with ARARs.	*Meets the Criterion* Complies with ARARs.	*Meets the Criterion* Complies with ARARs.	*Meets the Criterion* Complies with ARARs.	*Meets the Criterion* Complies with ARARs.
Long-Term Effectiveness and Permanence	*Poor* As no remedial activities are proposed for controlling or reducing exposure to perchlorate-impacted groundwater, Alternative G1-1 cannot offer any level of effectiveness or permanence.	*Poor to Fair* Alternative G1-2 would provide long-term effectiveness in minimizing the potential for exposure to groundwater with perchlorate concentrations exceeding the CG provided ICs are implemented effectively. It would take relatively longer for MNA to remediate perchlorate-impacted groundwater to concentrations less than the CG. Therefore, ICs would have to be implemented for a relatively long period of time. Once MNA reduces perchlorate concentrations to less than its CG , residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health and ICs including groundwater use restrictions would not be needed.	*Fair* In-situ bioremediation near the Station Boundary would provide long-term effectiveness in reducing perchlorate concentrations in groundwater migrating off-Station, and protecting potential off-Station receptors. This alternative is more effective and reliable for treatment of perchlorate-impacted groundwater compared to Alternatives G1-1 and G1-2 because of the active remediation at the Station Boundary. Groundwater modeling suggests that ICs including groundwater use restrictions would have to be implemented for a relatively long period of time for Alternative G1-3 to be protective. Once Alternative G1-3 reduces perchlorate concentrations to less than the CG, residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health and ICs would not be needed.	*Fair to Good* In-situ bioremediation of the Source Area would provide long-term effectiveness in reducing relatively high concentrations of perchlorate. In addition, in-situ bioremediation near the Station Boundary would be effective in the long-term to minimize potential off-Station migration of perchlorate at concentrations exceeding its CG. This alternative is more effective and reliable for treatment of perchlorate-impacted groundwater compared to Alternatives G1-1 through G1-3 because of the larger scale of proposed active remediation and lesser reliance on ICs. Groundwater modeling suggests that ICs including groundwater use restrictions would have to be implemented for a relatively long period of time for Alternative G1-4 to be protective. Once Alternative G1-4 reduces perchlorate concentrations to less than the CG, residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health and ICs would not be needed.	*Good* In-situ bioremediation of the Source Area would remediate relatively high concentrations of perchlorate. In addition, in-situ bioremediation in an area between IRP Sites 1 and 2 and near the Station Boundary would provide long-term effectiveness in further reducing perchlorate concentrations and minimizing its potential off-Station migration at concentrations exceeding its CG. This alternative is more effective and reliable for treatment of perchlorate-impacted groundwater compared to Alternatives G1-1 through G1-4 because of the larger scale of proposed active remediation and lesser reliance on ICs. ICs including groundwater use restrictions would be implemented to minimize the potential for unacceptable exposure. Once Alternative G1-5 reduces perchlorate concentrations to less than the CG, residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health and ICs would not be needed.	*Good* The implementation of ex-situ remediation using a relatively large number of extraction wells would effectively remediate perchlorate-impacted groundwater and minimize its potential off-Station migration. This alternative is more effective and reliable for treatment of perchlorate-impacted groundwater compared to Alternatives G1-1 through G1-4 because of the larger scale of proposed active remediation and lesser reliance on ICs. ICs including groundwater use restrictions would be implemented to minimize the potential for unacceptable exposure. Once Alternative G1-6 reduces perchlorate concentrations to less than the CG, residual concentrations of perchlorate are not expected to pose unacceptable risk to human-health and ICs would not be needed.
Reduction in Toxicity, Mobility, and Volume through Treatment	*Poor* This alternative would not be effective in reducing toxicity, mobility, or volume of perchlorate through treatment.	*Poor* This alternative would rely on natural processes to reduce perchlorate concentrations and toxicity in groundwater. This alternative would not be as effective in reducing mobility and mass/volume of perchlorate in the aquifer.	*Poor to Fair* This alternative includes in-situ bioremediation of perchlorate-impacted groundwater near the Station Boundary. In-situ bioremediation is expected to completely destroy perchlorate. Therefore, Alternative G1-3 would achieve a high degree of reduction in toxicity, mobility, or volume/mass of perchlorate through treatment compared to Alternatives G1-1 and	*Fair* This alternative includes in-situ bioremediation of perchlorate-impacted groundwater in the Source Area and near the Station Boundary. In-situ bioremediation is expected to completely destroy perchlorate. Therefore, Alternative G1-4 would achieve a high degree of reduction in toxicity, mobility, or volume/mass of perchlorate through treatment	*Good* This alternative includes in-situ bioremediation of perchlorate-impacted groundwater in the Source Area, downgradient of the Source Area, and near the Station Boundary. In-situ bioremediation is expected to completely destroy perchlorate. Therefore, Alternative G1-5 would achieve a high degree of reduction in toxicity, mobility, or volume/mass of	*Fair to Good* Although, groundwater extraction rates at IRP Sites 1 and 2 are expected to be low, with a sufficient number of extraction wells, this alternative would reduce toxicity, mobility, or volume/mass of perchlorate in the groundwater. Alternative G1-6 would achieve a high degree of reduction in toxicity, mobility, or volume/mass of perchlorate through treatment

Criterion	Alternative G1-1: No Action	Alternative G1-2: MNA and ICs	Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs	Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs	Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs
			G1-2.	compared to Alternatives G1-1 through G1-3.	perchlorate through treatment compared to Alternatives G1-1 through G1-4. Alternative G1-5 is expected to generate lesser quantities of treatment residuals during implementation compared to Alternative G1-6.	compared to Alternatives G1-1 through G1-4. Treatment residuals such as spent IX resin or biological solids may be generated as a result of ex-situ treatment. These treatment residuals would require proper handling and /or disposal.
Short-Term Effectiveness	*Good* Alternative G1-1 would have no short-term impact on site risks. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact.	*Fair* Alternative G1-2 would have short-term impacts on site risks if it is determined that additional monitoring wells or other installations are needed for monitoring of groundwater. The risks to workers/community and environmental impacts for Alternative G1-2 are primarily expected due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. Groundwater modeling conducted in support of this FS indicates it would take more than approximately 200 years for Alternative G1-2 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG. Because of the relatively long predicted remediation time-frame, the pollutant/ green house gas (GHG) emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for relatively long time), when compared to other activities.	*Poor to Fair* Alternative G1-3 would have short-term impacts on site risks since installation of injection/extraction or monitoring wells would be required for implementation of in-situ bioremediation and groundwater monitoring. The risks to workers/community and environmental impacts for Alternative G1-3 are primarily expected due to activities such as drilling/installation of wells, subsurface injection of bioremediation reagent, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. The scope of construction operations for Alternative G1-3 exceeds Alternatives G1-1 and G1-2; therefore, Alternative G1-3 is less effective in short-term compared to Alternatives G1-1 and G1-2. Groundwater modeling conducted in support of this FS indicates it would take more than approximately 200 years for Alternative G1-3 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG. Because of the relatively long predicted remediation time-frame, the pollutant/ GHG emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for a relatively long time), when compared to other activities.	*Poor to Fair* Alternative G1-4 would have short-term impacts on site risks, since installation of injection/extraction or monitoring wells would be required for implementation of in-situ bioremediation and groundwater monitoring. The risks to workers/community and environmental impacts for Alternative G1-4 are primarily expected due to activities such as drilling/installation of wells, subsurface injection of bioremediation reagent, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. The scope of construction operations for Alternative G1-4 exceeds Alternatives G1-1 and G1-2; therefore, Alternative G1-4 is less effective in the short-term compared to Alternatives G1-1 and G1-2 Groundwater modeling conducted in support of this FS indicates it would take more than approximately 200 years for Alternative G1-4 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG. Because of the relatively long predicted remediation time-frame, the pollutant/ GHG emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for a relatively long time), when compared to other activities.	*Fair to Good* Alternative G1-5 would have short-term impacts on site risks, since installation of injection/extraction or monitoring wells would be required for implementation of in-situ bioremediation and groundwater monitoring. The risks to workers/community and environmental impacts for Alternative G1-5 are primarily expected due to activities such as drilling/installation of wells, subsurface injection of bioremediation reagent, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. The pollutant/ GHG emissions/energy use are expected to be the highest for drilling/installation of wells, when compared to other activities. Groundwater modeling conducted in support of this FS indicates it would take approximately 19 years for Alternative G1-5 to remediate IRP Site 1 perchlorate-impacted groundwater to concentrations less than the CG. Therefore, although the scope of construction operations for Alternative G1-5 would be greater compared to Alternatives G1-2 through G1-4, the risks to workers/community and environmental impacts over the duration of implementation of Alternative G1-5 are expected to be less due to a shorter remediation time-frame.	*Poor* Alternative G1-6 would have short-term impacts on site risks, since installation of extraction/monitoring wells and conveyance/treatment system would be required. The risks to workers/community and environmental impacts for Alternative G1-6 are primarily expected due to activities such as drilling/installation of wells, construction of groundwater conveyance system, operation of groundwater extraction/conveyance/ treatment system, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. The pollutant/ GHG emissions/energy use are expected to be the highest for the operation of groundwater extraction, conveyance and treatment system, when compared to other activities. The scope of construction operations is greatest for Alternative G1-6 compared to the remaining alternatives. Therefore, Alternative G1-6 is less effective in the short-term compared to the remaining alternatives. Groundwater modeling indicates it would take approximately 49 years for Alternative G1-6 to remediate perchlorate-impacted groundwater to concentrations less than the CG.
Implementability	*Good* There are no implementability concerns associated with Alternative G1-1 since no action would be taken.	*Fair to Good* Alternative G1-2 is simplest to construct and operate when compared to active remediation technologies proposed under Alternatives G1-3 through G1-6. Well drilling and well maintenance required for MNA implementation are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data interpretation. The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of perchlorate-impacted	*Fair* Alternative G1-3 includes in-situ bioremediation of perchlorate near the Station Boundary and groundwater monitoring. The implementation of Alternative G1-3 would be more complex compared to Alternatives G1-1 and G1-2 since it involves more components and construction activities. Well drilling and well maintenance required for in-situ bioremediation and groundwater monitoring are routine activities and present little or no technical difficulties. The substrate and equipment required for implementing in-situ bioremediation are also commercially available from many vendors. The pilot studies conducted at IRP Site 1 provide valuable data to optimize the design of the full-scale in-	*Fair* Alternative G1-4 includes in-situ bioremediation of perchlorate at the Source Area and near the Station Boundary, and groundwater monitoring. The implementation of Alternative G1-4 would be more complex compared to Alternatives G1-1 and G1-2 since it involves more components and construction activities. Well drilling and well maintenance required for in-situ bioremediation and groundwater monitoring are routine activities and present little or no technical difficulties. The substrate and equipment required for implementing in-situ bioremediation are also commercially available from many vendors. The pilot studies conducted at IRP Site 1 provide valuable data to	*Poor to Fair* Alternative G1-5 includes in-situ bioremediation of perchlorate at the Source Area, area between IRP Sites 1 and 2, and near the Station Boundary; and groundwater monitoring. The implementation of Alternative G1-5 would be more complex compared to Alternatives G1-1 through G1-4 since it involves more components and construction activities. Well drilling and well maintenance required for in-situ bioremediation and groundwater monitoring are routine activities and present little or no technical difficulties. The substrate and equipment required for implementing in-situ bioremediation are also commercially available from many vendors. The pilot studies conducted at	*Poor* Alternative G1-6 includes ex-situ treatment of perchlorate-impacted groundwater using a FBR or IX. The groundwater modeling indicates that a large number of extraction wells would be required under Alternative G1-6 for the treatment of perchlorate-impacted groundwater. Therefore, Alternative G1-6 is expected to be more complex to construct and operate compared to the remaining alternatives (G1-1 through G1-5). Groundwater extraction, ex-situ treatment, reinjection, and infiltration are all mature, well-known technologies. Well drilling and maintenance present little or no technical difficulties. FBR and IX have been used for ex-situ treatment of perchlorate at several sites across

Criterion	Alternative G1-1: No Action	Alternative G1-2: MNA and ICs	Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs	Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs	Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs	Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs
		groundwater (if required) may require careful coordination with State and local agencies.	situ bioremediation. The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of perchlorate-impacted groundwater (if required) may require careful coordination with State and local agencies.	optimize the design of the full-scale in-situ bioremediation. The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of perchlorate-impacted groundwater (if required) may require careful coordination with State and local agencies.	IRP Site 1 provide valuable data to optimize the design of the full-scale in-situ bioremediation. The implementation of ICs for the on-Station portion of perchlorate-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of perchlorate-impacted groundwater (if required) may require careful coordination with State and local agencies.	the Nation; therefore, equipment and materials for its implementation are readily available.
State Acceptance	The State comments will be formally presented in the Proposed Plan and documented in the ROD.					
Community Acceptance	Community acceptance will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.					
Present Worth Cost[b]	*Not Applicable* No cost	*Good* $3,223,000[c]	*Fair to Good* $9,378,000[c]	*Poor to Fair* $12,479,000[c]	*Fair to Good* $9,218,000[d]	*Poor* $24,280,000[e]
Total Cost	Not Applicable	$9,267,000	$26,358,000	$29,546,000	$11,187,000	$40,383,000

Notes:
[a] The assigned ratings are comparative for the remedial alternatives.
[b] Alternative with least cost was rated as good.
[c] The present worth analysis was performed assuming an O&M period of 100 years and a discount rate of 2.8 percent.
[d] The present worth analysis was performed assuming an O&M period of 19 years and a discount rate of 2.8 percent.
[e] The present worth analysis was performed assuming an O&M period of 49 years and a discount rate of 2.8 percent.
µg/L = micrograms per liter
IX = ion exchange
ARAR = applicable or relevant and appropriate requirement
CG = cleanup goal
GHG = green house gas
FBR = fluidized bed reactor
FS = feasibility study
IC = institutional control
IRP = Installation Restoration Program
MNA = monitored natural attenuation
O&M = operation and maintenance
ROD = Record of Decision

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
47	nine evaluation criteria identified in the NCP	Section 2.8.2.1	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Section 6.1 and Figures 5-3 through 5-6. AECOM. April 2011.

6. Detailed Analysis of Alternatives

The NCP (40 C.F.R. § 300.430 [e][9][i] and [ii]) requires that a detailed analysis of remedial alternatives be conducted during the FS based on the nine evaluation criteria identified in 40 C.F.R. § 300.430 (e)(9)(iii). The results of the detailed analysis provide the basis for identifying a preferred alternative and preparing the Proposed Plan.

The detailed analysis of remedial alternatives for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater is presented in the following sections. Section 6.1 provides a brief description of each of the nine evaluation criteria. Sections 6.2.1 and 6.2.2 provide an assessment and a summary profile of each alternative against the evaluation criteria for IRP Sites 1 and 2, respectively. Sections 6.3.1 and 6.3.2 present comparative analysis among the alternatives to evaluate the relative performance of each alternative with respect to each evaluation criteria for IRP Sites 1 and 2, respectively.

6.1 Evaluation Criteria – IRP Sites 1 and 2

The nine evaluation criteria identified in the NCP (40 C.F.R. § 300.430 [e][9][iii]) are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied by each alternative and relate directly to statutory findings that must ultimately be made in the ROD. The two threshold criteria include:

- Overall protection of human-health and the environment, and
- Compliance with ARARs.

The primary balancing criteria are used to weigh major tradeoffs among alternatives and include the following:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability; and
- Cost.

The modifying criteria are taken into account following comments on the FS Report and Proposed Plan, and are addressed once a final decision is being made and the ROD is being prepared. The modifying criteria include:

- State acceptance; and
- Community acceptance.

Each of the nine evaluation criteria is summarized in the following sections.

6.1.1 Overall Protection of Human-Health and the Environment

Protection of human-health and the environment is accomplished by eliminating, reducing, or controlling exposure to contaminants to the levels established during development of the remediation

goals. This criterion is an evaluation of how each alternative protects human-health and the environment, in both the short-term and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site. In particular, this criterion reflects whether risks are reduced.

6.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Under this criterion, the alternatives are evaluated to determine whether they attain applicable or relevant and appropriate requirements under Federal environmental laws and State environmental or facility siting laws or provide grounds for invoking a waiver.

6.1.3 Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of risk remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. Factors that are considered, as appropriate, include the following:

- Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities.
- Adequacy and reliability of controls such as containment systems and ICs that are necessary to manage treatment residuals and untreated waste.

6.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion evaluates alternatives based on the degree to which they employ recycling or treatment that reduces toxicity, mobility, or volume. This includes how treatment is used to address the principal threats posed by the site. Factors that are considered include the following:

- The treatment or recycling processes the alternatives employ and materials they will treat;
- The amount of contaminants that will be destroyed, treated, or recycled;
- The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reductions are occurring;
- The degree to which the treatment is irreversible;
- The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate such hazardous substances and their chemicals; and
- The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

6.1.5 Short-Term Effectiveness

Under this criterion, alternatives are evaluated with respect to their effects on human-health and the environment during implementation of the remedial action. The short-term impacts of alternatives are evaluated considering the following:

- Short-term risks that might be posed to the community during implementation of an alternative;

- Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;

- Potential environmental impacts with respect to sustainability metrics (i.e., emission of pollutants and greenhouse gases) of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and

- Time until protection is achieved.

6.1.6 Implementability

The implementability evaluation of the alternatives was based on the following factors:

- Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.

- Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions);

- Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to get any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

6.1.7 Cost

The types of costs that are evaluated include the following:

- Capital costs, including both direct and indirect costs;

- Annual O&M costs; and

- Net present value of capital and O&M costs.

Cost estimates for remedial alternatives for perchlorate-impacted groundwater at IRP Site 1 and VOC-impacted groundwater at IRP Site 2 were generated using Remedial Action Cost Engineering Requirements (RACER™ 2010) system Version 10.3.0. The cost backup including underlying assumptions and quantities for cost estimates, and an individual cost summary for each remedial action alternative considered for detailed analysis in this FS are presented in Appendix G. The cost estimates were generated for remedial alternatives based on the conceptual design conducted using the available site characterization information for IRP Sites 1 and 2. The cost estimates generated in this FS are for comparison purposes only and are of sufficient level of accuracy to conduct comparative analysis of remedial alternatives based on costs.

6.1.8 State Acceptance

The criterion evaluates the State acceptance by considering the following:

- The State's position and key concerns related to the preferred alternative and other alternatives; and

- State comments on ARARs or the proposed use of waivers.

6.1.9 Community Acceptance

This evaluation includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This evaluation may not be completed until comments on the Proposed Plan are received.

6.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

6.2.1 Perchlorate-Impacted Groundwater at IRP Site 1

6.2.1.1 ALTERNATIVE G1-1: NO ACTION

Under the No Action Alternative, no deliberate actions would be undertaken to address IRP Site 1 perchlorate-impacted groundwater. Naturally attenuation processes such as dilution and dispersion would be acting to reduce the concentrations of perchlorate in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, perchlorate would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to perchlorate-impacted groundwater. This alternative would allow continued migration of perchlorate-impacted groundwater towards the Station Boundary. Groundwater modeling indicates that in the absence of active remediation/containment measures, perchlorate would likely migrate off-Station at concentrations exceeding its CG and posing unacceptable risk to human-health. In addition, under the No Action Alternative there would be no way to evaluate fate of perchlorate including its potential migration off-Station and to take necessary protective measures for potential off-Station receptors. Alternative G1-1 does not reduce risks to potential on-site receptors due to exposure to perchlorate-impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with ARARs

Since Alternative G1-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G1-1 affords little long-term effectiveness and permanence since it includes no controls for minimizing or reducing exposure to perchlorate-impacted groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dilution and dispersion would continue to act to reduce perchlorate concentrations in groundwater. However, there would be no way to evaluate the effectiveness of these mechanisms in reducing perchlorate concentrations.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative G1-1 would not be effective in reducing perchlorate toxicity, mobility and/or volume in groundwater through treatment. Natural processes such as dilution and dispersion would be the primary processes acting to reduce perchlorate concentrations in groundwater. However, there would be no way to evaluate fate of perchlorate including its migration off-Station.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
48	all identified ARARs	Section 2.8.2.1	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix G, Tables A2-2, A2-3, A3-1, A3-2, A4-1, and A4-2. AECOM. April 2011.

Table A2-2
Potential Federal Chemical-Specific[a] ARARs by Medium

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Safe Drinking Water Act (42 U.S.C., ch. 6A, § 300[f]–300[j]-26)[c]				
National primary drinking water standards are health-based standards for public water systems (MCLs).	Public water system.	40 C.F.R., 141.61(a)	Relevant and Appropriate (for IRP Site 2 groundwater response action only)	MCLs for VOCs reported in groundwater are considered to be relevant and appropriate requirements for IRP Site 2 groundwater that is a potential source of drinking water. Federal MCL has not been promulgated for the COC for the groundwater remedial action at IRP Site 1 i.e. perchlorate.
MCLGs pertain to known or anticipated adverse health effects (also known as recommended MCLs).	Public water system.	40 C.F.R. § 141.50	Relevant and Appropriate (for IRP Site 2 groundwater response action only)	MCLGs for VOCs reported in groundwater set at levels above zero are considered to be relevant and appropriate requirements for IRP Site 2 groundwater that is a potential source of drinking water (40 C.F.R. § 300.430[e][2][I][B]-[D]). MCLG has not been promulgated for the COC for the groundwater remedial action at IRP Site 1 i.e. perchlorate.
National secondary drinking water regulations are standards for the aesthetic qualities of public water systems (SMCLs).	Public water system.	40 C.F.R. § 143.3	Not an ARAR	SMCLs are federal contaminant levels intended as guidelines for the states. Because they are not enforceable, federal SMCLs are not ARARs.
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste.	Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether waste is hazardous.

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Groundwater protection standards: Owners/operators of RCRA treatment, storage, or disposal facilities must comply with conditions in this section that are 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 Cal. Code Regs. tit. 22, § 66264.94 in the uppermost aquifer underlying the waste management area of concern at the POC.	A regulated unit that receives or has received hazardous waste before 26 July 1982 or regulated units that ceased receiving hazardous waste prior to 26 July 1982 where constituents in or derived from the waste may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b)	Relevant and Appropriate	Potentially relevant and appropriate for groundwater monitoring at IRP Sites 1 and 2. The groundwater will be cleaned up to lesser of the federal MCL, federal *non-zero* MCLGs, and California MCL.
The POC is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends through the uppermost aquifer underlying the regulated unit	Hazardous waste treatment or disposal.	Cal. Code Regs. tit. 22, § 66264.95	Not an ARAR	The proposed remedial action would eliminate exposure and reduce concentrations of COCs to levels that do not result in unacceptable risk to human health.
Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C., ch. 103, §§ 9601–9675)[c]				
ACLs using a point of exposure beyond the facility boundary.	Known or projected points of entry from groundwater to surface water.	CERCLA Section 121(d)(2)(B)(ii) 42 U.S.C., ch. 103, § 9621	Not an ARAR	There is no known discharge of groundwater to surface water in the vicinity of the IRP Sites 1 and 2. Therefore, exposure-based CERCLA ACLs are not considered to be ARARs for this action.

(table continues)

Table A2-2 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
Clean Water Act of 1977, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)[c]				
National Recommended Water Quality Criteria.	Discharges to waters of the United States and groundwater.	33 U.S.C. § 1314(a)	Relevant and Appropriate	Relevant and appropriate if response actions at IRP Sites 1 and 2 include discharges to ground or surface water as a result of this remedial action.
Water quality standards. National Toxics Rule (NTR) and California Toxics Rules (NTR).	Discharges to waters of the United States.	40 C.F.R. § 131.36(b) and 131.38	Relevant and Appropriate	Relevant and appropriate if response actions at IRP Sites 1and 2 include discharges to ground or surface water as a result of this remedial action.
Nuclear Regulatory Commission (NRC) [c]				
Radiological criteria for license termination under unrestricted use and alternate criteria for license termination.	Existing NRC-licensed radioactive waste-contaminated site.	10 C.F.R. §§ 20.1402, 20.1403, and 20.1404	Not an ARAR	The cited regulations do not constitute potential ARARs for response actions at IRP Sites 1 and 2 since the radioactive constituents are not COCs for groundwater at the site.
NRC Standards for Protection Against Radiation	Existing NRC-licensed site.	10 C.F.R. §§ 20.1001 – 20.2402	Not an ARAR	The cited regulations do not constitute potential ARARs for response actions at IRP Sites 1 and 2 since the radioactive constituents are not COCs for groundwater at the site.
SOIL				
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste.	Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether the soil cuttings generated as a result of well development at IRP Sites 1 and 2 is hazardous.

(table continues)

Table A2-2 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
LDRs prohibit disposal of hazardous waste unless treatment standards are met.	Hazardous waste land disposal.	Cal. Code Regs. tit. 22, § 66268.1(f)	Applicable	During remedial action at IRP Sites 1 and 2, LDRs are potentially applicable to surface discharge of treated groundwater or waste residuals under Alternatives G1-6 and G2-4 if the extracted groundwater is classified as hazardous waste.

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

Acronyms/Abbreviations:
ACL – alternative concentration limit
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – *Code of Federal Regulations*
ch. – chapter
Fed. Reg. – *Federal Register*
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
NCP – National Oil and Hazardous Substances Pollution Contingency Plan
POC – point of compliance
RCRA – Resource Conservation and Recovery Act
§ – section
SMCL – secondary maximum contaminant level
TCLP – toxicity characteristic leaching procedure
tit. – title
U.S.C. – *United States Code*

Table A2-3
Potential State Chemical-Specific[a] ARARs by Medium

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Cal/EPA Department of Toxic Substances Control[c]				
Definition of "non-RCRA hazardous waste."	Waste.	Cal. Code Regs. tit. 22, § 66261.3(a)(2)(C) or 66261.3(a)(2)(F), 66261.22(a)(3) and (4), 66261.24(a)(2)–(a)(8), 66261.101(a)(1) and (a)(2)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste.
State MCL list (Organics).	Source of drinking water.	Cal. Code Regs. tit. 22, § 64444	Relevant and Appropriate (for IRP Site 2 groundwater response action only)	Like federal MCLs, these are tap water standards and are relevant and appropriate since aquifer underlying IRP Site 2 is a Class II aquifer.
State MCL list (Inorganics).	Source of drinking water.	Cal. Code Regs. tit. 22, § 64431 (Perchlorate MCL of 6 µg/L)	Relevant and Appropriate (for IRP Site 1 groundwater response action only)	Like federal MCLs, these are tap water standards and are relevant and appropriate since aquifer underlying IRP Site 1 is a Class II aquifer.
State secondary MCL list.	Source of drinking water.	Cal. Code Regs. tit. 22, § 64449(a)	Not an ARAR	Secondary MCLs have not been promulgated for the COCs reported in groundwater at IRP Sites 1 and 2.

Table *A*2-3 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
		GROUNDWATER AND SOIL		
Requires that solid non-hazardous wastes containing perchlorate be disposed of in either a hazardous waste landfill or a composite-lined portion of a non-hazardous waste landfill that meets all requirements applicable to disposal of municipal solid waste in California after October 9, 1993.	Perchlorate containing non-hazardous waste	Cal. Code Regs. tit. 22, div 4.5, Ch 33, §67384.10(a)	Not an ARAR	The requirements pertain to off-site actions and ARARs need to be identified only for on-site response actions. Off site actions will need to comply with all the applicable regulations.
State and Regional Water Quality Control Boards[c]				
Describes findings and declarations regarding protection of quality of waters of the state. Includes declaration for regulation of activities and factors which may affect water quality and statewide program for the control of the quality of all the waters of the state.		Cal. Water Code, div. 7, § 13000	Not an ARAR.	This statutory provision does not in itself establish or contain substantive environmental "standards, requirements, criteria, or limitations" and therefore does not meet the definition of an ARAR.
Establishes requirements for content of the State policy for water quality control.		Cal. Water Code, div. 7, § 13142	Not an ARAR.	This statutory provision sets forth requirements for contents of the state policy for water quality control and is procedural in nature. It does not in itself establish or contain substantive environmental "standards, requirements, criteria, or limitations" pertaining to actions of the DON at IRP Sites 1 and 2. Therefore, it does not meet the definition of an ARAR.
Establishes requirements that the environmental analysis of materials be performed in a State-certified laboratory.		Cal. Water Code, div. 7, § 13176	Not an ARAR	This statutory provision sets forth requirements for environmental analysis of materials and is procedural in nature. It does not in itself establish or contain substantive environmental "standards, requirements, criteria, or limitations" pertaining to actions of the DON at IRP Sites 1 and 2. Therefore, it does not meet the definition of an ARAR.

Table *A*2-3 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER AND SOIL				
Describes the water basins in San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes WQOs, including narrative and numerical standards, establishes implementation plans to meet WQOs and protect beneficial uses, and incorporates statewide water quality control plans and policies.		Comprehensive Water Quality Control Plan for the Santa Ana Region (Basin Plan) (Cal. Water Code § 13240)	Relevant and Appropriate	Substantive requirements pertaining to beneficial uses, WQOs, and certain statewide water quality control plans are potential state ARARs for the surface water and groundwater components of this response action.
Authorizes the SWRCB and RWQCB to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.		Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269 (Identified for IRP Sites 1 and 2), and 13360 (Identified for IRP Site 2 only) (Porter-Cologne Act)	Applicable	The DON accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, WQOs, waste discharge requirements, promulgated policies of the Basin Plan for the Santa Ana Region, as potential ARARs.
Requires cleanup and abatement of conditions of pollution or nuisance or threatened pollution or nuisance.		California Water Code Chapter 5, Article 1 (Cal. Water Code § 13300-13308)	Not an ARAR	These statutory provisions set forth requirements for cleanup and abatement of conditions of pollution or nuisance or threatened pollution or nuisance and enforcement; and are procedural in nature. They do not in themselves establish or contain substantive environmental “standards, requirements, criteria, or limitations” pertaining to actions of the DON at IRP Sites 1 and 2. Therefore, these statutory provisions do not meet the definition of an ARAR.

Table *A*2-3 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
Specifies the requirements for water wells, monitoring wells, and cathodic protection wells.		California Water Code, Chapter 10, Article 3 (Cal. Water Code § 13750.5-13755)	Not an ARAR	These statutory provisions set forth requirements for water wells, monitoring wells, and cathodic protection wells; and are procedural in nature. They do not in themselves establish or contain substantive environmental "standards, requirements, criteria, or limitations" pertaining to actions of the DON at IRP Sites 1 and 2. Therefore, these statutory provisions do not meet the definition of an ARAR.
Establishes the policy that high-quality waters of the state "shall be maintained to the maximum extent possible" consistent with the "maximum benefit to the people of the State." It provides that whenever the existing quality of water is better than that required by applicable water quality policies, such existing high-quality water will be maintained until it has been demonstrated to the state that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies. It also states that any activity that produces or may produce a waste or increased volume or concentration of waste and that discharges or proposes to discharge to existing high-quality waters will be required to meet waste-discharge requirements that will result in the best practicable treatment or control of the discharge.		Statement of Policy With Respect to Maintaining High Quality of Waters in California, SWRCB Res. 68-16	Not an ARAR	The DON has determined that SWRCB Res. 68-16 is not a chemical-specific ARAR for determining response action goals (See Section A2.2.1.2 for discussion). However, SWRCB Res. 68-16 is an action-specific ARAR for regulating discharged treated groundwater back into the aquifer and has been explained in Table A4-2.

Table *A*2-3 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
Describes requirements for RWQCB oversight of investigation and cleanup and abatement activities resulting from discharges of hazardous substances. RWQCB may decide on cleanup and abatement goals and objectives for the protection of water quality and beneficial uses of water within each region. Establishes criteria for "containment zones" where cleanup to established water-quality goals is not economically or technically practicable.		Policies and procedures for investigation and cleanup and abatement of discharges under Cal. Water Code § 13304, SWRCB Res. 92-49	Not an ARAR	Not more stringent than *Cal. Code Regs. tit. 22, § 66264.94(c).* See Section A2.2.1.2 for additional discussion.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the TDS is greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best economically achievable treatment practices.		SWRCB Res. 88-63 (Sources of Drinking Water Policy) and Regional Board Resolution 89-42	Applicable	Substantive requirements are potential ARARs. The aquifer underlying IRP Sites 1 and 2 does not meet the exclusion criteria specified in the Res. 88-63, and therefore is a potential drinking water source.
Establishes concentration limits for cleanup actions, including groundwater, surface water, and the unsaturated zones for other than hazardous waste at background. Allows a higher cleanup limit (but not to exceed MCLs) if background is not technically or economically achievable.		Cal. Code Regs. tit. 27, §§ 20380(a); 20400(a), (c), (d), (e), and (g)	Not an ARAR	Not more stringent than federal regulations at Cal. Code Regs. tit. 22, § 66264.94. See Section A2.2.1.2 for additional discussion.
Definitions of designated waste, nonhazardous waste, and inert waste.		Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230	Applicable	Potential ARARs for classifying waste and determining ARAR status of other requirements.

Table *A*2-3 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
The California Department of Health Services drinking water notification level for 1,2,3-Trichloropropane is 0.005 µg/L. If the notification levels are exceeded, notification of the local governing bodies is required. Additionally consumer notification and drinking water source removal (if chemical is present at concentrations 10 to 100 times the notification level) are recommended.		1,2,3-Trichloropropane Notification Level and Monitoring Results - California Department of Health Services (CDHS 2005)	Not an ARAR	IRP Site 2 aquifer is not presently used as a drinking water source. Therefore, the requirements and recommendations of the notification level for 1,2,3-TCP are not TBCs for IRP Site 2 groundwater response action. However, DON will continue to conduct monitoring for 1,2,3-TCP as a part of IRP Site 2 groundwater response action
Dischargers shall be responsible for accurate characterization of wastes, including determinations of whether or not wastes will be compatible with containment features and other wastes at a Unit, and whether or not wastes are required to be managed as hazardous wastes under Chapter 11 of Division 4.5 of Title 22 of this code.		Cal. Code Regs. tit. 27, §§ 20200(c)	Applicable (for IRP Site 1 groundwater response action only)	Applicable for accurate characterization of wastes.
California Department of Health Services [c]				
Standards for Protection from Radiation. This regulation incorporates 10 C.F.R. §§ 20.1001 – 20.2402 and Appendices A – F by reference.	Not exempt under Cal. Code Regs. tit. 17, §§ 30180, 30257, and other section of Cal. Code Regs. tit. 17.	Cal. Code Regs. tit. 17, § 30253	Not an ARAR	The cited regulations do not constitute potential ARARs for response actions at IRP Sites 1 and 2 since the radioactive constituents are not COCs for groundwater at the site.

Table *A*2-3 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
California Ambient Air Quality Standards (CAAQS)				
CAAQS for ambient air quality to protect public health and welfare.	Contamination of air affecting public health and welfare.	Cal. Code Regs. tit. 17, § 70200	Not an ARAR	CAAQS are not enforceable in and of themselves; they are translated into source-specific emissions limitations by the state. In addition, fugitive dust emissions of particulate matter are not expected during the groundwater response action.

Notes:

[a] many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables

[b] only the substantive provisions of the requirements cited in this table are potential ARARs

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

Acronyms/Abbreviations:

ARAR – applicable or relevant and appropriate requirement
Basin Plan – Water Quality Control Plan (RWQCB Region) Basin
Cal. Code Regs. – *California Code of Regulations*
Cal/EPA – California Environmental Protection Agency
Cal. Water Code – *California Water Code*
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – *Code of Federal Regulations*
div. – division
DON – Department of the Navy
gpd – gallons per day
MCL – maximum contaminant level
millirem/year – millirem per year
NPDES – National Pollutant Discharge Elimination System
OU – operable unit
pCi/L – picocuries per liter

Porter-Cologne Act – Porter-Cologne Water Quality Control Act
ppm – parts per million
RCRA – Resource Conservation and Recovery Act
Res. – Resolution
RWQCB – (California) Regional Water Quality Control Board
§ – section
SIP – State Implementation Plan
SWRCB – (California) State Water Resources Control Board
TDS – total dissolved solids
tit. – title
WQO – water quality objective

Table A3-1
Potential Federal Location-Specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
National Historic Preservation Act of 1966, as Amended (16 U.S.C. § 470–470x-6)[b]					
Historic project owned or controlled by federal agency	Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	Property included in or eligible for the National Register of Historic Places.	16 U.S.C. § 470–470x-6 36 C.F.R. pt. 800 40 C.F.R. § 6.301(b)	Not an ARAR	Historic properties at MCAS El Toro including properties listed on or eligible for listing on the National Register of Historic Places are not located on or in the vicinity of IRP Sites 1 and 2.
Archaeological and Historic Preservation Act (16 U.S.C. § 469–469c-1)[b]					
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Construction on previously undisturbed land would require an archaeological survey of the area. Data recovery and preservation would be required if significant archaeological or historical data were found on-site. The responsible official or Secretary of the Interior is authorized to undertake data recovery and preservation.	Regulated alteration of terrain caused as a result of a federal construction project or federally licensed activity or program where action may cause irreparable harm, loss, or destruction of significant artifacts.	16 U.S.C. § 469–469c-1 40 C.F.R. § 6.301(c)	Not an ARAR	Archaeological or historical resources are not known to exist on or in the vicinity of IRP Sites 1 and 2.
Historic Sites, Buildings, and Antiquities Act of 1935 (16 U.S.C. §§ 461–467)[b]					
Historic sites	Avoid undesirable impacts on landmarks.	Areas designated as historic sites.	16 U.S.C. §§ 461–467	Not an ARAR	No historic properties, sites, buildings, or landmarks are located at IRP Sites 1 and 2.

Table A3-1 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Archaeological Resources Protection Act of 1979, as Amended (16 U.S.C. § 470aa–470mm)[b]					
Archaeological resources on federal land	Prohibits unauthorized excavation, removal, damage, alteration, or defacement of archaeological resources located on public lands unless such action is conducted pursuant to a permit.	Archaeological resources on federal land.	Pub. L. No. 96-95 16 U.S.C. § 470aa–470mm	Not an ARAR	There are no known or suspected archaeological resources at IRP Sites 1 and 2.
Exec. Order No. 11990, Protection of Wetlands[b]					
Wetland	Avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and avoid support of new construction in wetlands if practicable alternatives exist.	Wetland meeting definition of Section 7(c) of the Exec. Order No. 11990.	40 C.F.R. § 6.302(a) and 40 C.F.R. pt. 6, app. A, § 6(a)(1), (3), and (5) (at the end of § 6.1007)	Relevant and Appropriate (only for IRP Site 1)	The substantive provisions of the cited regulations are relevant and appropriate for response actions at IRP Site 1. The disturbed wetland habitat are not expected to be adversely impacted by the remedial action at IRP Site 1. No wetlands have been identified at IRP Site 2 nor would wetlands potentially be affected by the proposed remedial alternatives.
Exec. Order No. 11988, Floodplain Management[b]					

Table A3-1 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Within floodplain	Evaluate potential effects of actions in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain.	Action that will occur in a floodplain (i.e., lowlands) and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 C.F.R. § 6.302(b) and 40 C.F.R. pt. 6, app. A, § 6(a)(1), (3), and (5) (at the end of § 6.1007)	Relevant and Appropriate	Areas overlying the IRP Site 1 perchlorate-impacted groundwater in the vicinity of IRP Site 2 landfill are located within the 100-year floodplain. Therefore, substantive requirements of 40 C.F.R. § 6.302(b) and 40 C.F.R. pt. 6 Appendix A, § 6(a)(1), (3), and (5) (at the end of § 6.1007), are potential ARARs for IRP Site 1 groundwater remedial action. IRP Site 2 is within the 100-year floodplain. The site is located upstream of the confluence of the north fork and the main channel of Borrego Canyon Wash. A man-made channel bisects the central portion of the landfill. Surface water occurs in a seep where the man-made channel intersects and exposes the water table. Flooding can occur in the washes and man-made channel.
Clean Water Act of 1977, as Amended, Section 404 (33 U.S.C. § 1344)[b]					
Waters of the United States	Action to prohibit discharge of dredged or fill material into waters of the United States without permit.	Discharge into Waters of the United States.	33 U.S.C. § 1344	Applicable	Discharge of dredged or fill material to waters of the United States is possible as part of the response action at IRP Sites 1 and 2. Therefore, the requirements of 33 U.S.C. § 1344 are ARARs for the remedial action at IRP Sites 1 and 2. The evaluation of pertinent action-specific provisions of 40 C.F.R §§ 230.10 (a), (c), and (d); and 33 C.F.R §§ 323.3(a) and (b); and 330.1(b) and (c) are presented in Table A4-1.

Table A3-1 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])[b]					
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.18(b)	Relevant and Appropriate	Areas overlying the IRP Site 1 perchlorate-impacted groundwater in the vicinity of IRP Site 2 landfill and IRP Site 2 VOC-impacted groundwater are located within the 100- year floodplain. The requirements of Cal. Code Regs. tit. 22, § 66264.18(b) were evaluated to determine if they constitute potential ARARs for groundwater remedial action. This evaluation indicated that flood plain protection requirements. of Cal. Code Regs. tit. 22, §66264.18(b) are potential ARARs for only those groundwater remedial action alternatives that include aboveground pumping and management of impacted groundwater. This includes Alternatives G1-6 and G2-4; and Alternatives G1-3, G1-4, G1-5, and G2-3 (only if groundwater recirculation system is implemented as a remedy) (see Section A3.2.1.1 for details).
Wild and Scenic Rivers Act (16 U.S.C. §§ 1271–1287)[b]					
Within area affecting national wild, scenic, or recreational river	Avoid taking or assisting in action that will have direct adverse effect on scenic river.	Activities that affect or may affect any of the rivers specified in 16 U.S.C. §1276(a).	16 U.S.C. §§ 1271–1287	Not an ARAR	There are no wild and scenic rivers at IRP Sites 1 and 2.
Fish and Wildlife Coordination Act (16 U.S.C. §§ 661–666c)[b]					

Table A3-1 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Area affecting stream or other water body	Action taken should protect fish or wildlife.	Diversion, channeling, or other activity that modifies a stream or other water body and affects fish or wildlife.	16 U.S.C. § 662	Not an ARAR	No diversion, channeling or other activity that modifies a stream or other water body is proposed for IRP Sites 1 and 2.
Rivers and Harbors Act of 1899 (33 U.S.C. §§ 401–413)[b]					
Navigable waters	Permits required for structures or work in or affecting navigable waters.	Activities affecting navigable waters.	33 U.S.C. § 403 33 C.F.R. § 322	Not an ARAR	There are no navigable waters at IRP Sites 1 and 2.
Endangered Species Act of 1973 (16 U.S.C. §§ 1531–1543)[b]					
Habitat upon which endangered species or threatened species depend	Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented.	Determination of effect upon endangered or threatened species or its habitat. Critical habitat upon which endangered species or threatened species depend.	16 U.S.C. § 1536(a), (h)(1)(B); 16 U.S.C. § 1538(a)(1)(B)and (G); and 16 U.S.C. § 1538(a)(2)(B) and (E)	Applicable	IRP Site 1 is located in an area that supports special status species (including the Riverside fairy shrimp and the California gnatcatcher) or habitat. IRP Site 2 is located in an area that supports special status species or habitat and supports one breeding pair of California gnatcatchers. The DON will comply with the substantive requirements of the section 7 consultation.
Migratory Bird Treaty Act of 1972 (16 U.S.C. §§ 703–712)					

Table A3-1 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Migratory bird area	Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds.	16 U.S.C. § 703	Relevant and Appropriate	Migratory birds have been observed at IRP Sites 1 and 2; therefore, this is a relevant and appropriate ARAR.
Marine Mammal Protection Act (16 U.S.C. §§ 1361–1421h)[b]					
Marine mammal area	Protects any marine mammal in the U.S. except as provided by international treaties from unregulated "take."	Presence of marine mammals.	16 U.S.C. § 1372(a)(2)	Not an ARAR	There are no marine waters at IRP Sites 1 and 2.
Magnuson-Stevens Fishery Conservation and Management Act of 1976, as Amended (16 U.S.C. §§ 1801–1882)[b]					
Fishery under management	Provides for conservation and management of specified fisheries within specified fishery conservation zones.	Presence of managed fisheries.	16 U.S.C. §§ 1801–1882	Not an ARAR	There are no fisheries at IRP Sites 1 and 2.
National Wildlife Refuge System Administration Act of 1996 (16 U.S.C. § 668dd–668ee)[b]					
Wildlife refuge	No person shall take any animal or plant on any national wildlife refuge, except as authorized under 50 C.F.R. § 27.51. The disposing or dumping of wastes is prohibited.	Area designated as part of National Wildlife Refuge System.	16 U.S.C § 668dd–668ee Substantive provisions of 50 C.F.R. § 27.11–27.97	Not an ARAR	There are no wildlife refuges at IRP Sites 1 and 2.
Wilderness Act (16 U.S.C. §§ 1131–1136)[b]					

Table *A*3-1 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Wilderness area	Area must be administered in such a manner as will leave it unimpaired as wilderness and preserve its wilderness character.	Federally owned area designated as wilderness area.	16 U.S.C. §§ 1131–1136 50 C.F.R. § 35.1–35.14	Not an ARAR	There are no wilderness areas at IRP Sites 1and 2.
Coastal Zone Management Act (16 U.S.C. §§ 1451–1464)[b]					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs.	Activities affecting the coastal zone including lands thereunder and adjacent shore land.	16 U.S.C. § 1456(c) 15 C.F.R. § 930	Not an ARAR	IRP Sites 1 and 2 are not within the coastal zone.
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])[b]					
Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage, or disposal of hazardous waste prohibited.	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.18(a)	Not an ARAR	The nearest fault that is considered active with Holocene movement is the Newport-Inglewood Fault located approximately 10 miles southwest of former MCAS El Toro.
Within salt dome formation, underground mine, or cave	Placement of noncontainerized or bulk liquid hazardous waste prohibited.	RCRA hazardous waste; placement.	Cal. Code Regs. tit. 22, § 66264.18(c)	Not an ARAR	There are no known salt dome formations, underground mines or caves at IRP Sites 1 and 2.

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

Acronyms/Abbreviations:
app. – appendix
ARAR – applicable or relevant and appropriate requirement
CCC – California Coastal Commission

Cal. Code Regs. – *California Code of Regulations*
C.F.R. – *Code of Federal Regulations*
DON – Department of the Navy
Exec. Order No. – executive order number
FEMA – Federal Emergency Management Agency
pt. – part
Pub. L. No. – public law number
RCRA – Resource Conservation and Recovery Act
§ – section
U.S. – United States
U.S.C. – *United States Code*

Table A3-2
Potential State Location-Specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Wetlands	California Fish and Game Commission Wetland Policy (adopted 1987) included in Fish and Game Code Addenda.		Not available	Not an ARAR	Not an ARAR. Since the cited requirement is not promulgated, it is not an ARAR for this remedial action. Additionally, the disturbed wetland habitat is not expected to be adversely impacted by the remedial action at IRP Site 1.
Species conservation and enhancement	Conservation objectives and policy.		Cal. Fish & Game Code §§ 1600 and 2014	Not an ARAR	Not a "cleanup standard, standard of control," or "other substantive requirement, criteria, or limitation.
Actions affecting wildlife resource	Provides definitions applicable to regulations in Chapter 6 of the Fish and Game Code.		Cal. Fish & Game Code § 1601	Not an ARAR	Not a "cleanup standard, standard of control," or "other substantive requirement, criteria, or limitation.
Actions affecting wildlife resource	Requires streambed alterations to not substantially adversely affect an existing fish or wildlife resource.	Waters of the state.	Cal. Fish & Game Code § 1603	Not an ARAR	The streambed alterations are not planned as a part of groundwater response action at IRP Site 2.
Rare and endangered plants	No person shall import into this state, or take, possess, or sell within this state, except as incident to the possession or sale of the real property on which the plant is growing, any native plant, or any part or product thereof, that the commission determines to be an endangered native plant or rare native plant.	Rare or endangered species determination.	Cal. Fish & Game Code § 1908	Not an ARAR	This requirement is not an ARAR because rare or endangered native plant species are not present at the site.

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Endangered species	No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.		Cal. Fish & Game Code § 2080	Not an ARAR	This requirement is not an ARAR because state listed endangered species are not present at the site.
	A take under Cal. Fish & Game Code § 2080 may be allowed if it is incidental to a response action and is fully mitigated.	Threatened or endangered species determination.	Cal. Fish & Game Code § 2081(b)	Not an ARAR	The planned DON response action does not include the intentional taking of species listed under the CESA. Cal. Fish & Game Code § 2081(b) allows for take incidental to otherwise lawful activities. The substantive provisions of Cal. Fish & Game Code § 2081(b) are integrally related to § 2080 and are also accepted as "relevant and appropriate" requirements consistent with 40 C.F.R. § 300.400(g)(2)(v). DON environmental restoration projects are exempt from procedural permitting processes, under CERCLA Section 121(d)(2)(B)(i) (42 U.S.C. § 9621[d][2][B][i]).
	Ensures that action taken will not jeopardize the survival and reproduction of any threatened or endangered species.	Threatened or endangered species determination.	Cal. Fish & Game Code §§ 2090–2096	Not an ARAR	Not effective after 01 January 1994.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Fur-bearing mammal	It is unlawful for any person to trap for the purposes of recreation or commerce in fur any fur-bearing mammal or nongame mammal with any body-gripping trap. It is unlawful for any person to buy, sell, barter, or otherwise exchange for profit, or to offer to buy, sell, barter, or otherwise exchange for profit, the raw fur, of any fur-bearing mammal or nongame mammal that was trapped in this state, with a body-gripping trap. It is unlawful for any person, including an employee of the federal, state, county, or municipal government, to use or authorize the use of any steel-jawed leghold trap, padded or otherwise, to capture any game mammal, fur-bearing mammal, nongame mammal, protected mammal, or any dog or cat.	Trapping for recreation or commerce	Cal. Fish & Game Code § 3003.1	Not an ARAR	The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Birds or mammals	It is unlawful to take birds or mammals with any net, pound, cage, trap, set line or wire, or poisonous substance, or to possess birds or mammals so taken, whether taken within or without this state.	Birds and Mammals	Cal. Fish & Game Code § 3005 (Statute 1957, c. 456, p. 1353, Section 3005)	Not an ARAR	Cal. Fish and Game Code Sections 3005, 3503, 4800, and Cal. Code Regs. tit. 14, § 460 are not applicable because the United States of America has not waived sovereign immunity in the Federal Endangered Species Act (FESA) for this State of California requirement. Pursuant to 40 CFR Section 300.400(g)(2) of the NCP, the Navy has determined that this requirement is not "relevant and appropriate" because it does not address problems or situations sufficiently similar to the circumstances of the release or CERCLA response action and is not well-suited to the site based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP.[2] CERCLA response actions are intended to respond to releases of hazardous substances in order to protect human health and the environment including environmental receptors. In contrast, the purpose of this State requirement is to regulate and set forth conditions for the "taking" of the species addressed by
Bird nests or eggs	It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.	Bird nests or eggs on-site	Cal. Fish and Game Code § 3503 (Added by Statutes 1985, c. 1334, Section 6)		
Mountain Lion	It is unlawful to take, injure, possess, transport, import, or sell any mountain lion or any part or product thereof.	A mountain lion must be potentially affected by the response action.	Cal. Fish & Game Code § 4800		
Fisher, marten, river otter, desert kit fox, and red fox	Fisher, marten, river otter, desert kit fox and red fox may not be taken at any time.		Cal. Code Regs. tit. 14, § 460		

(table continues)

[2] Note that there is no requirement in Subsection 300.400(g)(2) of the NCP that the Navy make specific findings for each of the eight factors listed in Subsection 300.400(g)(2)(i) through (viii) for each potential State ARAR. The factors are to be examined "where pertinent" with pertinence "depending, in part, on whether a requirement addresses a chemical, location, or action."

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
					those requirements. Moreover, that purpose is achieved through the regulation of intentional conduct directed at the species as opposed to incidental "take" (or possession, etc.) of species in the course of lawful activity such as CERCLA remedial action. The focus on intentional conduct is not well-suited to the circumstances at CERCLA sites. In summary, the purposes of this State requirement and the actions that it regulates do not include responding to releases of hazardous substances. Therefore, it is not "relevant and appropriate" based upon the pertinent provisions of Subsections 300.400(g)(2)(i) and (iv) of the NCP. Although this requirement is not an ARAR, the Navy will coordinate with other natural resource trustees throughout the CERCLA remedial action process. The Navy's ecological risk assessment process takes into account representative environmental receptors for the site and final remediation/CGs will ensure that they are adequately protected from exposure to CERCLA hazardous stances that present unacceptable risk.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
					In addition, any species that are present and are federal and/or state endangered, threatened, or fully protected species will be addressed by ARARs related to those designations. For a more detailed explanation of the positions set forth above, see June 16, 2009 letter from Department of Navy counsels Rex Callaway and Michael Waters to California Department of Fish and Game counsel Wendy Johnson; December 3, 2009 letter from Ms. Johnson to Mr. Callaway and Mr. Waters; and April 29, 2010 letter from Mr. Callaway and Mr. Waters to Ms. Johnson."
Falconiformes or Strigiformes	It is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird.	Falconiformes or Strigiformes on-site	Cal. Fish and Game Code § 3503.5 (Added by Statutes 1985, c. 1334, Section 6)	Not an ARAR	The State withdraws its previous identification of this requirement as a state ARAR in light of DON's identification of the substantive provisions of the Migratory Bird Treaty Act (MBTA as a 'relevant and appropriate' federal ARAR for this action.
Fully protected birds	Fully protected birds or parts thereof may not be taken or possessed at any time.	A fully protected species must be potentially affected. See Section A3.2.2.2 for list	Cal. Fish & Game Code § 3511	Not an ARAR	This requirement is not an ARAR because fully protected species are not present at the site.
Nongame birds	It is unlawful to take any nongame bird.	All birds occurring naturally in California that are not resident game birds, migratory game birds, or fully protected birds are nongame birds.	Cal. Fish & Game Code § 3800(a) (Added by Statutes 1971, c. 1470, p. 2906, Section 13)	Not an ARAR	The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR.

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Nongame birds	It is unlawful to take any nongame bird.	All birds occurring naturally in California that are not resident game birds, migratory game birds, or fully protected birds are nongame birds.	Cal. Fish & Game Code § 3800(a) (Added by Statutes 1971, c. 1470, p. 2906, Section 13)	Not an ARAR	The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR.
Actions impacting fur-bearing mammals	Provides manners under which fur-bearing mammals may be taken.		Cal. Fish & Game Code § 4000 et seq.	Not an ARAR	The scope of groundwater remedial actions does not include take of fur-bearing mammals.
Nongame mammals	All mammals occurring naturally in California that are not game mammals, fully protected mammals, or fur-bearing mammals, are nongame mammals. Nongame mammals or parts thereof may not be taken or possessed.	Response action may potentially take a nongame mammal.	Cal. Fish & Game Code § 4150	Not an ARAR	The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR.
Fully protected mammals	Fully protected mammals or parts thereof may not be taken or possessed at any time.	A fully protected species must be potentially affected. See Section A3.2.2.2 for list.	Cal Fish & Game Code § 4700	Not an ARAR.	This requirement is not an ARAR because fully protected species are not present at the site.

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Bear	It is unlawful to take any bear with firearm, trap, or bow and arrow without first procuring a tag authorizing the taking of that bear in accordance with this chapter, but no iron or steel-jawed or any type of metal-jawed trap shall be used to take any bear.	The response action could potentially take a bear.	Cal. Fish & Game Code § 4750	Not an ARAR.	The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR.
Fully protected reptiles and amphibians	Fully protected reptiles and amphibians or parts thereof may not be taken or possessed at any time.	A fully protected species must be potentially affected. See Section A3.2.3.2 for list.	Cal. Fish & Game Code § 5050	Not an ARAR.	This requirement is not an ARAR because fully protected species are not present at the site.
Fully protected fish	Fully protected fish or parts thereof may not be taken or possessed at any time.	A fully protected species must be potentially affected. See Section A3.2.4.2 for list.	Cal. Fish & Game Code § 5515	Not an ARAR.	This requirement is not an ARAR because fully protected species are not present at the site.
Waters of the state	Prohibits the passage of enumerated substances or materials into waters of the state deleterious to fish, plant life, or birds.	Not authorized under Cal. Water Code § 13263 or a waiver issued pursuant to subdivision (a) of § 13269 of the Water Code.	Cal. Fish & Game Code § 5650(a), (b), and (f)	Not an ARAR	Cal. Fish & Game Code § 5650 is not applicable because the United States of America has not waived sovereign immunity for this State of California requirement. No discharges to waters of the state that are deleterious to fish, plant life, or birds are planned as part of remedial action.

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Actions impacting white shark	White shark may not be taken, except under permit issued by the California Department of Fish and Game Department pursuant to Section 1002 of the Fish and Game Code for scientific or educational purposes.	White shark	Cal. Code Regs. tit. 14, § 28.06	Not an ARAR	White sharks have not been identified on or in the vicinity of IRP Site 2.
Reptiles and amphibians	It is unlawful to capture, collect, intentionally kill or injure, possess, purchase, propagate, sell, transport, import, or export any native reptile or amphibian, or part thereof.	Potentially affect native reptiles or amphibians	Cal. Code Regs. tit. 14, § 40	Not an ARAR	The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Fur-bearing mammal	Fur-bearing mammals may be taken only with a firearm, bow and arrow, or with the use of dogs, or traps.		Cal. Code Regs. tit. 14, § 465	Not an ARAR	Cal. Code Regs. tit. 14, § 465 is not applicable because the United States of America has not waived sovereign immunity for this State of California requirement. The activities regulated by this section are not sufficiently similar to the circumstance of the release or response action alternatives to be relevant and appropriate and are not well suited to the site pursuant to 40 C.F.R. § 300.400(g)(2)(i) and (iv) of the NCP. The purpose of this section is to prevent the taking of the species specified. In contrast, the DON response action alternatives are intended to respond to releases of hazardous substances in order to protect human health and the environment. Therefore, Cal. Code Regs. tit. 14, § 465 is not a "relevant and appropriate" ARAR. However, ecological risk assessments will take into account representative receptors specific for each location. In addition, any species that are present and are federal and/or state endangered, threatened, or fully protected species will be addressed by ARARS related to those designations.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Nongame birds and mammals	Nongame birds and mammals may not be taken except as provided. (a) The following nongame birds and mammals may be taken at any time of the year and in any number except as prohibited: English sparrow, starling, coyote, weasels, skunks, opossum, moles, and rodents (excluding tree and flying squirrels, and those listed as furbearers, endangered, or threatened species). (b) Fallow, sambar, sika, and axis deer may be taken only concurrently with the general deer season. (c) Aoudad, mouflon, tahr, and feral goats may be taken all	Taking of nongame birds and mammals.	Cal. Code Regs. tit. 14, § 472	Not an ARAR	The State has re-evaluated and withdrawn its previous identification of this requirement as a state ARAR.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Cal-EPA/DTSC Advisories, Guidance, and Criteria					
Hazardous substance release sites		Drilling, coring, sampling and logging at hazardous substance release sites.	Drilling, Coring, Sampling and Logging at Hazardous Substance Release Sites. Guidance Manual for Groundwater Investigations (Cal-EPA, July 1995)	Not an ARAR or to be considered (TBC) requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous substance release sites		Reporting hydrogeologic characterization data	Reporting Hydrogeologic Characterization Data at Hazardous Substance Release Sites. Guidance Manual for Groundwater Investigations (Cal-EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous substance release sites		Conducting hydrogeologic characterization	Guidelines for Hydrogeologic Characterization of Hazardous Substance Release Sites, Volume 1 & 2 (Cal-EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Hazardous waste sites		Conducting aquifer test	Aquifer Testing for Hydrogeologic Characterization. Guidance Manual for Groundwater Investigations (Cal-EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous substance release sites		Conducting borehole geophysics	Application of Borehole Geophysics at Hazardous Substance Release Sites. Guidance Manual for Groundwater Investigations (Cal-EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous substance release sites		Conducting groundwater modeling	Ground Water Modeling for Hydrogeologic Characterization. Guidance Manual for Groundwater Investigations (Cal-EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Hazardous waste sites		Construction of monitoring wells	Monitoring Well Design and Construction for Hydrogeologic Characterization. Guidance Manual for Groundwater Investigations (Cal-EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Sites potentially affected by VOCs		Conducting soil gas investigations	Advisory – Active Soil Gas Investigation (DTSC/CRWQCB-Los Angeles Region, January 2003)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous waste sites		Groundwater monitoring	Representative Sampling of Ground Water for Hazardous Substances (Cal/EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous waste sites accumulating hazardous wastes		Accumulation of hazardous waste	Accumulating Hazardous Waste at Generator Sites (Cal/EPA, July 1995)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. If the hazardous wastes are generated during the remedial action, they will be accumulated in accordance with the regulations identified as potential ARARs in Table A4-1.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Hazardous waste sites		Conducting Ecological Risk Assessment	Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities (DTSC Human and Ecological Risk Division, July 1996).	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous waste sites		Conducting Human Health Multimedia Risk Assessments	Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (DTSC Human and Ecological Risk Division, July 1992)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.

(table continues)

Table A3-2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Hazardous waste sites		Monitoring and Enforcement of Land Use Controls	Memorandum for Deputy Under Secretary of Defense (Installation and Environment). Subject: Monitoring and Enforcement of Land Use Controls (April 2, 2003)	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.
Hazardous waste sites		Long-Term Stewardship	Memorandum of Understanding on Long-Term Stewardship at Federal Facilities in the United States between the Environmental Council of the States, the U.S. Department of Defense, the U.S. Department of the Interior, the U.S. Department of Energy, and the U.S. Environmental Protection Agency (April 9, 2003).	Not an ARAR or TBC requirement	The guidance does not contain promulgated requirements; therefore, does not constitute potential ARAR. The DON has determined that the cited document does not constitute a TBC guidance for groundwater remedial action.

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

Acronyms/Abbreviations:

ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
Cal. Fish & Game Code – *California Fish and Game Code*
Cal. Pub. Res. Code – *California Public Resources Code*
CCC – California Coastal Commission
DON – Department of the Navy
§ – section

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Table A4-1
Potential Federal Action-Specific ARARs

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1: No Action; Alternative G1-2: MNA and ICs; Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs; Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs; Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs; Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1: No Action; Alternative G2-2: MNA and ICs; Alternative G2-3: In-Plume Treatment, Monitoring, and ICs; Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])*							
On-site waste generation	Person who generates waste shall determine if that waste is a hazardous waste.	Generator of waste.	Cal. Code Regs. tit. 22, § 66262.10(a), 66262.11	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Applicable for any operation where hazardous waste is generated. The determination of whether groundwater and/or wastes generated during remedial activities, such as soil cutting from well installation and treatment residues, are hazardous will be made at the time the wastes are generated.
Identification number for the generator	A generator shall not treat, store, dispose, transport, or offer for transportation, hazardous waste without having received an identification number.	Generator of waste.	Cal. Code Regs. tit. 22, § 66262.12				Not an ARAR. The requirement is procedural in nature; to constitute an ARAR a requirement must be substantive.
Use of a manifest	A generator of hazardous waste who transports or offers hazardous waste for transportation shall prepare a manifest.	Transportation of hazardous waste.	Cal. Code Regs. tit. 22, §§ 66262.20, 66262.22				Not an ARAR. The requirements pertain to off-site actions and ARARs need to be identified only for on-site response actions. Off-site actions will need to comply with all applicable regulations.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Packaging, labeling, marking, placarding	Before transporting hazardous waste or offering hazardous waste for transportation off-site, the generator must do the following: package the waste, label and mark each package of hazardous waste, and ensure that the transport vehicle is correctly placarded.	Transporting hazardous waste	Cal. Code Regs. tit. 22, §§ 66262.30, 66262.31, 66262.32, 66262.33				Not an ARAR. The requirements pertain to off-site actions and ARARs need to be identified only for on-site response actions. Off site actions will need to comply with all the applicable regulations.
Hazardous waste accumulation	Onsite hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with § 66262.171–178 or in tanks, on drip pads, inside buildings, and is labeled and dated, etc.	Accumulate hazardous waste	Cal. Code Regs. tit. 22 § 66262.34	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Substantive requirements are potentially applicable for accumulation of waste for less than 90 days if the waste is hazardous waste and is stored on site. Wastes will not be stored on site for greater than 90 days.
Record-keeping and reporting	Establish requirements for recordkeeping of manifest, test results, waste analysis, and biennial report.	Generator of hazardous waste	Cal. Code Regs. tit. 22, §§ 66262.40, 66262.41				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Management of hazardous waste at transfer and TSD facilities	Establish requirements for a hazardous waste treatment facility to have a plan for waste analysis, develop a security system, conduct regular inspections, provide training to facility personnel, and use a quality assurance program during construction.	Hazardous waste facilities	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 2				Not an ARAR. IRP Sites 1 and 2 does not constitute a hazardous waste facility. Based on the available information on the nature of the waste, large-scale hazardous waste operations are not expected as a part of IRP Sites 1 and 2 remedial action. Therefore, the requirements of Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 2 are not appropriate for remedial action at IRP Sites 1 and 2.
	Establish requirements for a facility to plan for emergency conditions. In addition, the design and operation of the facility must be done to prevent releases. Other requirements include testing and maintenance of equipment and incorporation of communication and alarm systems and contingency plan.	Hazardous waste facilities	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Articles 3 and 4				Not an ARAR. IRP Sites 1 and 2 does not constitute a hazardous waste facility. Based on the available information on the nature of the waste, large-scale hazardous waste operations are not expected as a part of IRP Sites1 and 2 remedial action. Therefore, the requirements of Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Articles 3 and 4 are not appropriate for remedial action at IRP Sites 1 and 2.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Use and management of containers	Establishes requirements for the use of containers for transferring or storing hazardous waste	Containers for transferring or storage of hazardous waste	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 9				Only the selected regulations at Cal. Code Regs. tit. 22, Div. 4.5. Ch.14, Article 9 constitute potential ARARs for IRP Site 1 remedial action. The specific provisions of Cal. Code Regs. tit. 22, Div. 4.5. Ch.14, Article 9 are evaluated as potential federal ARARs (in accordance with the rationale presented in Section A1.3.1) in this table and Section 4.
Use of tank systems	Establishes requirements for the use of tank systems for transferring, storing or treating hazardous waste.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 10				Only the selected regulations at Cal. Code Regs. tit. 22, Div. 4.5. Ch.14, Article 10 constitute potential ARARs for IRP Site 1 remedial action. The specific provisions of Cal. Code Regs. tit. 22, Div. 4.5. Ch.14, Article 10 are evaluated as potential federal ARARs in this table and Section 4.
Waste pile	Establishes requirements for storage or treatment of RCRA hazardous waste in a waste pile.	RCRA hazardous waste, noncontainerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage.	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 12				Not an ARAR. Wastes are not planned to be managed as waste piles as part of the remedial action at IRP Site 1.
Hazardous waste disposal	Establish design, operation, closure, and post-closure requirements for disposal of hazardous wastes in landfills.	Hazardous waste disposal in landfills.	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 14				Not an ARAR. Hazardous wastes (if any) are not planned to be disposed in landfills as part of the remedial action at IRP Site 1.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Treatment in a miscellaneous unit	Establish requirements for design, operation, maintenance, and closure of units in which hazardous waste is treated.	Treatment of hazardous waste in a unit.	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 16				Not an ARAR. Miscellaneous units are not planned for treatment of hazardous waste as a part of IRP Site 1 remedial action.
Land disposal restrictions for RCRA wastes and non-RCRA wastes	Movement of hazardous waste to new locations and placed in or on land will trigger LDR. General applicability, dilution prohibited, waste analysis and recordkeeping, and special rules apply for wastes that exhibit a characteristic waste.	Land disposal of hazardous wastes	Cal. Code Regs. tit. 22, Div. 4.5, Ch. 18, Articles 1, 3, 4, 10, 11	G1-6, G2-4			During remedial action at IRP Sites 1 and 2, LDRs are potentially applicable to surface discharge of treated groundwater under Alternatives G1-6 and G2-4 if the extracted groundwater is classified as hazardous waste.
Corrective Action Management Unit	Establishes requirements including maintenance of a written closure plan and content of the plan for a hazardous waste management facility	Hazardous waste management facility.	Cal. Code Regs. tit. 22, § 66264.112				Not an ARAR. The requirements for providing a closure plan are procedural in nature. However, consistent with the settlement between DON and DTSC at IRP Site 1, CERCLA documentation meeting the substantive requirements and content of a closure plan will be prepared.
Closure of hazardous waste management facility or unit	Establishes requirements for submission of a certification that the hazardous waste management unit or facility, has been closed in accordance with the specifications in the approved closure plan.	Hazardous waste management facility/ Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, §§ 66264.115 and 66265.115				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Site Closure	Establishes requirements for submission of a survey plat indicating the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed vertical and horizontal benchmarks.	Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66264.116				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive. Additionally, no land-based disposal facility is planned as a part of IRP Site 2 groundwater remedial action.
	Establishes post-closure and use at facilities where all hazardous wastes, waste residues, contaminated materials and contaminated soils will not be removed during closure.	Hazardous waste management facility where hazardous wastes, waste residues, contaminated materials and contaminated soils will not be removed during closure	Cal. Code Regs. tit. 22, § 66264.117				Not an ARAR. All the debris in unauthorized disposal Areas C1 and C2 believed to be the potential source of groundwater contamination at IRP Site 2 has been removed and consolidated in former operational landfill areas as a part of soil remedial action for IRP Site 2.
Postclosure care and use of the property	Postclosure care shall be begin after completion of closure and continue for approximately 30 years, based on protectiveness to human health and the environment.	Hazardous waste management facility where hazardous wastes, waste residues, contaminated materials and contaminated soils will not be removed during closure.	Cal. Code Regs. tit. 22, § 66264.117(b) (1) and (2)				Not an ARAR for the IRP Site 1 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Postclosure care and use of the property (continued)	Continue security requirements specified in §66264.14, which require 24-hour surveillance, a barrier surrounding entire facility, entry control, and placarding if hazardous waste remains exposed after final closure or if access by public or livestock may pose a threat to human health.	Hazardous waste management facility where hazardous wastes, waste residues, contaminated materials and contaminated soils will not be removed during closure.	Cal. Code Regs. tit. 22, § 66264.117(c)				Not an ARAR for the IRP Site 1 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.
	Postclosure use of the property shall never be allowed to disturb the integrity of the final cover and any other components of the containment system unless such disturbance is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or is necessary to reduce a threat to human health or the environment.	Hazardous waste management facility where hazardous wastes, waste residues, contaminated materials and contaminated soils will not be removed during closure.	Cal. Code Regs. tit. 22, § 66264.117(d)				Not an ARAR for the IRP Site 1 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.
	Postclosure care activities shall be in accordance with the provisions of an approved postclosure plan as specified in § 66264.118. Construction, filling, grading, excavating, or mining shall require issuance of a variance by the Department.	Hazardous waste management facility where hazardous wastes, waste residues, contaminated materials and contaminated soils will not be removed during closure.	Cal. Code Regs. tit. 22, § 66264.117(e) and (f)				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Postclosure care and use of the property (continued)	Establishes requirements for post-closure care and use of the property for interim status hazardous waste management facilities.	Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66265.117				Not an ARAR as these regulations pertain to interim status hazardous waste facilities. Functionally equivalent requirements in Cal. Code Regs. tit.22, § 66264.117 have been evaluated above.
	Establishes requirements including having a postclosure plan and content for the plan for a hazardous waste disposal unit.	Hazardous waste disposal unit	Cal. Code Regs. tit. 22, § 66264.118				Not an ARAR. The requirements for providing a postclosure plan are procedural in nature. However, consistent with the settlement between DON and DTSC at IRP Site 1, CERCLA documentation meeting the substantive requirements and content of a postclosure plan will be prepared.
	Establishes requirements including having a postclosure plan and content for the plan for a hazardous waste disposal unit under interim status.	Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66265.118				Not an ARAR as these regulations pertain to interim status hazardous waste facilities. Functionally equivalent requirements in Cal. Code Regs. tit. 22, § 66264.118 have been evaluated above.
	Establishes requirements for submission of a record of the type, location, and quantity of hazardous wastes disposed of within each cell or area of the facility following certification of closure.	Hazardous waste disposal unit/Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, §§ 6264.119 and 66265.119				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Postclosure care and use of the property (continued)	Establishes requirements for submission of a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan following completion of a post-closure care period.	Hazardous waste disposal unit/Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, §§ 66264.120 and 66265.120				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.
On-site waste generation	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste.	Cal. Code Regs. tit. 22, § 66264.13(a) and (b)	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Applicable when analyzing waste generated during the groundwater remedial action at IRP Sites 1 and 2.
Hazardous waste accumulation	On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with § 66262.171–178 or in tanks, on drip pads, inside buildings, is labeled and dated, etc.	Accumulate hazardous waste. `	Cal. Code Regs. tit. 22, § 66262.34	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during response action activities, such as soil cuttings from well installation and treatment residues, are hazardous will be made at the time the wastes are generated.
Hazardous waste accumulation	Discusses applicability of Cal. Code Regs. tit. 22, Div. 4.5, Ch. 14, Article 7	Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66265.110				Not an ARAR. This regulation does not in itself establish or contain substantive environmental "standards, requirements, criteria, or limitations" and therefore does not meet the definition of an ARAR.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Site closure	Minimize the need for further maintenance controls and minimize or eliminate, to the extent necessary to protect human health and the environment, postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or runoff, or waste decomposition products to groundwater or surface water or to the atmosphere.	Hazardous waste management facility.	Cal. Code Regs. tit. 22, § 66264.111(a) and (b)				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.
	Minimize the need for further maintenance controls and minimize or eliminate, to the extent necessary to protect human health and the environment, postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated rainfall or runoff, or waste decomposition products to groundwater or surface water or to the atmosphere.	Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66265.111(a) and (b)				Not an ARAR as these regulations pertain to interim status hazardous waste facilities. Functionally equivalent requirements in Cal. Code Regs. tit. 22, § 66264.111 have been evaluated above.
Clean closure	During the partial and final closure periods, all contaminated equipment, structures and soils shall be properly disposed or decontaminated by removing all hazardous waste and residues.	Hazardous waste management facility.	Cal. Code Regs. tit. 22, § 66264.114				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Clean closure (continued)	During the partial and final closure periods, all contaminated equipment, structures and soils shall be properly disposed or decontaminated by removing all hazardous waste and residues.	Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66265.114				Not an ARAR as these regulations pertain to interim status hazardous waste facilities. Functionally equivalent requirements in Cal. Code Regs. tit.22, § 66264.114 have been evaluated above.
Site Closure	Submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Department, a survey plat indicating the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed vertical and horizontal benchmarks.	Interim Status Hazardous waste management facility	Cal. Code Regs. tit. 22, § 66265.116				Not an ARAR. The requirements are procedural in nature.
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 before treatment, disposal, or storage elsewhere, in a container.	Cal. Code Regs. tit. 22, § 66264.171, .172, .173	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Substantive requirements are applicable for accumulation of waste for less than 90 days if the waste is RCRA hazardous waste and is stored on site.
	Inspect container storage areas weekly for deterioration.		Cal. Code Regs. tit. 22, § 66264.174	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Substantive requirements are potentially applicable if hazardous wastes are generated and stored on site for less than 90 days.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Container storage (continued)	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.	Storage in a container of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere.	Cal. Code Regs. tit. 22, § 66264.175(a) and (b)	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Potentially applicable if hazardous wastes are generated and stored on site less than 90 days.
	Keep containers of ignitable or reactive waste at least 50 feet from the facility property line.	Ignitable or reactive waste.	Cal. Code Regs. tit. 22, § 66264.176				Not an ARAR. The impacted groundwater or soil cuttings during well installation would not be ignitable or reactive.
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		Cal. Code Regs. tit. 22, § 66264.177	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Potentially applicable for temporary storage of incompatible materials.
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners.		Cal. Code Regs. tit. 22, § 66264.178	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Potentially applicable if RCRA hazardous wastes are generated and stored for less than 90 days.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Use of tank systems or piping	Requirements for the design and installation of new tank systems including strength, tightness testing, damage control, support, corrosion control, etc.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, §66264.192(a), (b),(c), e),(f), and (g)	G1-6 and G2-4; and G1-3, G1-4, G1-5, and G2-3, (only if groundwater recirculation system is implemented as a remedy)			Substantive requirements are potentially applicable for the remedial alternatives that include aboveground extraction of TCE impacted groundwater at IRP Site 2. If the groundwater extracted from the aquifer is classified as RCRA hazardous and tank systems are used for its storage, the substantive requirements of the cited regulation are potential ARARs. For Alternatives G1-3, G1-4, G1-5, and G2-3, the substantive requirements of the cited regulations are potential ARARs only if COC-impacted groundwater containment is implemented using hydraulic containment as a remedy.
	Requirements for secondary containment of tank systems.		Cal. Code Regs. tit. 22, §66264.193(b), (c), (d), and (e)				
	Requirements for secondary containment of ancillary equipment.		Cal. Code Regs. tit. 22, § 66264.193(f)				
	Requirements for operation of tank systems including spill prevention and prohibitions of material that could cause failure.		Cal. Code Regs. tit. 22, § 66264.194(a) and (b)				
	Requirements for inspection of tank systems including inspection of overflow protection, corrosion, release, detection equipment, and cathodic protection.		Cal. Code Regs. tit. 22, §66264.195(a), (b), and (c)				
	Requirements for response to leaks and spills from tank systems including removal of system from use if appropriate, containment, cleanup, emergency procedures, etc.		Cal. Code Regs. tit. 22, § 66264.196(b) except (b)(5) and (b)(7)				
	Requirements for closure and postclosure care of tank systems decontamination, clean closure and leaving waste in place at closure.		Cal. Code Regs. tit. 22, § 66264.197(a) and (b)				

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Placement of waste in land disposal units	Movement of excavated materials to new location and placement in or on land will trigger LDRs for the excavated waste or closure requirements for the unit in which the waste is being placed.	Materials containing RCRA hazardous wastes subject to LDRs are placed in another unit.	Cal. Code Regs. tit. 22, § 66268.40	G1-6, G2-4			Potentially applicable to surface discharge of treated groundwater under Alternatives G1-6 and G2-4 if the extracted groundwater is classified as hazardous waste.
	Treatment of waste subject to ban on land disposal must attain levels achievable by BDAT for each hazardous constituent in each listed waste, if residual is to be land disposed.	Placement of RCRA hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, or underground mine or cave.	Cal. Code Regs. tit. 22, § 66268.42				Not an ARAR. No constituents with standards expressed as treatment method are expected in the extracted groundwater from IRP Sites 1 and 2 aquifer. In addition, RCRA hazardous wastes generated during the remedial action will not be placed outside the area of contamination.
	BDAT standards for spent solvent wastes and dioxin-containing wastes are based on one of four technologies or combinations: for wastewaters, (1) steam stripping, (2) biological treatment, or (3) carbon absorption; and for all other wastes, (4) incineration. Any technology may be used, however, if it will achieve the concentration levels specified.	Solvent or dioxin-containing wastes.	Cal. Code Regs. tit. 22, § 66268.30, § 66268.31				Not an ARAR. No wastes classified as spent solvents or containing dioxins are expected during the remedial action.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Clean closure	Remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste. If waste is left on site, closure and postclosure care requirements are necessary.	Surface impoundments, container or tank liners, and hazardous waste residues or contaminated soil (including soil from dredging or soil disturbed in the course of drilling or excavation) returned to land. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated *in situ* or consolidated within the area of contamination.	Cal. Code Regs. tit. 22, § 66264.228(a), (b), (e)–(k), (m), and (o)–(q) except as it cross-references procedural requirements such as closure plans and annual reports.				Not an ARAR. No land-based disposal units are planned for waste management.
Waste pile	Use a single liner and leachate collection system. Waste put into waste pile is subject to land ban regulations.	RCRA hazardous waste, noncontainerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage.	Cal. Code Regs. tit. 22, § 66264.251 (except 251[j], 251[e][11])				Not an ARAR. Wastes are not planned to be managed as waste piles as part of this remedial action per the cited regulation.
	Alternative requirements that are protective of human health or the environment may replace design, operating, or closure standards for temporary tanks and container storage areas.		Cal. Code Regs. tit. 22, §66264.553(b), (d), (e), and (f)				Not an ARAR. Container storage requirements at Cal. Code Regs. tit. 22 §§ 66264.171-175 and 66264.177-178 are determined to be potentially applicable.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Waste pile (continued)	Allows generators to accumulate solid remediation waste in a U.S. EPA-designated pile for storage only, up to 2 years, during remedial operations without triggering LDRs.	Hazardous remediation waste temporarily stored in piles.	40 C.F.R. § 264.554(d)(1) (i–ii) and (d)(2), (e), (f), (h), (i), (j), and (k)				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.
	Prevent run-on and control and collect runoff from a 24-hour 25-year storm (waste piles, land treatment facilities, landfills). Prevent overtopping of surface impoundments.	RCRA hazardous waste treated, stored, or disposed after the effective date of the requirements.	Cal. Code Regs. tit. 22, §66264.221(c), (e), (h); §66264.251(c), (d), (f), (g), (h), (k); §66264.273(c), (d), (j)(1); §66264.301(c), (d), (f), (g)				Not an ARAR. No land-based disposal units are planned for waste management.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Closure of waste pile	At closure, owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste. If waste is left on-site, perform postclosure care in accordance with the closure and postclosure care requirements that apply to landfills.	Waste pile used to store hazardous waste.	Cal. Code Regs. tit. 22, § 66264.258(a) and (b) except references to procedural requirements				Not an ARAR. Wastes are not planned to be stored in waste piles.
CAMU	An area at a RCRA facility may be designated as a CAMU. Placement of remediation wastes into or within a CAMU does not constitute land disposal of hazardous wastes nor creation of a unit subject to minimum technology requirements or LDRs.	RCRA CAMU.	Cal. Code Regs. tit. 22, § 66264.552(c) and (e)				Not an ARAR. Remedial actions will not involve creation of a CAMU.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Use of equipment that contacts hazardous waste with organic concentrations greater than 10 percent by weight	Air emission standards for process vents or equipment leaks.	Equipment that contains or contacts hazardous waste with organic concentrations of at least 10 percent by weight or process vents associated with specified operations that manage hazardous wastes with organic concentrations of at least 10 ppm_w.	Cal. Code Regs. tit. 22, § 66264.1030–1034 (excluding 1030[c], 1033[j], 1034[c][2], 1034[d][2]); 66264.1050–1063 (excluding 1050[c], 1050[d], 1057[g][2], 1061[d], 1063[d][3])				Not an ARAR. No hazardous wastes are present with organic concentrations greater than 10 percent.
Treatment in a miscellaneous unit	Design and operating standards for unit in which hazardous waste is treated.	Treatment of hazardous waste in a unit.	Cal. Code Regs. tit. 22, § 66264.601				Not an ARAR. No miscellaneous hazardous waste treatment unit is planned.
Monitoring	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.	Cal. Code Regs. tit. 22, § 66264.91(a)(4) and (c), except as it cross-references permit requirements		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Relevant and appropriate for groundwater monitoring.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Monitoring (continued)	Requirements for monitoring groundwater, surface water, and the vadose zone.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.97 (b)(1)(A), (b)(1)(D)(1) and (2), (b) (4-7), (e)(6), (12)(A) and (B), (13), and (15)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Relevant and appropriate for groundwater monitoring.
	Requirements for monitoring surface water.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.97(c)		G1-6, G2-4		The substantive provisions of the cited regulation are relevant and appropriate ARARs if the treated groundwater is discharged into Borrego Canyon Wash.
	Requirements for unsaturated zone monitoring system.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.97(d)				Not pertinent to the groundwater remedial action at IRP Sites 1 and 2.
	General monitoring requirements.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.97(e)(1) through (e)(5)				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Monitoring (continued)	Requirements for a detection monitoring program.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.98(e)(1-5), (i), (j), (k)(1-3), (4)(A) and (D),(5), (7)(C) and (D),(n)(1),(2)(B), and (C)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		The requirements of detection monitoring program are only relevant and appropriate following completion of corrective action monitoring.
	Requirements for an evaluation monitoring program.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.99(b), (e)(1)–(6), (f)(3), and (g)				Not an ARAR. Groundwater monitoring will be conducted in accordance with the requirements of corrective action monitoring identified in Section A4.
Corrective action	An owner or operator required pursuant to section 66264.91 to establish a corrective action program for a regulated unit shall, at a minimum, comply with the requirements of this section for that unit.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(a)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Relevant and appropriate for groundwater monitoring.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Corrective action (continued)	The owner or operator required to take corrective action under Cal. Code Regs. tit. 22, § 66264.91 shall take corrective action to remediate releases from the regulated unit and to ensure that the regulated unit achieves compliance with the water quality protection standard.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(b)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		In accordance with the settlement between the DON and DTSC (see Section B1.3.2) and the fact that wastes at IRP Site 1 are similar to RCRA hazardous wastes, substantive provisions of cited regulations are potentially “relevant and appropriate” federal ARARs for groundwater remedial action at IRP Site 1. IRP Site 2 is not a RCRA regulated unit, therefore, the requirements are not applicable. However, the requirements are relevant and appropriate for all remedial action alternatives.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Corrective action (continued)	The owner or operator shall implement corrective action measures that ensure that constituents of concern achieve their respective concentration limits at all monitoring points and throughout the zone affected by the release, including any portions of the affected zone that extend beyond the facility boundary, by removing the waste constituents or treating them in place. The owner or operator shall take other action to prevent noncompliance due to a continued or subsequent release including, but not limited to, source control.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(c)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		In accordance with the settlement between the DON and DTSC (see Section B1.3.2) and the fact that wastes at IRP Site 1 are similar to RCRA hazardous wastes, substantive provisions of cited regulations are potentially "relevant and appropriate" federal ARARs for groundwater remedial action at IRP Site 1. IRP Site 2 is not a RCRA regulated unit, therefore, the requirements are not applicable. However, the requirements are relevant and appropriate for all remedial action alternatives.
	The owner or operator shall establish and implement, in conjunction with the corrective action measures, a water quality monitoring program that will demonstrate the effectiveness of the corrective action program and be effective in determining compliance with the water quality protection standard and in determining the success of the corrective action measures under subsection (c) of this section.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(d)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Relevant and appropriate for groundwater monitoring.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Corrective action (continued)	The corrective action program is complete when compliance with the water quality standard is demonstrated based on the results of sampling and analysis for all constituents of concern for a period of 1 year.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(g)(1)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Relevant and appropriate for groundwater monitoring.
Completion of response action	Corrective action measures taken pursuant to this section may be terminated when the owner or operator demonstrates to the satisfaction of the Department that the concentrations of all constituents of concern are reduced to levels below their respective concentration limits.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(f)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Relevant and appropriate for groundwater monitoring.
Solid Waste Management Unit/Permitted Hazardous Waste Management Unit	Establishes requirements for reporting the effectiveness of the corrective action program.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(h)				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.
	Media impacted by RCRA hazardous waste must be considered for corrective action regardless of the date of original impact.	Hazardous waste transfer, treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.101(a)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Relevant and appropriate for groundwater monitoring.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Solid Waste Management Unit/Permitted Hazardous Waste Management Unit (continued)	Establishes requirements for specifying the corrective action in a permit or order containing schedules of compliance for corrective action and assurances of financial responsibility for completing such corrective action.	Consolidated hazardous waste.	Cal. Code Regs. tit. 22, § 66264.101(b)				Not an ARAR. The requirements are procedural in nature; to constitute an ARAR a requirement must be substantive.
	Corrective action, where appropriate, must be performed not only at the facility, but also beyond the facility boundary.	Consolidated hazardous waste.	Cal. Code Regs. tit. 22, § 66264.101(c)				Not an ARAR since neither a solid waste management unit nor a hazardous waste management unit is planned as a result of remediation activities at IRP Sites 1 and 2.
Military Munitions Rule (40 C.F.R. pt. 266 subpt. M)*							
Military munitions	Standards for transportation and storage of solid waste military munitions and treatment and disposal of waste military munitions.	Management of military Munitions.	40 C.F.R. § 266.203, 266.205, and 266.206				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.
Clean Water Act, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)*							

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Discharge to surface waters	Owners and operators of construction activities must be in compliance with discharge standards.		CWA Section 402 (33 U.S.C. ch. 26, § 1342); 40 C.F.R. § 122.44(k)(2) and (4)	G1-6, G2-4			The substantive provisions of the cited regulation are potential ARARs if the treated groundwater is discharged into Borrego Canyon Wash.
	All direct dischargers meet technology-based requirements including the best control technology and the best available technology economically achievable.		CWA Section 301(b) (33 U.S.C. ch. 26, § 1311)	G1-6, G2-4			The substantive provisions of the cited regulation are potential ARARs if the treated groundwater is discharged into Borrego Canyon Wash.
Discharge of dredged /fill material	Guidelines for specification of disposal sites for dredged material. The discharge must represent the least damaging, practicable alternative. The discharge of dredged material must not result in significant degradation of the aquatic ecosystem. All practicable means must be utilized to minimize adverse environmental impacts.	Discharge of dredged material to waters of the United States.	40 C.F.R. § 230.10(a), (c), and (d)	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Discharge of dredged /fill material (continued)	Where the proposed discharge and extraction sites are adjacent and are comprised of similar materials and subject to the same sources of contaminants, disposal may be conducted without further testing because discharge is not likely to result in degradation of the discharge site, as long as the potential spread of contaminants to less contaminated areas can be prevented.		40 C.F.R. § 230.60(c)	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Discharge of dredged /fill material (continued)	The discharge of dredged material may be conducted without further testing if constraints are available to reduce contamination to acceptable levels within the discharge site and to prevent contaminants from being transported beyond the proposed discharge site boundaries.		40 C.F.R. § 230.60(d)	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).
	Evaluation and testing requirements for discharges of dredged material to waters of the United States.		40 C.F.R. § 230.61				Not an ARAR. No testing of fill material is required to evaluate impact of proposed fill materials (see ARAR evaluations of 40 C.F.R. § 230.60[c] and [d] above).

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Discharge of dredged /fill material (continued)	U.S. Army Corps of Engineers requirements for permitting discharges of dredged material to waters of the United States.	Discharge of dredged material to waters of the United States.	33 C.F.R. §§ 323.3(a) and (b); and 330.1(b) and (c)	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).
Safe Drinking Water Act (42 U.S.C. § 300[f]–300[j]-26)*							

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Injection	The UIC program prohibits injection activities that allow movement of contaminants into underground sources of drinking water that may result in violations of MCLs or adversely affect health.	An approved UIC program is required in states listed under SDWA Section 1422. Class I wells and Class IV wells are the relevant classifications for CERCLA sites. Class I wells are used to inject hazardous waste beneath the lowermost formation that contains a USDW within 0.25 mile of the well.	40 C.F.R. § 144.12, excluding the reporting requirements in § 144.12(b) and 144.12(c)(1)		G1-3, G1-4, G1-5, and G2-3 (only if groundwater recirculation system is implemented as a remedy); and G1-6 and G2-4 (only if the treated groundwater is returned to the aquifer)		Injection wells would be Class V wells under the UIC program. There are currently no specific technical requirements for injection into Class V wells. Substantive provisions of the UIC rules are relevant and appropriate only to the extent necessary to ensure that reinjection of treated groundwater would not cause the shallow aquifer at MCAS El Toro to violate primary drinking water regulations or may otherwise adversely affect the health of persons. For Alternatives G1-3, G1-4, G1-5, and G2-3, the substantive requirements of the cited regulations are potential ARARs only if impacted groundwater containment is implemented using hydraulic containment as a remedy. For Alternatives G1-6 and G2-4, the substantive requirements of the cited regulations are potential ARARs only if the treated groundwater is returned to the aquifer.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Injection (continued)	The UIC program regulates construction of new Class IV wells and operation and maintenance of existing wells.	Class IV wells are used to inject hazardous or radioactive waste into or above a formation that contains a USDW within 0.25 mile of the well.	40 C.F.R. § 144.13				Not an ARAR. Injection of hazardous waste and construction of Class IV well is not planned.
	Class IV wells are banned except for reinjection of treated groundwater into the same formation from which it was withdrawn, as part of a CERCLA cleanup or RCRA corrective action.		40 C.F.R. § 144.13(c)				Not an ARAR. Class IV wells are not proposed for groundwater reinjection.
	The director of the UIC program in a state may lessen the stringency of 40 C.F.R. § 144.52 construction, operation, and manifesting requirements for a well if injection does not occur into, through, or above a USDW or if the radius of endangering influence is less than or equal to the radius of the well.		40 C.F.R. § 144.16				Not an ARAR. No waiver on construction, operation and manifesting requirements for injection wells is planned.
	Prepare, maintain, and comply with plugging and abandonment plan.	Class I wells.	40 C.F.R. § 144.28(c), § 144.51(e)				Not an ARAR. Class I wells are not proposed for injection of groundwater.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Injection (continued)	Monitor Class I wells by: • frequent analysis of injection fluid; • continuous monitoring of injection pressure, flow rate, and volume; and • installation and monitoring of groundwater monitoring wells.	Class I wells are used to inject hazardous waste beneath the lowermost formation that contains a USDW within 0.25 mile of the well.	40 C.F.R. § 144.28(g)				Not an ARAR. Class I wells are not proposed for injection of groundwater.
	Applicants for Class I permits must: • identify all injection wells within the area of review; and • take action as necessary to ensure that such wells are properly sealed, completed, or abandoned to prevent contamination of a USDW.		40 C.F.R. § 144.55[b][4] (§ 144.55[b][4] is applicable only for Class III wells)				Not an ARAR. CERLCA response actions are not subject to permit requirements. Additionally, Class I wells are not proposed for injection of groundwater.
	Criteria for determining whether an aquifer may be determined to be an exempted aquifer include current and future use, yield, and water quality characteristics.		40 C.F.R. § 146.4				Not an ARAR. The aquifer underlying IRP Sites 1 and 2 can serve as potential source of drinking water in future; therefore, it cannot be determined to be exempted aquifer.
	Case and cement all Class I wells to prevent movement of fluids into USDW, taking into consideration well depth, injection pressure, hole size, composition of injected waste, and other factors.		40 C.F.R. § 144.28(e)				Not an ARAR. Class I wells are not proposed for reinjection of groundwater.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Injection (continued)	Conduct appropriate geologic drilling logs and other tests during construction.		40 C.F.R. § 146.12 (d), excluding the reporting requirements				Not an ARAR since Class I wells will not be installed. However, geological logging will be performed during well construction .
	Injection pressure may not exceed a maximum level designed to ensure that injection does not initiate new fractures or propagate existing ones and cause the movement of fluids into a USDW. Continuously monitor injection pressure, flow rate, and volume, and annual pressure, if required. Demonstration of mechanical integrity is required every 5 years. Groundwater monitoring may also be required.		40 C.F.R. § 146.13(a), (b), (d)		G1-3, G1-4, G1-5, and G2-3 (only if groundwater recirculation system is implemented as a remedy); and G1-6 and G2-4 (only if the treated groundwater is returned to the aquifer)		Relevant and appropriate for groundwater reinjection. For Alternatives G1-3, G1-4, G1-5, and G2-3, the substantive requirements of the cited regulations are potential ARARs only if impacted groundwater containment is implemented using hydraulic containment as a remedy. For Alternatives G1-6 and G2-4, the substantive requirements of the cited regulations are potential ARARs only if the treated groundwater is returned to the aquifer.
	Comply with state underground injection requirements.		40 C.F.R. § 147				The ARAR evaluation of the state underground injection regulations is provided in Table A4-2.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Injection (continued)	Wastes that no longer exhibit a hazardous characteristic are not prohibited if the wastes are disposed into a nonhazardous or hazardous injection well as defined under 40 C.F.R. § 146.6(a).	Characteristically hazardous wastewaters.	40 C.F.R. § 148.1(d)		G1-3, G1-4, G1-5, and G2-3 (only if groundwater recirculation system is implemented as a remedy); and G1-6 and G2-4 (only if the treated groundwater is returned to the aquifer)		Potential ARAR for groundwater reinjection in Class V wells. For Alternatives G1-3, G1-4, G1-5, and G2-3, the substantive requirements of the cited regulations are potential ARARs only if impacted groundwater containment is implemented using hydraulic containment as a remedy. For Alternatives G1-6 and G2-4, the substantive requirements of the cited regulations are potential ARARs only if the treated groundwater is returned to the aquifer.
	Hazardous waste to be injected is subject to land ban regulations. Treated groundwater that meets the definition of hazardous waste and is to be injected also is subject to land ban regulations.		40 C.F.R. § 268.2				Not an ARAR. The groundwater extracted under groundwater remedial alternatives would be treated before reinjection and would not exhibit the characteristics of hazardous waste.
Clean Air Act (42 U.S.C. §§ 7401–7671)*							

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Discharge to air	Provisions of SIP approved by U.S. EPA under Section 110 of CAA.	Major sources of air pollutants.	42 U.S.C. § 7410; portions of 40 C.F.R. § 52.220				Not an ARAR for the IRP Site 1 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site. Specific pertinent rules are listed below.
	NAAQS – primary and secondary standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare.	40 C.F.R. § 50.4–50.12				Not an ARAR. Federal NAAQS are non-enforceable standards.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission	Prohibits building, erection, installation, alteration, or replacement of any equipment or agricultural permit unit, the use of which may cause the issuance of air contaminants or the use of which may eliminate, reduce or control the issuance of air contaminants without first obtaining written authorization for such construction from the Executive Officer. A permit to construct shall remain in effect until the permit to operate the equipment or agricultural permit unit for which the application was filed is granted or denied, or the application is canceled.		SCAQMD Rule 201				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. In accordance with CERCLA Section 121 (e) (1) (42 U.S.C. § 9621[e]) and the NCP at 40 C.F.R. § 300.400(e) (1), no federal, state, or local permits are required for on-site response actions conducted pursuant to CERCLA.
	Prohibits operation or use of any equipment or agricultural permit unit, the use of which may cause the issuance of air contaminants, or the use of which may reduce or control the issuance of air contaminants, without first obtaining a written permit to operate from the Executive Officer or except as provided in Rule 202. Prohibits operation of equipment or agricultural permit unit contrary to the conditions specified in the permit to operate.		SCAQMD Rule 203				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. In accordance with CERCLA Section 121 (e) (1) (42 U.S.C. § 9621[e]) and the NCP at 40 C.F.R. § 300.400(e) (1), no federal, state, or local permits are required for on-site response actions conducted pursuant to CERCLA.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission (continued)	Shall not cause or allow the emissions of fugitive dust such that the presence of such dust remains visible in the atmosphere beyond the property line of the emission source and shall not cause or allow PM_{10} levels to exceed 50 micrograms per cubic meter when determined, by simultaneous sampling, as the difference between upwind and downwind samples.		SCAQMD Rule 403				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.
	Limits equipment from discharging particulate emissions in excess of 0.01 to 0.196 grain per cubic foot based on a given volumetric (dry standard cubic feet per minute) exhaust gas flow rate averaged over one hour or on cycle of operation. It excludes steam generators or gas turbines.		SCAQMD Rule 404				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission (continued)	Limits equipment from discharging particulate emissions in excess of 0.99 to 30 pounds per hour based on a given process weight.		SCAQMD Rule 405				Not an ARAR for the IRP Sites 1 and 2 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.
	Limits equipment from discharging carbon monoxide emissions in excess of 2000 ppm and sulfur dioxide emissions of 500 ppm or greater averaged over 15 minutes. It excludes stationary internal combustion engines, propulsion of mobile equipment or emergency venting.		SCAQMD Rule 407				Not an ARAR. Not pertinent to remedial action at IRP Sites 1 and 2.
	Limit sulfur compounds from combustion of gaseous fuels not to exceed 40 ppm, 0.05 percent by weight for liquid fuels and 0.56 pounds of sulfur per million BTU for solid fossil fuels.		SCAQMD Rule 431.1				Not an ARAR. Not pertinent to remedial action at IRP Sites 1 and 2.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Air emission (continued)	Limits concentration of oxides of nitrogen (as nitrogen dioxide) averaged over 15 minutes, from any non-mobile fuel burning equipment, to a range of 125 to 300 ppm for gaseous fuels and 225 to 400 ppm for solid and liquid fuels depending on equipment size.		SCAQMD Rule 474				Not an ARAR. Not pertinent to remedial action at IRP Sites 1 and 2.
	Limits emissions of volatile organic compounds (VOCs) from contaminated soil to less than 50 ppm. For contaminated soil with 50 ppm or greater, an approved mitigation plan, describing removal methods and mitigation measures, must be obtained from the District prior to proceeding with the excavation. Uncontrolled spreading of contaminated soil is not permitted.		SCAQMD Rule 1166				Not an ARAR. Not pertinent to the scope of remedial action at IRP Sites 1 and 2.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

Action	Requirement	Prerequisite	Citation	ARAR Determination			Comments
				A	RA	TBC	
Air emission (continued)	Applies to any new or modified equipment, which may cause the issuance of any non-attainment air contaminant, ozone depleting compound or ammonia. It requires all equipment to be constructed with best available control technology (BACT). For non-attainment emission increases, it requires the emission increases to be offset and substantiated with modeling that the equipment will not cause a significant increase in concentrations of non-attainment contaminants.		SCAQMD Regulation XIII				Not an ARAR. No equipment with potential to issue non-attainment air contaminant, ozone depleting compound or ammonia is planned for the remedial action.
Resource Conservation and Recovery Act							
Hazardous waste management system	Definitions.		40 C.F.R. § 260.10	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4			Applicable for the groundwater remedial action alternatives at IRP Sites 1 and 2.
Federal Hazardous Materials Transportation Law (49 U.S.C. §§ 5101–5127)*							

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Transportation of hazardous material	No person shall represent that a container or package is safe unless it meets the requirements of 49 U.S.C. §§ 5101–5127.	Interstate carriers transporting hazardous waste and substances by motor vehicle. Transportation of hazardous material under contract with any department of the executive branch of the federal government.	49 C.F.R. § 171.2(f)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.
	No person shall unlawfully alter or deface labels, placards or descriptions, packages, containers, or motor vehicles used for transportation of hazardous materials.		49 C.F.R. § 171.2(g)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.
Hazardous materials marking, labeling, and placarding	Each person who offers hazardous material for transportation or each carrier that transports it shall mark each package, container, and vehicle in the manner required.	Person who offers hazardous material for transportation; carries hazardous material; or packages, labels, or placards hazardous material.	49 C.F.R. § 172.300		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.
	Each person offering nonbulk hazardous materials for transportation shall mark the proper shipping name and identification number (technical name) and consignee's name and address.		49 C.F.R. § 172.301		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Hazardous materials marking, labeling, and placarding (continued)	Hazardous materials for transportation in bulk packages must be labeled with proper ID number, specified in 49 C.F.R. § 172.101 table, with required size of print. Packages must remain marked until cleaned or refilled with material requiring other marking.		49 C.F.R. § 172.302		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.
	No package marked with a proper shipping name or ID number may be offered for transport or transported unless the package contains the identified hazardous material or its residue.		49 C.F.R. § 172.303		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.
	The markings must be durable, in English, in contrasting colors, unobscured, and away from other markings.		49 C.F.R. § 172.304		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.
	Nonbulk combination packages containing liquid hazardous materials must be packed with closures upward, and marked with arrows pointing upward.		49 C.F.R. § 172.312		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.
	Labeling of hazardous material packages shall be as specified in the list.		49 C.F.R. § 172.400		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.

Table A4-1 (Continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Hazardous materials marking, labeling, and placarding (continued)	Each bulk packaging or transport vehicle containing any quantity of hazardous material must be placarded on each side and each end with the type of placards listed in Tables 1 and 2 of 49 C.F.R. § 172.504.	Each person who offers for transport or transports any hazardous materials shall comply with these placarding requirements.	49 C.F.R. § 172.504		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G2-4		Substantive requirements are potentially relevant and appropriate for transportation of hazardous materials (if any) on site.

Note:

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

Acronyms/Abbreviations:
A – applicable
ARAR – applicable or relevant and appropriate requirement
BAAQMD – Bay Area Air Quality Management District
BACT – best available control technology
BDAT – best demonstrated available technology
CAA – Clean Air Act
Cal. Code Regs. – *California Code of Regulations*
CAMU – corrective action management unit
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – *Code of Federal Regulations*
ch. – chapter
CWA – Clean Water Act
DON – Department of the Navy
EE/CA – Engineering Evaluation/Cost Analysis
°F – degrees Fahrenheit
FS – feasibility study
IR – Installation Restoration (Program)

kg/day – kilograms per day
LAER – lowest achievable emission rate
LDR – land disposal restriction
MCAS – Marine Corps Air Station
MCL – maximum contaminant level
mg/dscm – milligrams per dry standard cubic meter
NAAQS – National Ambient Air Quality Standards (primary and secondary)
NPDES – National Pollutant Discharge Elimination System
OU – operable unit
PCB – polychlorinated biphenyl
PM_{10} – particulate matter, less than 10 micrometers in diameter
POC – point of compliance
ppm – parts per million
ppm_w – parts per million by weight
pt. – part
Pub. L. No. – public law number
RA – relevant and appropriate
RAO – remedial action objective
RCRA – Resource Conservation and Recovery Act
RI – remedial investigation
§ – section
SCAQMD – South Coast Air Quality Management District
SDAPCD – San Diego Air Pollution Control District
SDWA – Safe Drinking Water Act
SIP – State Implementation Plan
subpt. – subpart
TBC – to be considered
TCE – trichloroethene
tit. – title
TSCA – Toxic Substances Control Act
UIC – underground injection control
U.S. – United States
U.S.C. – *United States Code*
USDW – underground source of drinking water
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

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Table A4-2
Potential State Action-Specific ARARs

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1: No Action; Alternative G1-2: MNA and ICs; Alternative G1-3: In-Situ Bioremediation Near the Station Boundary, Monitoring, and ICs; Alternative G1-4: In-Situ Bioremediation at the Source Area and Near the Station Boundary, Monitoring, and ICs; Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs; Alternative G1-6: Hydraulic Containment/Treatment, Monitoring, and ICs

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1: No Action; Alternative G2-2: MNA and ICs; Alternative G2-3: In-Plume Treatment, Monitoring, and ICs; Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
State Water Resources Control Board and Regional Water Quality Control Board*							
Discharges to high-quality waters	Incorporated into all Regional Board Basin Plans. Requires that quality of waters of the state that is better than needed to protect all beneficial uses be maintained unless certain findings are made. 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 Res. 68-16 (Policy With Respect to Maintaining High Quality of Waters in California) (Cal. Water Code § 13140, CWA regulations 40 C.F.R. § 131.12)		G1-3, G1-4, G1-5, and G2-3 (only if groundwater recirculation system is implemented as a remedy); and G1-6 and G2-4 (only if the treated groundwater is returned to the aquifer)		SWRCB Res. 68-16 is an ARAR for reinjection only. The DON has determined that perchlorate and VOC migration in groundwater at IRP Sites 1 and 2, respectively is not a discharge governed by the language in SWRCB Res. 68-16. The groundwater remedial alternatives will comply by extracting and treating of groundwater from the low COC concentration portion of the aquifer and injecting it into high concentration portion of the aquifer with similar total dissolved solids and nitrate concentrations. The state does not agree with the DON position regarding the ARAR status. See Section A2.2.1.2 for a complete discussion. For Alternatives G1-3, G1-4, G1-5, and G2-3, the substantive requirements of the cited regulations are potential ARARs only if impacted groundwater containment is implemented using hydraulic containment.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Discharges to high-quality waters (continued)							For Alternatives G1-6 and G2-4, the substantive requirements of the cited regulations are potential ARARs only if the treated groundwater is returned to the aquifer.
Actions affecting water quality	Provides water quality criteria for classifying the beneficial use of groundwater as municipal/domestic. Criteria outlined as follows: total dissolved solids ≤ 3,000 mg/L or yielding 200 gallons per day or serving as a public water system.	Applies in determining beneficial uses for waters that may be affected by discharges of waste.	SWRCB Res. 88-63 (“Sources of Drinking Water Policy”) (as contained in the Basin Plans)	G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, G24			Substantive provisions are potential ARARs for determining potential drinking-water sources.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Actions affecting water quality (continued)	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. Requires cleanup of all waste discharged and restoration of affected water to background conditions. Requires actions for cleanup and abatement to conform to Res. 68-16 and applicable provisions of Cal. Code Regs. tit. 23, div. 3, ch. 15 as feasible.	Cleanup and discharge of groundwater to groundwater or surface water and establishment of containment zones.	SWRCB Res. 92-49 (Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Cal. Water Code § 13304) (Cal. Water Code § 13307) (02 October 1996)				Not an ARAR. No more stringent than Cal. Code Regs. tit. 22, § 66264.94. See Section A2.2.1.2 for additional discussion.
Groundwater cleanup	Point of compliance.	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2550.5				Not an ARAR. Not more stringent than federal requirements as Cal. Code Regs. tit. 22, § 66264.95. Additionally, the remedial alternatives will be designed to achieve the established CGs throughout the estimated extent of IRP Site 2 impacted groundwater.
Groundwater Monitoring	Requires submission of Department of Water Resources well logs to the Regional Board	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2550.7(b)(3)				Not an ARAR for groundwater response action at IRP Site 2. The requirements are procedural in nature.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Groundwater Monitoring (continued)	Requires all monitoring systems be designed and certified by a registered geologist or a registered civil engineer.	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2550.7(e)(1)				Not an ARAR for groundwater response action at IRP Site 2. Not more stringent than general monitoring requirements at Cal. Code Regs., tit. 22, § 66264.97(e)(1).
	Requires collection of groundwater surface elevation and field parameters each time a well is sampled.	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2550.7(e)(13)				Not an ARAR for groundwater response action at IRP Site 2. Not more stringent than general monitoring requirements at Cal. Code Regs., tit. 22, § 66264.97(e)(13).
Landfill operation	Requires that existing landfills, waste piles, and surface impoundments be operated to ensure that wastes will be a minimum of five feet above the highest anticipated elevation of underlying ground water.	Cal. Code Regs. tit. 27 requirements are only applicable for waste discharged after 18 July 1997 unless otherwise noted.	Cal. Code Regs. tit. 27, § 20240				Not an ARAR for groundwater response action at IRP Site 2. However, based on the historical information available onIRP Site 2 including site cross-sections, it can be concluded that the base of the waste at IRP Site 2 is more than five feet above the highest anticipated elevation of underlying groundwater.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Monitoring	Requires general soil, surface water, and groundwater monitoring.	Discharge of waste to and after 18 July 1997.	Cal. Code Regs. tit. 27, § 20415				Not an ARAR for groundwater response action at IRP Site 2. Not more stringent than general monitoring requirements at Cal. Code Regs., tit. 22, § 66264.97 identified as potential federal ARARs in Section A4 and Table A4-1.
Closure and postclosure of waste management unit	Classified waste management units shall be closed according to an approved closure and postclosure maintenance plan that provides for continued compliance with the applicable standards for the monitoring program requirements in art. 5 of this chapter, throughout the closure and postclosure maintenance period	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2580(a)				Not an ARAR. Closure and postclosure maintenance are not relevant to groundwater remediation at IRP Site 2.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Closure and postclosure of waste management unit (continued)	Closed waste management units shall be provided with at least two permanent monuments installed by a licensed land surveyor or a registered civil engineer, from which the location and elevation of wastes, containment structures, and monitoring facilities can be determined throughout the postclosure maintenance period.	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2580(d)				Not an ARAR. Not relevant to groundwater remedial action at IRP Site 2.
	Vegetation for closed waste management units shall be selected to require minimum irrigation and maintenance and shall not impair the integrity of containment structures, including the final cover.	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2580(e)				Not an ARAR. Not relevant to groundwater remedial action at IRP Site 2.
	Requires a final cover constructed in accordance with specific prescriptive standards, to be maintained as long as wastes pose a threat to water quality	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2581				Not an ARAR. Not relevant to groundwater remedial action at IRP Site 2.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Closure and postclosure of waste management unit (continued)	Closure post-closure maintenance plan to address potential adverse affects on the final cover.	Cal. Code Regs. tit. 23 requirements are only applicable to waste discharges to land after 27 November 1984.	Cal. Code Regs. tit. 23, § 2597				Not an ARAR. Not relevant to groundwater remedial action at IRP Site 2.
	Requires cleanup and abatement of conditions of pollution or nuisance or threatened pollution or nuisance		California Water Code, Chapter 5, Article 1				Not an ARAR for groundwater response action at IRP Site 2. Requirements are procedural and administrative in nature and are thus no ARARs. In addition, nuisance provisions are vague and subjective in nature and lack objective "standards, requirements, criteria, or limitations" within the meaning of Section 121(d)(2) of CERCLA and are thus not ARARs.
Cal/EPA Department of Toxic Substances Control*							

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Land Use Covenants	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when Facility closure, corrective action, remedial or removal action, or other response actions are undertaken and Hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Property transfer by federal government to non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1(a) and (e)(1)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, and G2-4		These requirements are ARARs in the event of the transfer of the IRP Sites 1 and 2 property to a non-federal entity. Cal. Code Regs. tit. 22, § 67391.1 provides for a land-use covenant to be executed and recorded when remedial actions are taken and hazardous substances will remain at the property at concentrations that are unsuitable for unrestricted use of the land. The substantive provisions of this regulation have been determined to be "relevant and appropriate" state ARARs by the DON.
California Civil Code*							

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Land-use controls	Provides conditions under which landuse restrictions will apply to successive owners of land.	Transfer property from the DON to a nonfederal agency.	Cal. Civ. Code § 1471		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, and G2-4		These requirements are ARARs in the event of the transfer of the IRP Sites 1 and 2 property to a non-federal entity. Generally, Cal. Civ. Code § 1471 allows an owner of land to make a covenant to restrict the use of land for the benefit of a covenantee. The covenant runs with the land to bind successive owners, and the restrictions must be reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials, as defined in Cal. Health & Safety Code § 25260. Substantive provisions are the following general narrative standard: "to do or refrain from doing some act on his or her own

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Land-use controls (continued)							(land . . . where (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence of hazardous materials, as defined in Section 25260 of the California Health and Safety Code." This narrative standard would be implemented through incorporation of restrictive covenants in the deed and Environmental Restriction and Covenant Agreement at the time of transfer.
California Health and Safety Code*							
Land-use controls (continued)	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code § 25202.5		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, and G2-4		These requirements are ARARs in the event of the transfer of IRP Sites 1 and 2 property to a non-federal entity. The substantive provisions of Cal. Health & Safety Code § 25202.5 are the general narrative standards to restrict "present and future uses of all or part of the land on which the . . . facility . . . is located . . ."

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Land-use controls (continued)	Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions of Cal. Health & Safety Code § 25232(b)(1)(A)–(E).	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code §§ 25222.1 and 25355.5(a)(1)(C)		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, and G2-4		These requirements are ARARs in the event of the transfer of IRP Sites 1 and 2property to a non-federal entity. Generally, Cal. Health & Safety Code §§ 25222.1 and 25355.5(a)(1)(C) provide the authority for the DTSC to enter into voluntary agreements with land owners to restrict the use of property. The agreements run with the land restricting present and future uses of the land. The substantive requirements of the following Cal. Health & Safety Code § 25222.1 provisions are "relevant and appropriate": (1) the general narrative standard: "restricting specified uses of the property…" and (2) "…the agreement is irrevocable, and shall be recorded by the owner, …as a hazardous waste easement, covenant, restriction or servitude, or any combination thereof, as appropriate, upon the present and future uses of the land." The substantive requirements of the following Cal. Health & Safety Code § 25355.5(a)(1)(C) provisions are "relevant and appropriate": "…execution

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Land-use controls (continued)							and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof , as appropriate, upon the present and future uses of the land."
	Provides processes and criteria for obtaining written variances from a landuse restriction and for removal of the land use restrictions.	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code §§ 25233(c) and 25234		G1-2, G1-3, G1-4, G1-5, G1-6, G2-2, G2-3, and G2-4		These requirements are ARARs in the event of the transfer of IRP Sites 1 and 2 property to a non-federal entity. Cal. Health & Safety Code § 25233(c) sets forth "relevant and appropriate" substantive criteria for granting variances based upon specified environmental and health criteria. Cal. Health & Safety Code § 25234 sets forth the following "relevant and appropriate" substantive criteria for the removal of a land-use restriction on the grounds that "…the waste no longer creates a significant existing or potential hazard to present or future public health or safety."
California Labor Code*							

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Employment in the State of California	Establishes requirements for ensuring safe and healthful working conditions for working men and women in California		Cal. Health & Safety Code §6300 et seq.				Not an ARAR. The provisions at Cal. Health & Safety Code §6300 et seq. do not meet the definition of an ARAR since they are not cleanup standards, standards of control or other substantive environmental protection requirements, criteria, or limitations. However, the remedial action activities at IRP Sites 1 and 2 will be conducted in accordance with the health and safety plan which will comply with all applicable federal and state health and safety regulations.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Underground injection of hazardous waste	Establishes requirements for discharge of hazardous waste into an injection well		Cal. Health & Safety Code §§ 25159.10 through 25159.25				Not an ARAR. The cited requirements are not ARARs since injection of hazardous waste is not planned as a part of the groundwater remedial action at IRP Sites 1 and 2. If the groundwater is extracted under any remedial alternative, it would be treated so that the COC concentrations do not exceed federal or state primary MCLs before reinjection into the aquifer. The reinjection wells for treated groundwater would be designated as Class V wells per 40 C.F.R. § 144.6(e). In accordance with 40 C.F.R. § 144.83, California is a "Direct Implementation" Program State where U.S.EPA runs the Class V UIC program. The evaluation of the substantive requirements of the federal UIC regulations that may be potential ARARs for groundwater reinjection is presented in Table A4-1.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission	Visible emissions standard that states a person shall not discharge any air contaminant into the atmosphere from any single source of emission for a period or periods aggregating more than 3 minutes in a 60-minute period, which is (a) as dark or darker in shade as that designated No. 1 on the Ringelmann Chart, or (b) of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in (a).		SCAQMD Rule 401				Not an ARAR for the IRP Site 1 groundwater remedial action. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC- and-naphthalene impacted soil at the site.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission (continued)	Prohibits the discharge of any air emissions in quantities that may cause injury, detriment, nuisance, or annoyance to the public.	Discharge to air	SCAQMD Rule 402				Not an ARAR for groundwater response action at IRP Sites 1 and 2. The nuisance rule includes subjective non-environmental criteria such as “annoyance”, “comfort”, and “repose”. As such, the DON is troubled by the vague and subjective nature of the nuisance rule and the lack of objective “standard, requirements, criteria, or limitations” within the meaning of Section 121 (d)(2) of CERCLA. Other federal and state ARARs addressing actual and potential air emissions will ensure adequate protection of human health and the environment.
	Prohibits a person from building, erecting, installing or using any equipment, the use of which reduces or conceals an emission which would otherwise constitute a violation of these rules or Chapter 3 (starting with 41700) of Part 4, of Division 26 of the Health and Safety Code.		SCAQMD Rule 408				Not an ARAR. Not pertinent to remedial action at IRP Sites 1 and 2.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission (continued)	Limits the emissions of particulate matter from the exhaust of a combustion source (such as a gas turbine) to 0.23 grams per cubic meter (0.1 grains per standard cubic foot) at 12 percent carbon dioxide averaged over 15 minutes. It excludes internal combustion engines.		SCAQMD Rule 409				Not an ARAR. Not pertinent to remedial action at IRP Sites 1 and 2.
	Limit sulfur compounds from combustion of gaseous fuels not to exceed 40 ppm, 0.05 percent by weight for liquid fuels and 0.56 pounds of sulfur per million BTU for solid fossil fuels.		SCAQMD Rules 431.2, 431.3				Not an ARAR. Not pertinent to remedial action at IRP Sites 1 and 2.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission (continued)	Prohibits initiation of excavation at an active or inactive landfill without an Excavation Management Plan approved by the Executing Officer of AQMD. The plan shall provide information regarding the quantity and characteristics of the material to be excavated and transported and shall identify mitigation measures including gas collection and disposal, baling, encapsulating, covering the material and chemical neutralizing.		SCAQMD Rule 1150				Not an ARAR. Not relevant to groundwater remedial action at IRP Sites 1 and 2. Additionally, the requirements are procedural in nature and therefore not ARARs, since only substantive requirements are ARARs for the CERCLA response actions.
	T-BACT must be employed for new stationary equipment when the operation of that equipment results in a higher than allowable maximum individual cancer risk.	Stationary source that emits carcinogenic air contaminants.	SCAQMD Rule 1401	G1-6 and G2-4; and G1-3, G1-4, G1-5, and G2-3 (only if groundwater recirculation system is implemented as a remedy)			Requires that applicant demonstrate that the cumulative impact of emissions from new or modified source and all other permitted units within 100 meters owned or operated by the applicant are below a maximum individual cancer risk of 10^{-6}. T-BACT is required if maximum individual cancer risk exceeds this limit. VGAC will be designed to achieve maximum individual cancer risk of less than 10^{-6} threshold.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission (continued)	Specifies the use of CARB low diesel fuel or alternative fuels, limits on non emergency operators or diesel PM standards including emission control technology in order to reduce the emissions impact including cancer risk on affected receptors located near the engine exhaust.	Stationary source that emits carcinogenic air contaminants.	SCAQMD Rule 1470				Not an ARAR. Not pertinent to remedial action at IRP Site 1.
	Implements the provisions of Part 61, Chapter I, Title 40 of the C.F.R. under the supervision of the Air Quality Management District (AQMD) Executive Officer. It specifies emissions testing, monitoring procedures or handling of hazardous pollutants such as beryllium, benzene, mercury, vinyl chloride and asbestos.		SCAQMD Regulation X				Not an ARAR. Emissions of hazardous pollutants not expected.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Air emission (continued)	Compiles BACT requirements for various types of equipment or process. BACT is determined on a permit-by-permit basis based on the definition of BACT. In essence, BACT is the most stringent emission limit or control technology that is: ▪ Found in a State Implementation Plan (SIP), or ▪ Achieved in practice, or ▪ Is technically feasible and cost effective For practical purposes, at this time, nearly all AQMD BACT determinations will be based on achieved in practice BACT because it is generally more stringent than BACT based on SIP, and because state law constrains AQMD from using the third approach.		BACT Guidelines document				Not an ARAR. Not an ARAR since the guidance is not promulgated.
California Integrated Waste Management Board*							

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Emergency response	Establishes requirements for maintenance and content of a written postclosure emergency response plan.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21130				IRP Site 1 does not constitute a disposal site. In addition, the requirements for preparation and maintenance of an emergency response plan are procedural in nature and therefore do not constitute ARARs.
Site security	Establish requirements for placing signs stating the intended date of the last receipt of the waste at the site. Also establishes requirements for protection of sedimentation and detention basins.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21135 (a), (b), (c), (d) and (e)				Not an ARAR. IRP Site 1 does not constitute a disposal site and does not contain sedimentation or detention basins.
	All points of access to the site must be restricted. All monitoring, control, and recovery systems shall be protected from unauthorized access. Once closure activities are complete, site access by the public may be allowed in accordance with the approved postclosure maintenance plan.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21135 (f) and (g)				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Structure removal	Requires that site structures, and leachate and gas controls systems not intended for reuse be dismantled and removed at the time of closure to protect public health and safety.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21137				Not an ARAR. IRP Site 1 is not a disposal site and does not contain any structure or leachate and gas control system that needs dismantling.
Final Cover	Requires that final cover shall function with minimum maintenance and provide waste containment to protect public health and safety by controlling at a minimum, vectors, fire, odor, litter and landfill gas migration. The final cover shall also be compatible with postclosure land use.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21140				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.
Final grading	Requires that final grades be designed and maintained to reduce impacts to health and safety, and take into consideration any postclosure land use. Also requires discharger to produce and submit to the Enforcement Authority an iso-settlement map at least every five years only if RWQCB does not require such maps.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21142				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Slope stability	The owner shall assure the integrity of final slopes under both static and dynamic conditions to protect public health and safety and prevent damage to postclosure land uses, roads, structures, utilities, gas monitoring and control systems, leachate collection and control systems to prevent public contact with leachate, and prevent exposure of waste.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21145				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.
Drainage and erosion control	The drainage and erosion control system shall be designed and maintained to assure integrity of postclosure land uses, roads, and structures; to prevent public contact with waste and leachate; to assure integrity of gas monitoring and control systems; to prevent safety hazards; and to prevent exposure of waste.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21150				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Landfill gas control and leachate contact	During the postclosure maintenance period, the owner/operator shall assure that landfill gas control and leachate collection and control is done in a manner that prevents public contact and controls vectors, nuisance, and odors.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21160				IRP Site 1 is not a disposal site and therefore, the cited regulation for landfill gas control and leachate contact does not constitute an ARAR for the remedial action at IRP Site 1.
Gas monitoring and control during closure and postclosure	During the closure and postclosure period, the owner/operator shall protect public health and safety and the environment, and control the landfill gases generated at the disposal site to ensure that: 1) concentrations of methane gas do not exceed 1.25% by volume in air within on-site structures, 2) concentrations of methane do not exceed 5% by volume in air at the property or designated landfill boundary and 3) trace gases do not pose an acute or chronic exposure to toxic or carcinogenic compounds.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 20921-20937				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Postclosure maintenance	During the postclosure maintenance, the owner/operator shall assure that the landfill is maintained and monitored for no less than 30 years following closure.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21180				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.
Postclosure land use	Site Closure Design shall show one or more proposed uses of the closed site or show development that is compatible with open space. Changes in postclosure land use must be approved by the appropriate State agency prior to implementation.	Disposal sites that did not complete closure prior to November 18, 1990; new postclosure activities that may jeopardize the integrity of previously closed disposal sites.	Cal. Code Regs. tit. 27, § 21190				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1.
Final Closure Plan	Provides the purpose and content requirements for closure plan for solid waste disposal sites.	Solid waste disposal sites that received waste after November 1990.	Cal. Code Regs. tit. 27, § 21800				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1. In addition, the requirements are procedural in nature and are therefore not ARARs.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Final Postclosure Maintenance Plan	Provides the purpose and content requirements for postclosure plan for solid waste disposal sites	Solid waste disposal sites that received waste after November 1990.	Cal. Code Regs. tit. 27, § 21830				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1. In addition, the requirements are procedural in nature and are therefore not ARARs.
Certification of closure	Establishes requirements for obtaining certification of closure of the solid waste landfill from CIWMB, RWQCB, and the Enforcement Authority.	Solid waste disposal sites that received waste after November 1990.	Cal. Code Regs. tit. 27, § 21880				IRP Site 1 is not a disposal site and therefore, the cited regulation does not constitute an ARAR for the remedial action at IRP Site 1. In addition, the requirements are procedural in nature and are therefore not ARARs.
State Water Resources Control Board (SWRCB)*							

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
Storm water discharges	Construction and earth-moving activities that result in disturbance of at least one acre are subject to Water Quality Order No. 99-08-DWQ and the NPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). Such activities include, but are not limited to, clearing, grading, stockpiling and excavation of soil or other materials.	NPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit).	40 CFR: Parts 9, 122, 123, and 124				Not an ARAR, since the remedial action at IRP Site 1 would not result in a disturbance of one acre. An evaluation of the ARAR status of these regulations for soil response action at IRP Site 1 have been presented in a separate FS that addresses MEC-and-naphthalene impacted soil at the site.
Orange County Sanitation District							

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
	To protect the reusability of the treated wastewater, every applicant for a Special Purpose Discharge Permit (SPDP), the type of permit that would be applicable in this case, must comply with Attachment 112, *Evaluation of Alternative Discharge Methods*, before an SPDP permit application is distributed. OCSD requires the applicant to technically evaluate and justify why no other disposal options are reasonably available. To protect the public health and potable water resources, MCAS El Toro is strongly advised to consider all other reasonable options before considering sewer discharge.						Not an ARAR, since a requirement must be of state-wide application in order to qualify as an ARAR. In addition, no discharge is planned to the sewerage system as a result of remediation activities at IRP Site 1, and therefore, this regulation does not constitute an ARAR.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
	Consideration must be given to enable MCAS El Toro to have the flexibility for accommodating the treatment of the emerging pollutants of concern that may impact OCSD's ability to meet its commitments and to ensure compliance with standards for ocean discharge, biosolids land application, and water reuse. If needed, the pretreatment system should have the capability and the flexibility to meet the required standards by adding advanced treatment units such as microfiltration, ion exchange, reverse osmosis, advanced oxidation utilizing ultraviolet radiator, or any other pertinent technology or disposal alternatives.						Not an ARAR, since a requirement must be of state-wide application in order to qualify as an ARAR. In addition, no discharge is planned to the sewerage system as a result of remediation activities at IRP Site 1, and therefore, this regulation does not constitute an ARAR.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
	In addition to the current local discharge limits for dischargers to OCSD's sewers as found in OCSD's *Wastewater Discharge Regulations*, MCAS El Toro must provide treatment for the new pollutants, including perchlorate, NDMA, and 1,4-dioxane, that are currently regulated as part of the wastewater standards. Until numerical limits have been developed for these pollutants. MCAS El Toro must provide treatment for these pollutants so that the discharge alone, or collectively, will not negatively impact OCSD's capability to meet its environmental and regulatory obligations.						Not an ARAR, since a requirement must be of state-wide application in order to qualify as an ARAR. In addition, no discharge is planned to the sewerage system as a result of remediation activities at IRP Site 1, and therefore, this regulation does not constitute an ARAR.
	If a Special Discharge Permit (SPDP) is issued for discharge to the sewer, there are costs associated with the permit and its related requirements.						Not an ARAR, since a requirement must be of state-wide application in order to qualify as an ARAR. In addition, no discharge is planned to the sewerage system as a result of remediation activities at IRP Site 1, and therefore, this regulation does not constitute an ARAR.

Table A4-2 (continued)

Remedial Action Alternatives for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-1; Alternative G1-2; Alternative G1-3; Alternative G1-4; Alternative G1-5; Alternative G1-6

Remedial Action Alternatives for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-1; Alternative G2-2; Alternative G2-3; Alternative G2-4

				ARAR Determination			
Action	**Requirement**	**Prerequisite**	**Citation**	**A**	**RA**	**TBC**	**Comments**
	Please note that in the past, a superfund site was considered an industrial source, the discharge of which was not approved to be used for water reclamation. Please contact the California Department of Health Services to obtain a better understanding whether your effluent would be considered an industrial source that would not be acceptable for water reclamation.						Not an ARAR, since a requirement must be of state-wide application in order to qualify as an ARAR. In addition, no discharge is planned to the sewerage system as a result of remediation activities at IRP Site 1, and therefore, this regulation does not constitute an ARAR.

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

Acronyms/Abbreviations:

A – applicable
APCD – Air Pollution Control District
AQMD – Air Quality Management District
ARAR – applicable or relevant and appropriate requirement
BAT – best available technology
BPT – best practicable treatment
CAI – closed, abandoned, or inactive
Cal. Code Regs. – *California Code of Regulations*
Cal/EPA – California Environmental Protection Agency
Cal. Fish & Game Code – *California Fish and Game Code*

Cal. Health & Safety Code – *California Health and Safety Code*
Cal. Pub. Res. Code – *California Public Resources Code*
Cal. Water Code – *California Water Code*
CAMU – corrective action management unit
CEQA – California Environmental Quality Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – *Code of Federal Regulations*
ch. – chapter
CWA – Clean Water Act
div. – division
DON – Department of the Navy
DTSC – (Cal/EPA) Department of Toxic Substances Control
EE/CA – engineering evaluation/cost analysis
FS – feasibility study
LDR – land disposal restriction
mg/L – milligrams per liter
NAWQC – National Ambient Water Quality Control
PM_{10} – particulate matter, less than 10 micrometers in diameter
ppm – parts per million
Prop. – proposition
RA – relevant and appropriate
RAO – removal action objective
RCRA – Resource Conservation and Recovery Act
Res. – resolution
RI – remedial investigation
RWQCB – Regional Water Quality Control Board, Santa Ana Region
§ – section
SCAQMD – South Coast Air Quality Management District
SIP – State Implementation Plan
SWAT – Solid Waste Assessment Test
SWRCB – (California) State Water Resources Control Board
T-BACT – best available control technology for toxics
TBC – to be considered
tit. – title
TPH – total petroleum hydrocarbons
U.S.C. – *United States Code*
UST – underground storage tank
VOC – volatile organic compound
WQO – water quality objective

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
49	**Individual and comparative analyses of IRP Site 2 groundwater remedial alternatives**	**Section 2.8.2.2**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Sections 6.2.2 and 6.3.2, and Table 6-2. AECOM. April 2011.

6.2.2 VOC-Impacted Groundwater at IRP Site 2

6.2.2.1 ALTERNATIVE G2-1: NO ACTION

Under the No Action Alternative no deliberate actions would be undertaken to address groundwater at IRP Site 2. Naturally attenuation processes such as dispersion, dilution, sorption, volatilization, and biodegradation would be acting to reduce the concentrations of VOCs in groundwater; however, these mechanisms would not be monitored under this alternative. Under this alternative, VOCs would continue to have the potential to migrate in the groundwater.

Overall Protection of Human-Health and the Environment

The No Action Alternative does not provide any protection of human-health or the environment since no remedial activities would be performed to contain, treat, or reduce exposure to VOC-impacted groundwater. This alternative would allow continued migration of VOC-impacted groundwater towards the Station Boundary. In addition, under the No Action Alternative there would be no way to evaluate fate of VOCs including their migration off-Station and to take necessary protective measures for potential off-Station receptors. Alternative G2-1 does not reduce risks to potential on-site receptors due to exposure to VOC-impacted groundwater since no restrictions are imposed on groundwater use.

Compliance with ARARs

Since Alternative G2-1 entails no remedial action, ARARs would not be triggered. Therefore, a discussion of compliance with ARARs is not appropriate for this alternative.

Long-Term Effectiveness and Permanence

Alternative G2-1 affords little long-term effectiveness and permanence since it includes no controls for minimizing or reducing exposure to VOC-impacted groundwater. All current and potential future risks would remain under this alternative. Natural attenuation mechanisms including dispersion, dilution, sorption, volatilization, and biodegradation would continue to act to reduce VOC concentrations in groundwater. However, there would be no way to evaluate the effectiveness of these mechanisms in reducing VOC concentrations.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative G2-1 would not reduce VOC toxicity, mobility and/or volume in groundwater through treatment. Natural processes such as dispersion, dilution, sorption, volatilization, and biodegradation would be the primary processes acting to reduce VOC concentrations in groundwater. However, there would be no way to evaluate fate of VOCs including their migration off-Station.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community or the environment impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G2-1 would have no short-term impact on site risks at IRP Site 2. There would be no construction/implementation activity to generate additional site risk, no work crews to potentially be exposed to these risks, and no sources of additional environmental impact. Since Alternative G2-1 includes no remedial action, SER analysis was not conducted for this alternative.

Implementability

Alternative G2-1 requires no effort, services, supplies, or technology. There are no implementability concerns associated with Alternative G2-1 since no action would be taken.

Cost

There are no direct costs associated with Alternative G2-1.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G2-1 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.2.2 ALTERNATIVE G2-2: MONITORED NATURAL ATTENUATION AND INSTITUTIONAL CONTROLS

Alternative G2-2 consists of natural attenuation monitoring and ICs to attain the RAOs for VOC-impacted groundwater. Periodic sampling of groundwater would be performed from selected locations to evaluate the effectiveness of natural attenuation processes to reduce VOC concentrations in groundwater. Monitoring would also evaluate migration of VOCs off-Station at concentrations exceeding their respective CGs.

ICs under Alternative G2-2 would include non-engineered controls to minimize human exposure to VOC-impacted groundwater. Restrictions on groundwater use would be to protect potential on-site and off-site receptors, and protect the MNA system components.

A complete description of Alternative G2-2 is presented in Section 5.2.2.

Overall Protection of Human-Health and the Environment

Alternative G2-2 provides protection of human-health and the environment. This alternative restricts on-site use of groundwater; thereby protecting human-health by minimizing the potential for exposure to VOC-impacted groundwater. In the absence of active remediation/containment measures, VOCs may continue to potentially migrate off-Station at concentrations exceeding their respective CGs. However, groundwater use restrictions implemented for the off-Station portion of the aquifer would minimize the potential exposure of off-Station receptors to VOC-impacted groundwater. Effective implementation of ICs would be necessary for Alternative G2-2 to be protective of human-health.

Compliance with ARARs

Alternative G2-2 complies with all identified ARARs.

Long-Term Effectiveness and Permanence

Alternative G2-2 would provide long-term effectiveness in minimizing the potential for exposure to VOC-impacted groundwater posing unacceptable risk to human-health provided ICs are implemented effectively. Effective implementation of ICs for the on-Station portion of VOC-impacted groundwater can be accomplished relatively easily using the mechanisms summarized in Section 5.2.2.1. However, implementation of ICs for the off-Station portion of the aquifer with VOC concentrations exceeding their respective CGs may require careful coordination with State and local agencies.

It would take relatively longer for MNA to remediate VOCs in impacted groundwater to concentrations less than their respective CGs. Therefore, ICs would have to be implemented for a

relatively longer period of time. Once MNA reduces VOC concentrations to less than their respective CGs, residual concentrations of VOCs are not expected to pose unacceptable risk to human-health, and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative G2-2 would rely on natural processes such as dilution and dispersion to reduce VOC concentrations and toxicity in groundwater. Groundwater modeling indicates limited mobility of TCE (predominant COC) in groundwater at IRP Site 2 under natural conditions. Since biodegradation of VOCs appears to be limited in IRP Site 2 groundwater, this alternative would not be as effective in reducing mass/volume of VOC-impacted groundwater.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G2-2 would have a short-term impact on site risks at IRP Site 2 if it is determined that additional monitoring wells or other installations are needed for monitoring the groundwater. Well drilling would present a short-term risk of exposure of work crews to VOC-impacted groundwater and the inherent physical risk of using mechanized well drilling equipment.

Alternative G2-2 would have a low degree of environmental impact as evaluated through the qualitative SER analysis. The impacts to the environment for Alternative G2-2 are primarily expected due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/GHG emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for a relatively long time), when compared to other activities.

Groundwater modeling conducted in support of this FS indicates it would take more than approximately 32 years for Alternative G2-2 to remediate VOCs in IRP Site 2 groundwater to concentrations less than their respective CGs.

Implementability

MNA is relatively easy to implement. Well drilling (if needed) and well maintenance are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analyses and data interpretation. Access to monitoring wells for implementation of MNA can be ensured through effective implementation of ICs.

The implementation of ICs for the on-Station portion of VOC-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of the aquifer with VOC concentrations exceeding their respective CGs may require additional administrative effort since it may include careful coordination with State and local agencies. Access to monitoring wells for implementing MNA would be ensured using ICs.

Cost

RACER™ 2010 system Version 10.3.0 was used to generate a cost estimate for Alternative G2-2. The detailed costs for implementation of Alternative G2-2 are presented in Appendix G. The estimated net present-worth of Alternative G2-2 is approximately $1,755,000. The present-worth analysis assumed an O&M period of 32 years and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G2-2 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.2.3 Alternative G2-3: In-Plume Treatment, Monitoring, and Institutional Controls

Alternative G2-3 would include active remediation of the hot-spot defined by relatively elevated concentrations of TCE (above 40 μg/L) in groundwater. Active remediation of the hot-spot would treat relatively elevated concentrations of VOCs including TCE and minimize their downgradient migration. Active remediation of the hot-spot would be implemented using in-situ bioremediation, ISCO, or in-situ chemical reduction using ZVI.

Groundwater monitoring would be conducted to evaluate the effectiveness of active remediation technologies to treat VOCs, and to track the distribution of VOCs downgradient of the hot-spot.

To attain the RAOs, Alternative G2-3 would also include implementation of ICs. ICs would be implemented as part of Alternative G2-3 to minimize exposure of potential receptors to VOC-impacted groundwater until the concentrations of VOCs are reduced below their respective CGs.

A complete description of Alternative G2-3 is presented in Section 5.2.3.

Overall Protection of Human-Health and the Environment

Alternative G2-3 would be protective of human-health and the environment. In-situ remediation technologies would be implemented to reduce concentrations of VOCs in the hot-spot and minimize migration of relatively elevated concentrations of VOCs downgradient. Natural attenuation mechanisms would reduce concentrations of VOCs in groundwater downgradient of the hot-spot over time. Alternative G2-3 would also include implementation of ICs until the time VOCs are reduced to concentrations less than or equal to their respective CGs.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative G2-3 would comply with all identified ARARs.

Long-Term Effectiveness and Permanence

In-situ remediation technologies are expected to be effective in a long-term by reducing relatively elevated concentrations of VOCs in the hot-spot. In addition, natural attenuation mechanisms would reduce concentrations of VOCs in groundwater downgradient of the hot-spot. ICs would be implemented as part of Alternative G2-3 until the time VOCs are reduced to concentrations less than or equal to their respective CGs. Once Alternative G2-3 reduces VOC concentrations to less than their respective CGs, residual concentrations of VOCs are not expected to pose unacceptable risks to human-health, and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative G2-3 includes treatment of the VOC hot-spot area using technologies such as in-situ bioremediation, ISCO, or ZVI. If implemented properly, these technologies are expected to completely destroy the VOCs and convert them into innocuous products. Therefore, Alternative G2-3 would achieve a high degree of reduction in toxicity, mobility, or volume/mass of VOCs.

Downgradient of the hot-spot, natural processes such as dilution and dispersion would reduce perchlorate toxicity by reducing its concentration in groundwater. Groundwater modeling indicates limited mobility of TCE (predominant COC) in groundwater at IRP Site 2 under natural conditions. Since biodegradation of VOCs appears to be limited in IRP Site 2 groundwater, this alternative would not be as effective in reducing mass/volume of VOC-impacted groundwater.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G2-3 would have a short-term impact on risks at IRP Site 2 since subsurface injection of amendments/oxidants would be required as part of in-situ remediation implementation. Drilling conducted as part of in-situ remediation implementation would present short-term health and safety risks to work crews. Implementation of proper health and safety measures including the use of personal protective equipment would be required to address these concerns.

The impacts to the environment due to implementation of Alternative G2-3 were evaluated through the qualitative SER analysis. This analysis indicated that environmental impacts associated with implementation of Alternative G2-3 are primarily expected due to activities such as drilling/installation of wells, subsurface injection of reagents, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/GHG emissions/energy use are expected to be the highest for drilling/installation or replacement of wells, when compared to other activities.

Groundwater modeling conducted in support of this FS indicates that it would take approximately 29 years to remediate the VOCs in IRP Site 2 groundwater to concentrations less than their respective CGs using Alternative G2-3.

Implementability

Injection of reagents using direct push and or injection wells as part of in-situ remediation is a mature, well-known technology. Well drilling and well maintenance required for in-situ treatment and groundwater monitoring are routine activities and present little or no technical difficulties. The reagents and equipment required for implementing in-situ treatment are also commercially available from many vendors. The pilot studies conducted at IRP Site 2 provide valuable data to optimize the design of the full-scale in-situ bioremediation.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analyses and data analysis required for in-situ remediation performance monitoring. Access to the site during the O&M phase can be ascertained through effective implementation of ICs. The implementation of ICs for the on-Station portion of VOC-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of the aquifer with VOC concentrations exceeding their respective CGs may require additional administrative effort since it may include careful coordination with State and local agencies.

Cost

RACER™ 2010 was used to generate a cost estimate for Alternative G2-3. The detailed costs for implementation of Alternative G2-3 are presented in Appendix G. The estimated net present-worth of Alternative G2-3 is approximately $3,665,000. The present-worth analysis assumed an O&M period of 29 years and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G2-3 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.2.2.4 Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and Institutional Controls

This alternative would involve installation of groundwater extraction wells to extract and hydraulically contain VOC-impacted groundwater. Extracted groundwater would be treated using appropriate treatment technology such as GAC and/or air stripping. Treated groundwater would either be returned to the aquifer using infiltration galleries or groundwater reinjection wells, discharged into Borrego Canyon Wash, or used for irrigation.

To attain the RAOs, ICs would be implemented until the time VOCs are reduced to concentrations less than or equal to their respective CGs.

A complete description of Alternative G2-4 is presented in Section 5.2.4.

Overall Protection of Human-Health and the Environment

Alternative G2-4 would be protective of human-health and the environment. Extraction of VOC-impacted groundwater and its ex-situ treatment would reduce VOC concentrations in groundwater and minimize their migration off-Station at concentrations exceeding their respective CGs. Therefore, Alternative G2-4 would result in protection of potential off-Station receptors.

Alternative G2-4 would include implementation of ICs until the time VOCs are reduced to concentrations less than or equal to their respective CGs along the estimated extent of IRP Site 2 VOC-impacted groundwater. Therefore, Alternative G2-4 would minimize the potential for exposure of on-site receptors to VOC concentrations exceeding their respective CGs.

Compliance with ARARs

Alternative G2-4 would comply with all identified ARARs.

Long-Term Effectiveness and Permanence

The implementation of ex-situ remediation using extraction wells would effectively remediate IRP Site 2 VOC-impacted groundwater and minimize its potential off-Station migration. ICs including groundwater use restrictions would be implemented to minimize the potential for unacceptable exposure. Once Alternative G2-4 reduces VOC concentrations to less than their respective CGs a, residual concentrations of VOCs are not expected to pose unacceptable risks to human-health, and ICs including groundwater use restrictions would not be needed.

Reduction of Toxicity, Mobility, or Volume through Treatment

Although, groundwater extraction rates at IRP Site 2 are expected to be low, with a sufficient number of extraction wells, this alternative would reduce toxicity, mobility, or volume/mass of VOCs in IRP Site 2 groundwater. The extracted impacted groundwater would be treated using aboveground technologies such as GAC and/or air stripping. The ex-situ treatment would generate treatment residuals such as spent GAC, which would require proper handling and /or disposal.

Short-Term Effectiveness

The short-term effectiveness includes risks to workers/community or the environmental impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Alternative G2-4 would have a short-term impact on site risks at IRP Site 2, since installation of extraction wells and the groundwater conveyance/treatment system would be required as part of implementation. Well drilling would present a short-term risk of exposure of work crews to VOC-impacted groundwater and the inherent physical risk of using mechanized well drilling equipment. There is a risk for exposure of site workers to VOC-impacted groundwater when it is extracted and treated aboveground. However, adherence to standard health and safety procedures would minimize exposure to impacted groundwater.

The impacts to the environment due to implementation of Alternative G2-4 were evaluated through the qualitative SER analysis. This analysis indicated that environmental impacts associated with implementation of Alternative G2-4 are primarily expected due to activities such as drilling/installation of wells, construction of a groundwater conveyance/treatment system, the operation of the groundwater extraction/conveyance/treatment system, transport of site personnel, and disposal of groundwater generated during sampling of wells. The pollutant/GHG emissions and energy use are expected to be the highest for the operation of groundwater extraction, conveyance, and treatment systems, when compared to other activities.

Groundwater modeling conducted in support of this FS indicates that it would take 3 wells extracting groundwater at flow rates ranging from 0.3 gpm to 2 gpm to remediate IRP Site 2 VOC-impacted groundwater to concentrations less than their respective CGs, in approximately 21 years.

Implementability

Groundwater extraction, ex-situ treatment, and infiltration/reinjection of treated groundwater are all mature, well-known technologies. Well drilling and maintenance present little or no technical difficulties. Equipment and materials for its implementation are readily available. Field tests may be required to determine design parameters for implementation of infiltration.

Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analyses and data analysis required for performance monitoring. Access to the site during the O&M phase can be ensured through effective implementation of ICs.

Cost

RACER ™ 2010 system Version 10.3.0 was used to generate a cost estimate for Alternative G2-4. The detailed costs for implementation of Alternative G2-4 are presented in Appendix G. The estimated net present-worth of Alternative G2-4 is approximately $2,167,000. The present-worth analysis assumed an operation and maintenance period of 21 years and a discount rate of 2.8 percent.

State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

Community Acceptance

Community acceptance of Alternative G2-4 will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

implement the alternatives. There is no action associated with Alternative G1-1 therefore implementation considerations are deemed to be good. For the active alternatives, Alternative G1-2 would be the simplest to construct and operate. Alternatives G1-3, G1-4, and G1-5 include in-situ bioremediation of perchlorate. Alternative G1-6 includes ex-situ treatment of perchlorate-impacted groundwater using a FBR or IX. Groundwater modeling indicates that a large number of extraction wells would be required under Alternative G1-6 for the treatment of perchlorate-impacted groundwater. Therefore, Alternative G1-6 is expected to be more complex to construct and operate compared to alternatives proposing in-situ bioremediation (Alternatives G1-3 through G1-5). The in-situ pilot studies provided valuable data for full-scale design and implementation of in-situ bioremediation proposed under Alternatives G1-3 through G1-5. Since the implementation of Alternative G1-5 involves more components and construction activities it would be more complex compared to Alternatives G1-3 and G1-4.

6.3.1.7 Cost

There are no costs associated with Alternative G1-1. A comparison of present-worth costs for the remaining alternatives indicates that the remedial alternative involving ex-situ treatment (i.e., Alternative G1-6) is most expensive. In comparison, the present-worth costs for in-situ treatment Alternatives (i.e., G1-3 through G1-5) that are expected to remediate perchlorate-impacted groundwater to concentrations less than the CG are relatively cheaper. The present-worth costs for Alternative G1-2 are the lowest.

6.3.1.8 State Acceptance

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

6.3.1.9 Community Acceptance

Community acceptance will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.3.2 VOC-Impacted Groundwater at IRP Site 2

6.3.2.1 Overall Protection of Human-Health and the Environment

All alternatives, except Alternative G2-1 (No Action) provide adequate protection of human-health and the environment. Alternatives G2-2 through G2-4 protect human-health by providing varying degrees of treatment and/or MNA to reduce VOC concentrations in groundwater, and ICs to minimize the potential for exposure to VOC-impacted groundwater.

Alternative G2-2 would rely on natural attenuation mechanisms such as dispersion, dilution, sorption, volatilization, and biodegradation to reduce concentrations of VOCs in groundwater. Alternatives G2-3 and G2-4 include implementation of in-situ remediation and ex-situ treatment of extracted groundwater, respectively, to treat VOCs in groundwater. All active alternatives (Alternatives G2-2 through G2-4) would include implementation of ICs including groundwater use restrictions until the remedial alternatives reduce concentrations of VOCs to less than their respective CGs.

6.3.2.2 Compliance with Applicable or Relevant and Appropriate Requirements

Since Alternative G2-1 entails no remedial action, ARARs would not be triggered. Alternatives G2-2 through G2-4 would comply with all identified ARARs.

6.3.2.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

This criterion evaluates the residual risk at the completion of remedial actions along with the adequacy and reliability of remedial alternatives for ensuring the continued protection of human-health and the environment. Alternative G2-4 would provide a high degree of long-term effectiveness since it would include comprehensive remediation of the IRP Site 2 VOC-impacted groundwater. Alternative G2-4 would also minimize migration of VOC-impacted groundwater. The reliability of groundwater extraction and ex-situ treatment for remediation of VOCs proposed under Alternative G2-4 is high compared to other alternatives that include a relatively lesser degree of active remediation. Alternative G2-3 would include active treatment of relatively elevated concentrations of TCE using in-situ bioremediation, ISCO, or in-situ chemical reduction. Therefore, Alternative G2-3 would provide a high degree of reliability to treat VOCs to less than their respective CGs compared to Alternative G2-2. Alternative G2-2 would rely on natural processes such as dispersion and dilution to reduce concentrations of VOCs in groundwater.

6.3.2.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternative G2-2 would rely on natural attenuation mechanisms for reduction in concentrations, toxicity, mobility, or volume of VOCs in groundwater. Alternatives G2-3 and G2-4 employ active treatment technologies to permanently reduce toxicity, mobility or volume of VOCs in groundwater. Alternatives G2-3 would include implementation of in-situ remediation for the hot-spot area and would rely on natural attenuation mechanisms for remediation of the residual VOCs. Alternative G-4 would involve implementation of ex-situ treatment for the extracted, impacted groundwater to reduce concentrations of VOCs below their respective CGs. Therefore, Alternative G2-4 would provide a high degree of reduction in toxicity, mobility, and/or volume of VOCs through treatment compared to Alternative G2-3.

6.3.2.5 SHORT-TERM EFFECTIVENESS

The short-term effectiveness criterion includes risks to workers/community, or the environment impacts during the construction and implementation phase of the remedial action, and time required to achieve protectiveness. Since no remedial action would be implemented as part of Alternative G2-1, there would be no short-term risks to workers/community or adverse environmental impacts due to remedial action implementation. For the remaining alternatives, the short-term effectiveness would be a function of risks to workers and environmental impacts during the remedial construction phase (e.g., drilling and substrate injection), and during the O&M phase (e.g., transportation of personnel/equipment, treatment system operation, and potential for exposure to impacted groundwater). The risks to workers/community and environmental impacts associated with different remedial alternatives were evaluated through a qualitative SER analysis. The scope of construction operations would be the greatest for Alternative G2-4 compared to other alternatives. In addition, environmental impacts during the O&M phase are also expected to be relatively high for Alternative G2-4 due to the operation of groundwater extraction, conveyance, and treatment systems. Therefore, Alternative G2-4 would provide a lower degree of short-term effectiveness compared to Alternatives G2-1, G2-2, and G2-3. The scope of remedial construction operations and resultant potential risks to workers/community and environmental impacts are expected to be higher for Alternative G2-3 compared to Alternative G2-2. Therefore, Alternatives G2-2 would provide a higher short-term effectiveness compared to Alternatives G2-3.

6.3.2.6 IMPLEMENTABILITY

This criterion primarily addresses the ability to construct and operate the alternative, the reliability and ability to monitor the alternative, and the availability of equipment and specialists necessary to implement the alternative. There are no implementability concerns associated with Alternative G2-1 since no action would be taken. Alternative G2-2 would be the next simplest to construct and

operate. Alternative G2-3 would include active remediation of relatively elevated TCE concentrations using in-situ bioremediation, ISCO, or in-situ chemical reduction. Alternative G2-4 would include installation of groundwater extraction wells, and aboveground conveyance and treatment systems for remediation of VOC-impacted groundwater. The pilot studies conducted at IRP Site 2 for both in-situ and ex-situ remediation technologies provide valuable data for full-scale design and implementation of Alternatives G2-3 and G2-4. However, since the implementation of Alternative G2-4 involves more components and construction activities, it would be more complex compared to Alternatives G2-3.

6.3.2.7 COST

There are no costs associated with Alternative G2-1. A comparison of present-worth costs for the remaining alternatives indicates that Alternative G2-2 is the least expensive and Alternative G2-3 is the most expensive.

6.3.2.8 STATE ACCEPTANCE

The State comments will be formally presented in the Proposed Plan and documented in the ROD.

6.3.2.9 COMMUNITY ACCEPTANCE

Community acceptance will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.

6.4 POTENTIAL INTERACTION BETWEEN IRP SITES 1 AND 2 GROUNDWATER REMEDIES

IRP Site 1 perchlorate-impacted groundwater is commingled with VOC-impacted groundwater associated with IRP Site 2 near the Station Boundary (see Figures 3-7 and 3-8). This commingling did not significantly impact the development and evaluation of separate remedial alternatives for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater primarily because of the following reasons: (1) the extent of commingling is limited considering the overall extent of IRP Site 1 perchlorate impacted groundwater and relatively low perchlorate concentrations reported in IRP Site 2 groundwater, and (2) the different nature of IRP Site 1 groundwater COC (perchlorate) compared to IRP Site 2 COCs (VOCs, primarily TCE).

Although the development and evaluation of remedial alternatives for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater were not impacted by commingling, the designs of the selected separate groundwater remedies for IRP Sites 1 and 2 would need to take into account potential interactions between these remedies. This Section briefly summarizes these potential interactions that may need to be considered during the remedial design/remedial action phase.

Both TCE and perchlorate are amenable to in-situ biodegradation under anaerobic conditions. As observed during the in-situ bioremediation pilot study near the Station Boundary (AECOM and ECS 2010), when anaerobic conditions are created in the subsurface, both perchlorate- and TCE-degrading bacteria are stimulated. Therefore, remedial alternatives for IRP Site 1 groundwater that include in-situ bioremediation near the Station Boundary would also lead to treatment of VOCs and/or minimize their potential downgradient migration. Conversely, remedial alternatives for VOCs associated with IRP Site 2 groundwater that involve in-situ bioremediation will also aid in controlling potential downgradient migration of perchlorate.

A more detailed discussion of potential interaction between IRP Sites 1 and 2 groundwater remedial alternatives is presented in Tables 6-3 and 6-4.

Table 6-2: Summary of Individual and Comparative Analysis of Alternatives – IRP Site 2 VOC-impacted Groundwater[a]

Criterion	Alternative G2-1: No Action	Alternative G2-2: Monitored Natural Attenuation (MNA) with Institutional Controls	Alternative G2-3: In-Plume Treatment, Monitoring, and ICs	Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs
Overall Protection of Human-Health and the Environment	*Does not Meet the Criterion* No remedial activities would be performed to contain, treat, or reduce exposure to VOCs in groundwater. In addition, there would be no way to assess fate of VOCs in groundwater. This alternative does not reduce risks to potential receptors due to exposure to impacted groundwater since no restrictions are imposed on groundwater use.	*Meets the Criterion* Groundwater use restrictions implemented as part of this alternative would protect human-health by minimizing the potential for exposure to groundwater with VOC concentrations exceeding their respective CGs. These restrictions would be implemented for the on-Station and off-Station portions of impacted groundwater until natural attenuation processes reduce VOC concentrations to less than their respective CGs along the estimated extent of IRP Site 2 VOC-impacted groundwater.	*Meets the Criterion* Treatment of the VOC hot-spot would reduce and minimize migration of relatively elevated concentrations of VOCs downgradient. Natural attenuation mechanisms would reduce concentrations of VOCs in groundwater downgradient of the hot-spot over time. In addition, ICs including groundwater use restrictions would minimize the potential for exposure to VOCs above their respective CGs.	*Meets the Criterion* Extraction of impacted groundwater and its ex-situ treatment would reduce VOC concentrations in groundwater and minimize off-Station migration of VOC-impacted groundwater at concentrations exceeding CGs. ICs including groundwater use restrictions would protect human-health until the time VOC concentrations are reduced to less than or equal to their respective CGs.
Compliance with ARARs	*Not Applicable* Since no-action entails no remedial action, ARARs are not triggered.	*Meets the Criterion* Complies with ARARs.	*Meets the Criterion* Complies with ARARs.	*Meets the Criterion* Complies with ARARs.
Long-Term Effectiveness and Permanence	*Poor* As no remedial activities are proposed for controlling or reducing exposure to VOC-impacted groundwater, Alternative G2-1 cannot offer any level of effectiveness or permanence.	*Fair* Alternative G2-2 would provide long-term effectiveness in minimizing the potential for exposure to groundwater with VOC concentrations exceeding their respective CGs provided ICs are implemented effectively. Natural attenuation mechanisms would reduce concentrations of VOCs in groundwater and these reductions would be monitored through groundwater sampling and analyses at regular intervals. Once MNA reduces VOC concentrations to less than their respective CGs, residual concentrations of VOCs are not expected to pose unacceptable risks to human-health and ICs including groundwater use restrictions would not be needed.	*Fair to Good* Treatment of the VOC hot-spot would provide long-term effectiveness by reducing relatively elevated concentrations of VOCs. In addition, natural attenuation mechanisms would reduce concentrations of VOCs in groundwater downgradient of the hot-spot. This alternative is more effective and reliable for treatment of VOC-impacted groundwater compared to Alternatives G2-1 and G2-2 because of the implementation of active remediation for the VOC hot-spot. Once Alternative G2-3 reduces VOC concentrations to less than their respective CGs, residual concentrations of VOCs are not expected to pose unacceptable risks to human-health and ICs including groundwater use restrictions would not be needed.	*Good* The implementation of ex-situ remediation using extraction wells would effectively remediate VOC-impacted groundwater and minimize its potential off-Station migration. This alternative is more effective and reliable for treatment of VOC-impacted groundwater compared to Alternatives G2-1 through G2-3 because of the larger scale of proposed active remediation and lesser reliance on ICs. ICs including groundwater use restriction would be implemented to minimize the potential for unacceptable exposure. Once Alternative G2-4 reduces VOC concentrations to less than their respective CGs, residual concentrations of VOCs are not expected to pose unacceptable risks to human-health and ICs including groundwater use restrictions would not be needed.
Reduction in Toxicity, Mobility, and Volume through Treatment	*Poor* This alternative would not reduce toxicity, mobility and/or volume of VOCs in groundwater through treatment.	*Poor* This alternative would rely on natural processes such as dilution and dispersion to reduce VOC concentrations and toxicity in groundwater. Groundwater modeling indicates limited mobility of TCE (predominant COC) in groundwater at IRP Site 2 under natural conditions. Since biodegradation of VOCs appears to be limited in IRP Site 2 groundwater, this alternative would not be as effective in reducing mass/volume of VOC-impacted groundwater.	*Fair* This alternative includes treatment of VOC hot-spot area using technologies such as in-situ bioremediation, ISCO, or ZVI. If implemented properly, these technologies are expected to completely destroy the VOCs and convert them into innocuous products. Therefore, Alternative G2-3 would achieve a high degree of reduction in toxicity, mobility, or volume/mass of VOCs through treatment compared to Alternatives G2-1 and G2-2.	*Good* Although, groundwater extraction rates at IRP Site 2 are expected to be low, with a sufficient number of extraction wells, this alternative would reduce toxicity, mobility, or volume/mass of VOCs in the groundwater. Treatment residuals such as spent granular activated carbon may be generated as a result of ex-situ treatment. These treatment residuals would require proper handling and /or disposal. Alternative G-4 would involve implementation of ex-situ treatment of the estimated extent of IRP Site 2 VOC-impacted groundwater to reduce concentrations of VOCs below their respective CGs. Therefore, Alternative G2-4 would achieve a high degree of reduction in toxicity, mobility, and/or volume of VOCs through treatment compared to Alternatives G2-1 through G2-3.
Short-Term Effectiveness	*Good* Alternative G2-1 would have no short-term impact on site risks. There would be no construction/implementation activity to generate additional site risk; no work crews to potentially be exposed to these risks; and no sources of additional environmental impact.	*Fair to Good* Alternative G2-2 would have short-term impacts on site risks if it is determined that additional monitoring wells or other installations are needed for monitoring of VOC-impacted groundwater. The risks to workers/community and environmental impacts for Alternative G2-2 are primarily expected due to activities such as drilling/installation of wells, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. Groundwater modeling conducted in support of this FS indicates it would take more than approximately 32 years for Alternative G2-2 to remediate VOCs in IRP Site 2 groundwater to concentrations less than their respective CGs. Because of the relatively long predicted remediation time-frame, the pollutant/ GHG emissions/energy use are expected to be the highest for monitoring (due to transport of personnel for a relatively long time), when compared to other activities.	*Fair* Alternative G2-3 would have short-term impacts on site risks, since installation of injection/extraction or monitoring wells would be required for implementation of in-situ treatment (bioremediation, chemical oxidation or chemical reduction) and groundwater monitoring. The risks to workers/community and environmental impacts for Alternative G2-3 are primarily expected due to activities such as drilling/installation of wells, subsurface injection of reagents, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. The scope of construction operations for Alternative G2-3 exceeds Alternatives G2-1 and G2-2; therefore, Alternative G2-3 is less effective in the short-term compared to Alternatives G2-1 and G2-2. The pollutant/ GHG emissions/energy use are expected to be the highest for drilling/installation or replacement of wells, when compared to other activities. Groundwater modeling conducted in support of this FS indicates it would take approximately 29 years for Alternative G2-3 to remediate VOCs in IRP Site 2 groundwater to concentrations less than their respective CGs.	*Poor* Alternative G2-4 would have short-term impacts on site risks, since installation of extraction wells and a conveyance/treatment system would be required. The risks to workers/community and environmental impacts for Alternative G2-4 are primarily expected due to activities such as drilling/installation of wells, construction of groundwater conveyance system, operation of groundwater extraction/conveyance/ treatment system, transport of site personnel, and disposal of groundwater generated during sampling/development of wells. The pollutant/ GHG emissions/energy use are expected to be the highest for operation of groundwater extraction, and conveyance and treatment system, when compared to other activities. Groundwater modeling conducted in support of this FS indicates it would take approximately 21 years for Alternative G2-4 to remediate VOCs in IRP Site 2 groundwater to concentrations less than their respective CGs. Since a limited number of additional extraction/monitoring wells would be required for Alternative G2-4, the pollutant/ GHG emissions/energy use are expected to be the highest for operation of groundwater extraction, and conveyance and treatment system, when compared to other activities. The scope of construction operations is greatest for Alternative G2-4 compared to the remaining alternatives. Therefore, Alternative G2-4 is less effective in the short-term compared to the remaining alternatives.

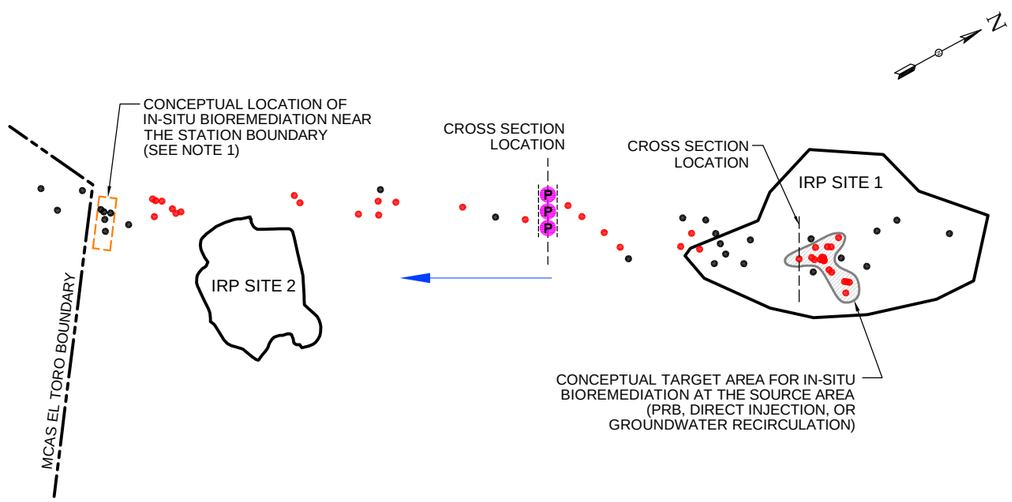
Criterion	Alternative G2-1: No Action	Alternative G2-2: Monitored Natural Attenuation (MNA) with Institutional Controls	Alternative G2-3: In-Plume Treatment, Monitoring, and ICs	Alternative G2-4: Hydraulic Containment/Treatment, Monitoring, and ICs
Implementability	*Good* There are no implementability concerns associated with Alternative G2-1 since no action would be taken.	*Fair to Good* Alternative G2-2 is simplest to construct and operate when compared to active remediation technologies proposed under Alternatives G2-3 and G2-4. Well drilling and well maintenance required for MNA implementation are routine activities and present no technical difficulties. Services of experienced personnel, equipment, and material/supplies are generally readily available for groundwater sampling, laboratory analysis and data interpretation. The implementation of ICs for the on-Station portion of VOC-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of VOC-impacted groundwater (if required) may require careful coordination with State and local agencies.	*Fair* Alternatives G2-3 includes in-situ treatment (bioremediation, chemical oxidation or chemical reduction) of the VOC hot-spot. The implementation of Alternative G2-3 would be more complex compared to Alternatives G2-1 and G2-2 since it involves more components and construction activities. Well drilling and well maintenance required for in-situ treatment and groundwater monitoring are routine activities and present little or no technical difficulties. The substrate and equipment required for implementing in-situ treatment are also commercially available from many vendors. The pilot studies conducted at IRP Site 2 provide valuable data to optimize the design of the full-scale in-situ remediation. The implementation of ICs for the on-Station portion of VOC-impacted groundwater is not expected to present any significant challenges. However, implementation of ICs for the off-Station portion of VOC-impacted groundwater (if required) may require careful coordination with State and local agencies.	*Poor* Alternative G2-4 includes ex-situ treatment of VOC-impacted groundwater. This would include installation of extraction wells, groundwater conveyance system, and aboveground treatment system. The implementation of Alternative G2-4 would be more complex compared to the remaining alternatives since it involves more components and construction activities. Groundwater extraction, ex-situ treatment, reinjection, and infiltration are all mature, well-known technologies. Well drilling and maintenance present little or no technical difficulties.
State Acceptance	The State comments will be formally presented in the Proposed Plan and documented in the ROD.			
Community Acceptance	Community acceptance will be evaluated following the public comment period for the Proposed Plan and documented in the ROD.			
Present Worth Cost[b]	*Not Applicable* No cost	*Good* $1,755,000[c]	*Fair* $3,665,000[d]	*Fair to Good* $$2,167,000[e]
Total Cost	Not Applicable	$2,768,000	$4,646,000	$2,920,000

Notes:
[a] The assigned ratings are comparative for the remedial alternatives.
[b] Alternative with least cost was rated as good.
[c] The present worth analysis was performed assuming an O&M period of 32 years and a discount rate of 2.8 percent.
[d] The present worth analysis was performed assuming an O&M period of 29 years and a discount rate of 2.8 percent.
[e] The present worth analysis was performed assuming an O&M period of 21 years and a discount rate of 2.8 percent.

ARAR = applicable or relevant and appropriate requirement
CG = cleanup goal
COC = constituent of concern
GHG = green house gas
FS = feasibility study
IC = institutional control
IRP = Installation Restoration Program
ISCO = in-situ chemical oxidation
MNA = monitored natural attenuation
O&M = operation and maintenance
ROD = Record of Decision
TCE = trichloroethene
VOC = volatile organic compound
ZVI = zero-valent ion

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
50	design configurations	Section 2.9.2.1	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Figure 5-5. AECOM. April 2011.

CONCEPTUAL PLAN



LEGEND:

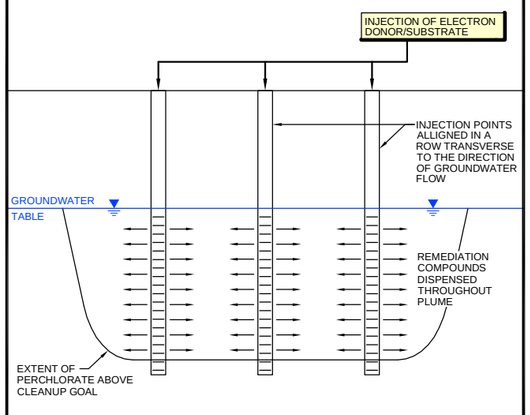
- P — CONCEPTUAL LOCATION OF PERMEABLE REACTIVE BARRIER BETWEEN IRP SITES 1 & 2. FINAL LOCATION TO BE DETERMINED DURING THE REMEDIAL DESIGN.
- INDICATES PERCHLORATE CONCENTRATIONS GREATER THAN 6 µg/L
- INDICATES DETECTABLE PERCHLORATE CONCENTRATIONS LESS THAN 6 µg/L
- GENERAL GROUNDWATER FLOW DIRECTION

NOTES:

1. IN-SITU BIOREMEDIATION AT THE STATION BOUNDARY WOULD BE IMPLEMENTED USING THE DESIGN CONFIGURATIONS PRESENTED FOR ALTERNATIVE G1-3. (SEE FIGURE 5-2)

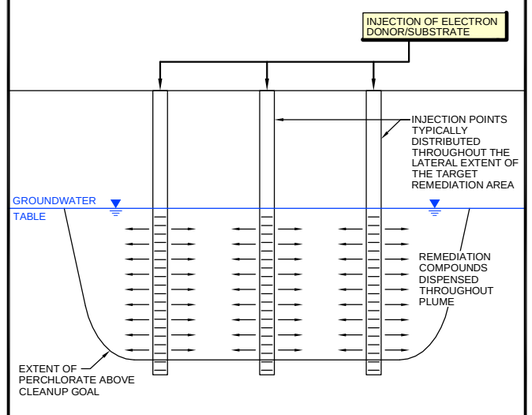
µg/L MICROGRAMS PER LITER
IC INSTITUTIONAL CONTROL
IRP INSTALLATION RESTORATION PROGRAM
MCAS MARINE CORPS AIR STATION
PRB PERMEABLE REACTIVE BARRIER

CONCEPTUAL PERMEABLE REACTIVE BARRIER CROSS SECTION



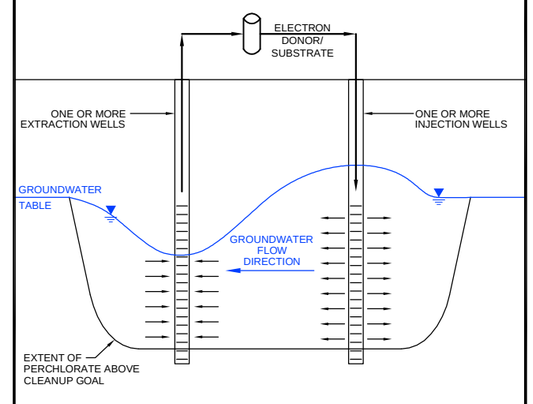
NOTE:
DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

CONCEPTUAL CROSS SECTION FOR DIRECT INJECTION IN THE SOURCE AREA



NOTE:
DIRECTION OF GROUNDWATER FLOW IS PERPENDICULAR TO THE CROSS SECTION AND INTO THE PAPER.

CONCEPTUAL CROSS SECTION OF GROUNDWATER RECIRCULATION SYSTEM



ALTERNATIVE IN-SITU BIOREMEDIATION DESIGN CONFIGURATIONS

Feasibility Study — Draft Final

Conceptual Design: Alternative G1-5
In-Situ Bioremediation at the Source Area, Downgradient of the Source Area & Near the Station Boundary, Monitoring, and ICs
IRP Sites 1 & 2

Date: 09-10	Former MCAS El Toro	Figure
Project No. 95653	AECOM	5-5

File: L:\work\95653\cad\IRP Sites 1 & 2 FS (GW)\Draft Final\FIGURE 5-5.dwg Time: Sep 27, 2010 - 4:32pm

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administration Record
51	**Memorandum of Agreement (MOA)**	**Section 2.9.2.1**	Final Groundwater Feasibility Study, Installation Restoration Program Sites 1 and 2, Former Marine Corps Air Station El Toro, California. Appendix D. AECOM. April 2011.

Appendix D
Memorandum of Agreement Between the DON and the DTSC

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Memorandum of Agreement Between
The United States Department of the Navy and
The California Department of Toxic Substances Control

Use of Model "Covenant to Restrict Use of Property" at Installations Being Closed and Transferred by the United States Department of the Navy

1. Background

   a. The purpose of this Memorandum of Agreement (MOA) is to formalize the use of two model environmental restriction covenants (attached) that have been drafted during negotiations between representatives of the United States Department of the Navy (DON) and the California Department of Toxic Substances Control (DTSC).

   b. Under CERCLA Sec. 104, as delegated to DON by E.O. 12580, and implemented pursuant to the National Contingency Plan (NCP – 40 CFR Sec. 300 et seq.) and 10 USC Sec. 2701, et seq., the cleanup of hazardous substances, pollutants and contaminants is required to be at a level that protects human health and the environment. As a result, this protection can be achieved at certain sites by the imposition of "institutional controls" (i.e., ICs – legal mechanisms to protect human health and the environment by restricting access or exposure to the contaminants in question) with or without underlying "engineering controls" (i.e., ECs – engineered mechanisms such as a cap on a landfill, designed to physically insure access or exposure to the contaminants in question is prevented). Collectively these ICs and ECs are called "land use controls" (LUCs).

   c. In the case of property being closed and transferred by DON to a nonfederal entity, it is necessary to insure that these LUCs stay in place and are honored by all future owners and occupants of the property in question, for as long as contamination is present at levels that do not permit unrestricted use. One key way such LUCs can be maintained is by DON's retention of sufficient legal title and interest to insure continuing enforcement of the terms of the LUCs. This retention would entail burdening such conveyances of title with deed covenants insuring that the deed transferring such property contain a formal restriction – a restrictive covenant – on the use of the property that will "run with the land," and is enforceable against the "servient estate" (i.e., all future owners of the land) and is retained by the United States, as represented by DON, acting as holder of the "dominant estate." In addition, DON can convey a separate and similar restrictive covenant to DTSC as provided in

Section 2 below.

d. In the State of California, such a restriction on the use of land, to protect human health and the environment is recognized by Section 1471 of the California Civil Code. This statute characterizes such a restrictive covenant as an "environmental restriction" and requires such words to be placed in the title of the document creating such an interest. DON has agreed to include such restrictive language in the deeds it executes where it imposes LUCs as a remedy under applicable law.

e. Similar to CERCLA, State environmental protection laws recognize the availability of using LUCs as remedies to protect human health and the environment. Currently, DTSC's authority under Chapter 6.5 and 6.8 of Division 20 of the California Health and Safety Code, provides statutory avenues to impose LUCs at a cleanup site to insure that the LUCs are honored by future owners. Chapter 6.5 is generally used when the cleanup site in question is one subject to the State's authorities under the hazardous waste facilities law, and Chapter 6.8 is generally used when the cleanup site in question is one subject to the State's equivalent to the federal CERCLA program.

f. In the case of property being closed and transferred to a nonfederal entity by DON where a cleanup remedy has used LUCs as a remedy as described above, DON and DTSC have a mutual interest in insuring that the "environmental restriction" imposed on the land is enforced for however long the protection of public health and the environment requires such restrictions.

g. As a result, DON and DTSC agree that it is in both parties' and the public's interests, that DTSC be in a position to enforce the "environmental restrictions" that the DON will be imposing on these transferring parcels of property. To this end, in addition to retaining the power to enforce protective covenants, DON agrees to convey a separate power to enforce such restrictive covenants to DTSC equivalent to DON's power to enforce any "environmental restrictions" burdening the transferring property by entering into a "Covenant to Restrict Use of Property." Under both Chapter 6.5 and Chapter 6.8, DTSC has the authority to monitor and enforce such "environmental restrictions" conveyed to it by the owner of property on which such an "environmental restriction" has been found necessary. Therefore, in consideration of DON's conveying such an interest, DTSC may implement as appropriate the various statutory authorities it possesses under Chapter 6.5 and Chapter 6.8 (as applicable) to insure these "environmental restrictions" are honored by all future owners and occupants.

2. Terms of Understanding:

a. DON and DTSC agree that in all future property transfers to a nonfederal agency, where DON is acting on behalf of the United States as the transferring or disposing agent, the applicable model "Covenant to Restrict Use of Property" attached to this MOU will be used throughout California when the proposed remedy involves imposing an IC (except those "early transfers" where 1) the transferee will perform the cleanup, and 2) the cleanup includes an IC in the remedy, and 3) has executed an order or enforceable agreement with DTSC or has entered into a Sec. 25222.1 agreement with DTSC, that calls for the transferee entering into a "Covenant to Restrict Use of Property" directly with DTSC).

b. DON and DTSC have entered into a number of Federal Facility Agreements and Federal Site Remediation Agreements for DON property. These Agreements generally call for coordination of the DON's satisfaction of its corrective action obligations under the Resource Conservation and Recovery Act (RCRA) and Health and Safety Code section 25200.10 with its responsibilities under CERCLA section 120(i), EO 12580, the Defense Environmental Restoration Program and the NCP. The Agreements recognize that the DON may satisfy some or all of its corrective action obligations through CERCLA response actions. Where such corrective action at hazardous waste management units is being satisfied through CERCLA, Attachment A shall be used. Attachment B is the model which will be used for hazardous waste management facilities not addressed in Federal Site Remediation or Federal Facility Agreements.

c. When issuing Proposed Plans for public comment, DON will attach a copy of this MOU and the appropriate model "Covenant to Restrict Use of Property" so as to assure the public that the specific LUC being proposed will be enforced, in part, by DON's retained power to enforce the deed covenants and conveyance of the power to enforce protective deed covenants to DTSC contemporaneously with the execution of the deed transferring DON's interests to the new owner.

d. In using these models to draft the appropriate "Covenant to Restrict Use of Property," DON's and DTSC's personnel will work collaboratively to develop the specific information applicable to the given site called for by Articles I (Statement of Facts) and IV (Restrictions) of the attached models. A final "Covenant to Restrict Use of Property" that is ready for signature for a given site, will be prepared in time to allow it to be

executed contemporaneously with the execution of the deed transferring DON's non-retained interests in the property to the new owner. In the case of "early transfers" where DON is performing the cleanup after the transfer, and is imposing an LUC at the time of the "early transfer" in support of its ongoing cleanup activities, the Parties recognize that the contents of Articles I and IV of the model covenants for such sites will likely not be as detailed as that suggested in the attached models. The degree of detail contained within the model covenant will be the information available as to the cleanup site, although the covenants must be adequate to protect human health and the environment to allow an early transfer. The form of remedy and any additional associated IC will be more fully developed once the remedy is selected and implemented.

e. The Parties recognize that given the need to tailor the terms of the "environmental restriction" to the remedy that is finally selected after seeking public comment on the Proposed Plan, the terms of the final "Covenant to Restrict Use of Property" may vary greatly from the draft proposal. The Parties recognize that the public should be given specific notice of this fact in the Proposed Plan.

f. The Parties recognize that remedies proposed by the DON will be submitted to DTSC for concurrence. However, there may be unresolved disagreements at some cleanup sites concerning the remedy being proposed by DON including, in particular, the scope and nature of the LUCs, and the terms of any underlying, proposed "Covenant to Restrict Use of Property." In such situations the Parties will use their best efforts to resolve all disputes informally. If the Parties are ultimately unable to resolve the issue in dispute, DON and DTSC reserve any rights they might have to take any action available under applicable state or federal law.

g. Either Party may terminate its involvement in this Agreement by giving thirty (30) days written notice to the other Party. Upon receipt of notice and the expiration of thirty days termination shall occur by operation of law.

Signed: _____ 10 March 2000

F.R. Ruehe
Rear Admiral
United States Navy
Commander Navy Region Southwest

Date

Signed: Edwin F. Lowry 3/10/00

Edwin F. Lowry
Director
Department of Toxic Substances Control

Date

Attachment A: Model Site Mitigation Program "Environmental Restriction Covenant and Agreement"

Attachment B: Model Hazardous Waste Management Program/State Regulated Unit "Environmental Restriction Covenant and Agreement"

Approved as to form:

Date: 9 March 00 By: Mary Kay Fanyo

Approved as to form:

Date: March 16, 2000 By: [illegible]

MODEL SITE MITIGATION PROGRAM

DEED RESTRICTION

RECORDING REQUESTED BY: **[Covenantor's Name]** **[Street Address]** **[City]**, California **[Zip Code]** WHEN RECORDED, MAIL TO: Department of Toxic Substances Control Region ___ **[Street Address]** **[City]**, California **[Zip Code]** Attention: **[Name of Branch Chief]**, Chief **[Branch Designation]**	

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

COVENANT TO RESTRICT USE OF PROPERTY

ENVIRONMENTAL RESTRICTION

(Re: *[Insert parcel number(s) and name of site property to be restricted.]*)

This Covenant and Agreement ("Covenant") is made by and between the United States of America acting by and through the Department of the Navy ("DON") (the "Covenantor"), the current owner of property situated in *[city]*, County of [ ], State of California, described in Exhibit "A", attached hereto and incorporated herein by this reference (the "Property"), and the State of California acting by and through the Department of Toxic Substances Control (the "Department"). Pursuant to Civil Code section 1471(c), Health and Safety Code Sections 25222.1 and 25355.5 the

Department has determined that this Covenant is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials as defined in Health and Safety Code ("H&SC") section 25260. In addition, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104 (42 USC Section 9604), as delegated to the Covenantor by E.O. 12580, ratified by Congress in 10 USC Sec. 2701, et seq., and implemented by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP – 40 CFR Part 300) and implementing guidances and policies, the Covenantor has also determined that this Covenant is reasonably necessary to protect present or future human health or safety or the environment as the result of the presence on the land of hazardous substances, pollutants and contaminants as defined in CERCLA Section 101 (42 USC Section 9601).

The Covenantor and the Department, collectively referred to as the "Parties", therefore intend that the use of the Property be restricted as set forth in this Covenant, in order to protect human health, safety and the environment.

The Covenantor retains sufficient legal title and interest in the subject property to insure continuing enforcement of the protective covenants and agreements contained within this Covenant to Restrict the Use of Property. Further in any subsequent transfers or conveyance of title to nonfederal entities the DON shall burden the property with additional deed covenants that insure that any subsequent deed or transfer contains the protective covenants and right of access and power to conduct monitoring of wastes retained on site. Those covenants and agreements shall be enforceable against the servient estate in that those protective covenants shall run with the land to

all successors and assigns.

ARTICLE I

STATEMENT OF FACTS

1.01 The Property, totaling approximately [acres] [square yards] is more particularly described and depicted in Exhibit "A", attached hereto and incorporated herein by this reference. ***[Exhibit "A" must include the legal description of the property used by the county recorder. This must include the particular description of the boundaries of the area to be subject to a particular use restriction. If the property does not already have a legal description (it generally will not if it is a portion of a larger piece of property) a survey will be required.]*** The Property is located in the area now generally bounded by ***[include narrative description of the area; this will typically be street names: e.g., Main Street on the north, Maple Street on the east, etc.]*** County of [ ], State of California.

1.02 ***[Use this paragraph if imposing additional restrictions on a portion of the Property, for example on a capped portion, or if for any other reason it is necessary to precisely identify any portion of the property, such as an area with groundwater monitoring wells. The purpose of this paragraph is to give the precise location of such areas where use restrictions generally will apply. Renumber following paragraphs accordingly.]*** A limited portion of the Property is more particularly described in Exhibit "B" which is attached and incorporated by this reference ("Capped Property") as defined below ***[or "(other identified) Property"]***. ***[Exhibit B must include a legal description of the exact area(s) being restricted***

and any necessary diagram(s). This will generally require a legal survey and engineering drawing for the Cap or other area to be further restricted.] The [Capped *(or other description)*] Property is located in the area now generally bounded by [ ]. ***[Include language that generally describes the Capped or other identified Property.]*** The [Capped *(or other identified)* Property is also more specifically described as encompassing [ ] County Assessor's Parcel No.(s) [ ].

1.03 ***[Briefly describe the remedial measures implemented at the Property, including, if applicable, installation of a cap and construction and ongoing operation and maintenance of a groundwater treatment system, in order to identify the remaining contaminants and physical remedial measures on the Property that necessitate this deed restriction. This paragraph should also briefly discuss the regulatory context for the DON facility. Reference should be made to any applicable Federal Facility Agreement (FFA) or Federal Facility Site Remediation Agreement(FFSRA) and any corrective action obligations under RCRA or Chapter 6.5 of Division 20 of the Health and Safety Code covered by the FFA or FFSRA. This paragraph should refer to, and give the approval date for, the RAP, ROD, RAW or other decision document that selected the remedial measures at the Property and required this Covenant.]***

SAMPLE [For a facility which has an FFA or FFSRA and hazardous waste management units]: The DON and the Department entered into a Federal Facility Agreement (FFA) on [date]. Pursuant to that FFA, the DON may satisfy some or all of its corrective action obligations under the Resource Conservation and Recovery Act

(RCRA)(42 USC 6901 et seq)or California Health and Safety Code sectin 25200.10 through CERCLA response actions. ***{Proceed to additional SAMPLES as appropriate.]***

SAMPLE [For a property with remaining contamination, but no cap, O&M, or other ongoing response activities]: The Property is [a portion of a site] being remediated pursuant to a Record of Decision (ROD) pursuant to the Defense Environmental Restoration Program (DERP), 10 U.S.C. section 2701 et seq, and CERCLA; and a Remedial Action Plan (RAP) pursuant to Chapter 6.8 of Division 20 of the H&SC, under the oversight of the Department. The ROD/RAP provides that a deed restriction be required as part of the site remediation, because lead, which is a hazardous substance, as defined in H&SC section 25316, and a hazardous material as defined in H&SC section 25260 remains at depths of 10 feet or more below the surface of the Property. The DON circulated the ROD/RAP, for public review and comment. The ROD/RAP was approved by the DON and concurred in by the Department on [date], pursuant to which the Property was excavated to a depth of 10 feet, graded, then backfilled with clean soil.

SAMPLE [For a property with ongoing operation and maintenance of a monitoring or treatment system and/or cap. The exact provisions of this paragraph will vary depending upon the facts of the particular site or facility. The paragraph below is illustrative of the kind of information that should be included. Note specifically there is reference to a signed Operation and Maintenance Agreement.]: [Covenantor] ***[or party responsible for the activity, if different from***

Covenantor] is remediating the Property under the supervision and authority of the Department. The Property is [a portion of a site] being remediated pursuant to a Record of Decision (ROD) pursuant to the Defense Environmental Restoration Program (DERP), 10 U.S.C. section 2701 et seq; and a Remedial Action Plan (RAP) pursuant to Chapter 6.8 of Division 20 of the H&SC. Because hazardous substances, as defined in H&SC section 25316, which are also hazardous materials as defined in H&SC section 25260, including volatile organic compounds, total petroleum hydrocarbons, chlorinated benzenes and polychlorinated biphenyls, remain in the soil and groundwater in and under portions of the Property, the Remedial Action Plan provides that a deed restriction be required as part of the site remediation. The DON circulated the ROD/RAP for public review and comment. The ROD/RAP were approved by the DON and concurred in by Department on [*date*]. Remediation includes installing and maintaining a synthetic membrane cover ("Cap") over the Capped Property. The Cap consists of a low permeability synthetic membrane and other associated layers, as more particularly described in the engineering drawing attached as Exhibit "B" hereto. The response action also includes the installation and operation of: (1) a passive gas collection system on the Capped Property which removes volatile organic compounds migrating upward from under the Cap, (2) a vapor extraction system, which remediates certain volatile organic compound-impacted soils, and (3) groundwater monitoring wells ("Monitoring Wells"). The location of the gas collection system, vapor extraction system, and Monitoring Wells are shown on Exhibit "B". ***[This exhibit will have been identified in paragraph 1.02.]*** The operation and maintenance of the Cap, gas collection system, vapor extraction system, and Monitoring Wells is pursuant to an Operation and

Maintenance Manual incorporated into the Operation and Maintenance Agreement between [Covenantor] ***[or name of other entity]*** and the Department dated [ ]. ***[If an O&M Agreement has not been signed, the approval date for the O&M Manual or Plan should be referenced.]***

1.04 ***[This paragraph should set out specific information about the risk assessment findings relevant to the contaminants of concern remaining at the property, essentially the basis for the restrictions imposed by this covenant. The Restrictions in Paragraphs 4.01, and any requirement for Soil Management Activity and any Prohibited Activity must be linked to the contaminants and risk assessment as discussed in this paragraph. The following paragraph is given for purposes of illustration. Each site will have different facts; those should be developed in a manner similar to the sample paragraph given here. Land use must be consistent with the approved RAW, RAP or ROD and the health risk assessment.]***

SAMPLE: As detailed in the Final Health Risk Assessment ***[or other appropriate document]*** as proposed by the Covenantor and approved by the Department on [***date***], all or a portion of the surface and subsurface soils within 10 feet of the surface of the Property contain hazardous substances, as defined in H&SC section 25316, which include the following metal contaminants of concern in the ranges set forth below: arsenic (0.3 to 38.1 parts per million ("ppm"), beryllium (2.6 ppm), copper (4.6 to 756 ppm, and nickel (7.3-105 ppm). In addition, there are low pH soils. Based on the Final Risk Assessment the Department and the Covenantor have

concluded that use of the Property as a residence, hospital, school for persons under the age of 21 or day care center would entail an unacceptable cancer risk to the users or occupants of such property operated or occupied. The Department and the Covenantor have further concluded that the Property, as remediated, and operated or occupied subject to the restrictions of this Covenant, does not present an unacceptable threat to human safety or the environment, if limited to ***[as applicable:*** commercial and industrial, parks, open space,***[or other appropriate]]*** use.

SAMPLE: [Note: Groundwater restrictions in Paragraph 3.04 must be based on a discussion of what contaminants are found in groundwater at the site, and what the drinking water standards are.]

Groundwater at the Property is found 15 to 20 feet below ground surface. Contaminants in the groundwater include benzene (50- 123 ppm), chromium (75- 213 ppm) and TCE (350-780 ppm). California drinking water standards are benzene at 0.08 ppm, chromium at 30 ppm and TCE at 5 ppm. The Department and the Covenantor concludes that the groundwater presents an unacceptable threat to human health and safety absent an environmental restriction to eliminate exposure to such levels of groundwater.

ARTICLE II

DEFINITIONS

2.01 Department. "Department" means the State of California by and through the Department of Toxic Substances Control and includes its successor agencies, if

any.

2.02 Owner. "Owner" shall include the Covenantor's successors in interest, and their successors in interest, including heirs and assigns, during his or her ownership of all or any portion of the Property.

2.03 Occupant. "Occupant" means Owners and any person or entity entitled by ownership, leasehold, or other legal relationship to the right to occupy any portion of the Property.

2.04 Covenantor. "Covenantor" shall mean the United States acting through the Department of the Navy (DON).

ARTICLE III

GENERAL PROVISIONS

3.01 Restrictions to Run with the Land. This Covenant sets forth protective provisions, covenants, restrictions, and conditions (collectively referred to as "Restrictions"), subject to which the Property and every portion thereof shall be improved, held, used, occupied, leased, sold, hypothecated, encumbered, and/or conveyed. These Restrictions are consistent with the separate restrictions placed in the deed by and in favor of the Covenantor, conveying the Property from the Convenantor to its successor in interest described above. Each and every Restriction: (a) runs with the land in perpetuity pursuant to H&SC sections 25222.1 25355.5(a)(1)(C) and Civil Code section 1471; (b) inures to the benefit of and passes with each and every portion of the Property; (c) shall apply to and bind all subsequent Occupants of the Property; (d) is for the benefit of, and is enforceable by the Department; and (e) is imposed upon the entire Property unless expressly stated as applicable only to a specific portion thereof.

3.02 Binding upon Owners/Occupants. Pursuant to H&SC sections 25222.1, 25355.5(a)(1)(C), this Covenant binds all Owners of the Property, their heirs, successors, and assignees, and the agents, employees, and lessees of the owners,

heirs, successors, and assignees. Pursuant to Civil Code section 1471(b), all successive owners of the Property are expressly bound hereby for the benefit of the Department.

3.03 Written Notice of Hazardous Substance Release. The Owner shall, prior to the sale, lease, or rental of the Property, give written notice to the subsequent transferee that a release of hazardous substances has come to be located on or beneath the Property, pursuant to Health and Safety Code section 25359.7. Such written notice shall include a copy of this Covenant. *[This last sentence is optional, to be used at sites where it is important that buyers and tenants be specifically aware of the ongoing remediation and their obligations.]*

3.04 Incorporation into Deeds and Leases. The Restrictions set forth herein shall be incorporated by reference in each and all deeds and leases for any portion of the Property.

3.05 Conveyance of Property. The Owner shall provide notice to the Department not later than thirty (30) days after any conveyance of any ownership interest in the Property (excluding mortgages, liens, and other non-possessory encumbrances). The Department shall not, by reason of this Covenant alone, have authority to approve, disapprove, or otherwise affect a conveyance, except as otherwise provided by law, by administrative order, or by a specific provision of this Covenant.

ARTICLE IV

RESTRICTIONS

[The following examples are intended to be illustrative. Not all of them will be

applicable. The restrictions for a particular property should have a direct relationship to what the Health Risk Assessment said was appropriate for use at the site. The restrictions must also protect the integrity and physical accessibility of, and legal rights of access to, any ongoing remediation facilities at the site.]

4.01 Prohibited Uses. The Property shall not be used for any of the following purposes: ***[Note: These prohibitions must be based on the appropriate decision documents as set forth in Paragraphs 1.03 and 1.04]***

[Sample provisions:]

(a) A residence, including any mobile home or factory built housing, constructed or installed for use as residential human habitation.

(b) A hospital for humans.

(c) A public or private school for persons under 21 years of age.

(d) A day care center for children.

4.02. Soil Management ***[Note: The basis for the soil restrictions must be in Paragraphs 1.03 and 1.04]***

[Sample provisions]

(a) No activities that will disturb the soil [at or below [ ] feet below grade] (e.g., excavation, grading, removal, trenching, filling, earth movement or mining) shall be allowed on the Property without a Soil Management Plan and a Health and Safety Plan approved by the Department.

(b) Any contaminated soils brought to the surface by grading, excavation, trenching or backfilling shall be managed in accordance with all applicable provisions of

state and federal law.

(c) The Owner shall provide the Department written notice at least fourteen (14) days prior to any building, filling, grading, mining or excavating in the Property [more than [ ] feet below the soil surface] [which will remove more than [ ] cubic yards of soil].

4.03 Prohibited Activities. ***[This paragraph will not be applicable to all sites. If not used, renumber accordingly. If there are groundwater restrictions, the basis must be in Paragraphs 1.03 and 1.04]*** The following activities shall not be conducted at the Property:

[Sample provisions]

(a) Raising of food (agricultural products intended for human consumption or use, including but not limited to food, cattle, fibers, including cotton).

(b) Drilling for [drinking irrigation] water, oil, or gas [without prior written approval by the Department].

[or] (b) Extraction of groundwater for purposes other than site remediation or construction dewatering.

[The following paragraphs are samples of restrictions that may be applicable when there is a cap, vapor and/or gas collection system, and/or groundwater monitoring system.]

4.04 Non-Interference with Cap [and Vapor Extraction System (VES)] and [Groundwater Capture System (GCS)].

[Sample provisions:]

(a) Activities that may disturb the Cap (e.g. excavation, grading, removal, trenching, filling, earth movement, or mining) shall not be permitted on or within _____ feet of the Capped Property without prior review and approval by the Department. ***[Similar restrictions may be appropriate for other ongoing remediation systems.]***

(b) All uses and development of the Capped Property shall preserve the integrity **[*(if appropriate:)* and physical accessibility]** of the Cap. ***[Extend to other systems as appropriate.]***

(c) The Cap shall not be altered without written approval by the Department.

(d) The Owner shall notify the Department of each of the following: (i) the type, cause, location and date of any damage to the Cap and (ii) the type and date of repair of such damage. Notification to the Department shall be made as provided below within ten (10) working days of both the discovery of any such disturbance and the completion of any repairs. Timely and accurate notification by any Owner or Occupant shall satisfy this requirement on behalf of all other Owners and Occupants. ***[Extend to other systems as appropriate.]***

4.05 Access for Department. The Department shall have reasonable right of entry and access to the Property for inspection, monitoring, and other activities consistent with the purposes of this Covenant as deemed necessary by the Department in order to protect the public health or safety, or the environment.

ARTICLE V

ENFORCEMENT

5.01 Enforcement. Failure of the Owner or Occupant to comply with any of the

Restrictions specifically applicable to include grounds for the Department to require that the Owner modify or remove any improvements ("Improvements" herein shall mean all buildings, roads, driveways, and paved parking areas), constructed or placed upon any portion of the Property in violation of the Restrictions. Violation of this Covenant by the Owner or Occupant may result in the imposition of civil and/or criminal remedies including nuisance or abatement against the Owner or Occupant as provided by law. The State of California shall have all remedies as provided at in California Civil Code Section 815.7 as that enactment may be from time to time amended.

ARTICLE VI

VARIANCE AND TERMINATION

6.01 Variance. The Owner, or with the Owner's consent, any Occupant, may apply to the Department for a written variance from the provisions of this Covenant. Such application shall be made in accordance with H&SC section 25233. The Department will grant the variance only after finding that such a variance would be protective of human, health, safety and the environment.

6.02 Termination. The Owner, or with the Owner's consent, any Occupant, may apply to the Department for a termination of the Restrictions or other terms of this Covenant as they apply to all or any portion of the Property. Such application shall be made in accordance with H&SC section 25234. No termination or other terms of this Covenant shall extinguish or modify the retained interest held by the United States.

ARTICLE VII

MISCELLANEOUS

7.01 No Dedication Intended. Nothing set forth in this Covenant shall be

construed to be a gift or dedication, or offer of a gift or dedication, of the Property, or any portion thereof to the general public or anyone else for any purpose whatsoever.

7.02 Recordation. The Covenantor shall record this Covenant, with all referenced Exhibits, in the County of [name of county] within ten (10) days of the Covenantor's receipt of a fully executed original.

7.03 Notices. Whenever any person gives or serves any Notice ("Notice" as used herein includes any demand or other communication with respect to this Covenant), each such Notice shall be in writing and shall be deemed effective: (1) when delivered, if personally delivered to the person being served or to an officer of a corporate party being served, or (2) three (3) business days after deposit in the mail, if mailed by United States mail, postage paid, certified, return receipt requested:

To Owner: *[include name and address of Owner and name of person to receive service]*

To Department: *[title and address of Regional Branch Chief.]*

Any party may change its address or the individual to whose attention a Notice is to be sent by giving written Notice in compliance with this paragraph.

7.04 Partial Invalidity. If any portion of the Restrictions or other term set forth herein is determined by a court of competent jurisdiction to be invalid for any reason, the surviving portions of this Covenant shall remain in full force and effect as if such portion found invalid had not been included herein.

7.05 Statutory References. All statutory references include successor provisions.

IN WITNESS WHEREOF, the Parties execute this Covenant.

Covenantor: ***[name of Covenantor]***

By: _____

Title: ***[signatory's name and title]***

Date: _____

Department of Toxic Substances Control

By: _____

Title: ***[signatory's name and title]***

Date: _____

Approved as to form:

Date: 9 March 00 By: Mary Kay Fanger

Approved as to form:

Date: March 16, 2000 By: Arnold M Thomas

Ratification of Document endorsed 3-2-00

STATE OF CALIFORNIA)
)
COUNTY OF _____)

On this _____ day of _____, in the year _____,

before me _____, personally appeared

_____,

personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

MODEL HAZARDOUS WASTE MANAGEMENT PROGRAM

DEED RESTRICTION

RECORDING REQUESTED BY: **[Covenantor's Name]** **[Street Address]** **[City]**, California **[Zip Code]** WHEN RECORDED, MAIL TO: Department of Toxic Substances Control Region ___ **[Street Address]** **[City]**, California **[Zip Code]** Attention: **[Name of Branch Chief]**, Chief **[Branch Designation]**	

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

COVENANT TO RESTRICT USE OF PROPERTY

ENVIRONMENTAL RESTRICTION

(Re: *[Insert parcel number(s) and name of site property to be restricted.]*)

This Covenant and Agreement ("Covenant") is made by and between the United States of America acting by and through the Department of Navy or "DON" (the "Covenantor"), the current owner of certain property situated in *[city]*, County of _____, State of California, described in Exhibit "A", attached hereto and incorporated herein by this reference (the "Property"), and the State of California acting by and through the Department of Toxic Substances Control (the "Department"). Pursuant to Civil Code section 1471(c), the Department has determined that this Covenant is reasonably necessary to protect present or future human health or safety or the environment as a

result of the presence on the land of hazardous materials as defined in Health and Safety Code ("H&SC") section 25260. In addition, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104 (42 USC Section 9604), as delegated to the Covenantor by E.O. 12580, ratified by Congress in 10 USC Sec. 2701, et seq., and implemented by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP – 40 CFR Part 300) and implementing guidances and policies, the Covenantor (DON) has also determined that this Covenant is reasonably necessary to protect present or future human health and safety and the environment as the result of the presence on the land of hazardous substances, pollutants and contaminants as defined in CERCLA Section 101 (42 USC Section 9601).

The Covenantor and the Department, collectively referred to as the "Parties", therefore intend that the use of the Property be restricted as set forth in this Covenant, in order to protect human health, safety and the environment.

The Covenantor retains sufficient legal title and interest in the subject property to insure continuing enforcement of the protective covenants and agreements contained within this Covenant to Restrict the Use of Property. Further in any subsequent transfers or conveyance of title to nonfederal entities the DON shall burden the property with additional deed covenants that insure that any subsequent deed or transfer contains the protective covenants and right of access and power to conduct monitoring interest contained herein and of wastes retained on site. Those covenants and agreements shall be enforceable against the servient estate in that those protective covenants shall run with the land to all successors and assigns.

ARTICLE I

STATEMENT OF FACTS

1.01 The Property, totaling approximately [acres] [— square yards] is more particularly described and depicted in Exhibit "A", attached hereto and incorporated herein by this reference. *[Exhibit "A" must include the legal description of the property used by the county recorder. This must include the particular description of the boundaries of the area to be subject to a specific use restriction. A survey may be required].* The Property is located in the area now generally bounded by *[include narrative description of the area; this will typically be street names: e.g. Main Street on the north, Maple Street on the east, etc.]* County of [ ], State of California.

1.02 *[Use this paragraph if imposing additional restrictions on a portion of the Property, for example on a capped portion, or if for any other reason it is necessary to precisely identify any portion of the property, such as an area with groundwater monitoring wells. The purpose of this paragraph is to give the precise location of such areas where use restrictions will apply. Renumber following paragraphs accordingly]* A limited portion of the Property is more particularly described in Exhibit "B" which is attached and incorporated by this reference ("Capped Property" or "[*other identified*] Property"). *[Exhibit B must include a legal description of the exact area(s) being restricted and any necessary diagram(s). This will generally require a legal survey and engineering drawing for the Cap or other area to be further restricted.].* The [Capped or {other identified}] Property is located in the area now generally bounded by _____. *[include language that generally describes the Capped or other identified Property]* The

[Capped or {other identified}] Property is also more specifically described as encompassing xxxx County Assessor's Parcel numbers ---.

1.03 *[Briefly describe the regulatory oversight of the facility by the Department and the CERCLA decisions including any applicable Federal Facility Agreement (FFA) or Federal Facility site Remediation Agreement (FFSRA) and implementing activities of the Covenantor, the remedial activities that have occurred at the Property, including, if applicable, installation of a cap and construction and ongoing operation and maintenance of a groundwater treatment system. This paragraph should refer to the Closure Report or other decision document such as a ROD which approved the remedial activities at the Property and required this Covenant. The paragraph needs to identify the contaminants and physical remedial measures on the Property which necessitate this deed restriction.]*

Since [*date*] the Department [*or*, the Department's predecessor in interest (California Department of Health Services)] authorized this [treatment], [storage], [disposal] facility ("Facility") pursuant to an [interim status document] [permit]. Under this authorization the Site was a hazardous waste facility, regulated by the Department, subject to the requirements of the California Hazardous Waste Control Law ("HWCL"), at Health and Safety Code ("H&S Code") section 25100 et seq., and the federal Resource Conservation and Recovery Act ("RCRA"), at 42 U.S.C. section 6901 et seq. Pursuant to the closure requirements of the HWCL, including H&S Code section 25246 and post-closure notices provisions of Title 22 California Code of Regulations [section 66265.119(b) for interim status hazardous waste facilities] [*or* 66264.119(b) for permitted hazardous waste facilities]] [*or, if restrictions required for permit:* corrective

action requirements of the HWCL, including H&S Code Section 25200.10] the Department is requiring this Covenant as part of the [facility closure] [corrective action] [permitting] of the facility. The Department circulated a [Closure Plan] [Remedial Measures Study] [*other appropriate document*], which contained a Final Health Risk Assessment [and/or Remedial Goals document], together with a draft [Environmental Impact Report] [Negative Declaration] pursuant to the California Environmental Quality Act, Public Resources Code section 21000 et seq for public review and comment from [*date*] to [*date*]. Because hazardous wastes, which are also hazardous materials as defined in Health and Safety Code sections 25117 and 25260, including [list hazardous wastes] remain in the [soil] and [groundwater] at the Property, the [Closure Plan] [Remedial Measures Study] provided that a deed restriction would be required as part of the facility remediation. The Department approved the [Closure Plan] [Remedial Measures Study] [*other appropriate document*] together with the [*environmental document*] on [*date*].

Pursuant to these documents, the Property was [*describe remedial actions taken which relate to what is left on the property. This description must include installation of any physical remedial measures. The description must identify what contaminants remain on the Property.*]

SAMPLE: Hazardous wastes, which are also hazardous materials as defined in H&S Code sections 25117 and 25260, and are CERCLA hazardous substances, pollutants or contaminant, including xxxx and yyyy, remain in the soil and groundwater at the Property. Remediation includes installing and maintaining a synthetic membrane cover ("Cap") over the Capped Property. The Cap consists of a low permeability

synthetic membrane and other associated layers over the hazardous wastes and materials, as more particularly described in the engineering drawing attached as Exhibit "B" hereto. The Remedial Measure also includes the installation and operation of: (1) a passive gas collection system ("GCS") on the Capped Property which removes miscellaneous gas/vapors migrating upward from under the Cap, (2) a vapor extraction system ("VES"), which remediates certain volatile organic compound-impacted soils, and (3) groundwater monitoring wells ("Monitoring Wells"). The location of the GCS, VES and Monitoring Wells are shown on the map attached as exhibit "--". The operation and maintenance ("O&M") of the Cap, GCS, VES, and Monitoring Wells is pursuant to an O&M Manual incorporated into the O&M Agreement between [Covenantor] *[or name of other entity]* and the Department dated September 20, 1995. *[If an O&M Agreement has not been signed, the approval date for the O&M Manual or Plan should be referenced]*

1.04 *[This paragraph should set out specific information about the risk assessment findings relevant to the contaminants of concern remaining at the property, essentially the basis for the restrictions imposed by this covenant. The Restrictions in Paragraphs 4.01, and any requirement for Soil Management Activity and any Prohibited Activity must be linked to the contaminants and risk assessment as discussed in this paragraph. The following paragraph is given for purposes of illustration. Each site will have different facts; those should be developed in a manner similar to the sample paragraph given here. You must consult with the assigned toxicologist about what are the appropriate land uses.]*

SAMPLE: As detailed in the Final Health Risk Assessment *[or other appropriate*

document] as proposed by the Covenantor and approved by the Department on *[date]*, all or a portion of the surface and subsurface soils within 10 feet of the surface of the Property contain hazardous wastes and hazardous materials, as defined in H&S Code section 25117 and 25260, which include one or more of the following metal contaminants of concern in the ranges set forth below: arsenic (0.3 to 38.1 parts per million ("ppm"), beryllium (2.6 ppm), copper (4.6 to 756 ppm, and nickel (7.3-105 ppm). In addition, there are low pH soils. Based on the Final Risk Assessment the Department and the Covenantor have concluded that use of the Property as a residence, hospital, school for persons under the age of 21 or day care center would entail an unacceptable cancer risk to the users or occupants of such property. The Department and the Covenantor have further concluded that the Property, as remediated, and operated or occupied subject to the restrictions of this Covenant, does not present an unacceptable threat to human safety or the environment, if limited to *[as applicable:* commercial and industrial use, parks, open space, [or other appropriate] use*]*.

SAMPLE [Note: Groundwater restrictions in Paragraph 3.04 must be based on a discussion of what contaminants are found in groundwater at the site, and what drinking water standards are.]: Groundwater at the Property is first found at 15 to 20 feet below ground surface. Contaminants in the groundwater include benzene (50- 123 ppm), chromium (75- 213 ppm) and TCE (350-780 ppm). California drinking water standards are benzene at .08 ppm, chromium at 30 ppm and TCE at 5 ppm. The Department and the Covenantor concludes that the groundwater presents an unacceptable threat to human health and safety absent an environmental restriction to eliminate exposure to such levels of groundwater.

ARTICLE II

DEFINITIONS

2.01 Department. "Department" shall mean the State of California by and through the California Department of Toxic Substances Control and shall include its successor agencies, if any.

2.02 Owner. "Owner" shall include the Covenantor's successor's in interest, and their successors in interest, including heirs and assigns, during his or her ownership of all of any portion of the Property.

2.03 Occupant. "Occupant" shall mean Owners and any person or entity entitled by ownership, leasehold, or other legal relationship to the right to occupy any portion of the Property.

2.04 Covenantor. "Covenantor" shall mean the United States acting through the Department of the Navy (DON).

ARTICLE III

GENERAL PROVISIONS

3.01 Restrictions to Run With the Land. This Covenant sets forth protective provisions, covenants, restrictions, and conditions (collectively referred to as "Restrictions"), upon and subject to which the [Property] [Capped Property] [Restricted Property] and every portion thereof shall be improved, held, used, occupied, leased, sold, hypothecated, encumbered, and/or conveyed. These Restrictions are consistent with the separate restrictions placed in the deed by and in favor of the Covenantor, conveying the Property from the Covenantor to its successor in interest described above. Each and every one of the Restrictions: (a) shall run with the land in perpetuity pursuant to H&SC sections 25202.5, and 25202.6, and Civil Code section 1471; (b) shall inure to the benefit of and pass with each and every portion of the Property; (c) shall apply to and bind all subsequent Occupants of the Property; (d) are for the benefit of, and shall be enforceable by the State of California; and (e) are imposed upon the entire Property unless expressly stated as applicable only to a specific portion thereof.

3.02 Binding Upon Owners/Occupants. Pursuant to Health and Safety Code section 25202.5(b), this Covenant shall be binding upon all of owners of the land, their heirs, successors, and assignees, and the agents, employees, and lessees of the owners, heirs, successors, and assignees. Pursuant to Civil Code section 1471(b), all successive owners of the Property are expressly bound hereby for the benefit of the covenantee(s) herein.

3.03 Written Notice of Hazardous Substance Release. The Owner shall, prior to the sale, lease, or rental of the Property, give written notice to the subsequent

transferee that a release of hazardous substances has come to be located on or beneath the Property, pursuant to Health and Safety Code section 25359.7. Such written notice shall include a copy of this Covenant. *[This last sentence is optional, to be used at sites where it is important that buyers and tenants be specifically aware of the ongoing remediation and their obligations]*

3.04 Incorporation into Deeds and Leases. The Restrictions set forth herein shall be incorporated by reference in each and all deeds and leases for any portion of the Property.

3.05 Conveyance of Property Covenantor agrees that the Owner shall provide notice to the Department not later than thirty (30) days after any conveyance of any ownership interest in the Property (excluding mortgages, liens, and other non-possessory encumbrances). The Department shall not, by reason of this Covenant alone, have authority to approve, disapprove, or otherwise affect such conveyance. *[This paragraph is optional, to be used, for example, at sites with groundwater treatment systems that will require access by the Department and by the entity responsible for O&M.]*

ARTICLE IV

RESTRICTIONS

[The following examples are intended to be illustrative. Not all of them will be applicable. The restrictions for a particular property should have a direct relationship to what the Health Risk Assessment said was ok/appropriate for use at the site. The toxicologist must be involved with drafting the Restrictions. The restrictions must also protect the integrity of, and access to, any ongoing remediation facilities at the site.]

4.01 Prohibited Uses. The Property shall not be used for any of the following purposes: *[Note: These prohibitions must be based on the facts and Health Risk Assessment as set forth in Paragraph 1.04]*

[sample provisions]

(a) A residence, including any mobile home or factory built housing, constructed or installed for use as residential human habitation.

(b) A hospital for humans.

(c) A public or private school for persons under 21 years of age.

(d) A day care center for children.

4.02 Soil Management *[Note: The basis for the soil restrictions must be in Paragraph 1.04]*

[sample provisions]

(a) No activities which will disturb the soil *[*at or below xxx feet below grade*]* (e.g., excavation, grading, removal, trenching, filling, earth movement or mining) shall be permitted on the Property without a Soil Management Plan and a Health and Safety Plan submitted to the Department for review and approval.

(b) Any contaminated soils brought to the surface by grading, excavation, trenching or backfilling shall be managed in accordance with all applicable provisions of state and federal law.

(c) The Owner will provide the Department written notice at least fourteen (14) days prior to any building, filling, grading, mining or excavating in the Property [more than feet below the soil surface] [which will remove more than cubic yards of soil].

4.03 Prohibited Activities. *[This paragraph will not be applicable to all sites. If*

not used, renumber accordingly. If there are groundwater restrictions, the basis must be in Paragraph 1.04] The following activities shall not be conducted at the Property: *[sample provisions]*

(a) No raising of agricultural products intended for human consumption or use, including but not limited to food,cattle, fibers including, cotton) shall be permitted on the property.

(b) No drilling for *[*drinking/IRRIGATION *]* water, oil, or gas shall be permitted on the Property *[*without prior written approval by the Department*]. [or]* (b) No groundwater shall be extracted on the Property for purposes other than site remediation or construction dewatering. *[The following paragraphs are samples of restrictions that may be applicable when there is a cap, vapor and/ or gas collection system, and/or groundwater monitoring system.]*

4.04 <u>Non-Interference with Cap [and VES] and [GCS]</u>.

[sample provisions]

(a) No activities which will disturb the Cap (e.g. excavation, grading, removal, trenching, filling, earth movement, or mining) shall be permitted on or within _____feet of the Capped Property without prior review and approval by the Department. *[Similar restrictions may be appropriate for other ongoing remediation systems.]*

(b) All uses and development of the Capped Property shall preserve the integrity of the Cap. *[Extend to other systems as appropriate.]*

(c) Any proposed alteration of the Cap shall require written approval by the Department.

(d) The Owner shall notify the Department of each of the following: (i) The

type, cause, location and date of any disturbance to the Cap which could affect the ability of the Cap to contain subsurface hazardous wastes or hazardous materials in the Capped Property, and (ii) the type and date of repair of such disturbance. Notification to the Department shall be made as provided below within ten (10) working days of both the discovery of any such disturbance(s) and the completion of any repairs. Timely and accurate notification by any Owner or Occupant shall satisfy this requirement on behalf of all other Owners. *[Extend to other systems as appropriate.]*

4.05 Access for Department. The Department shall have reasonable right of entry and access to the Property for inspection, monitoring, and other activities consistent with the purposes of this Covenant as deemed necessary by the Department in order to protect the public health and safety and the environment.

ARTICLE V

ENFORCEMENT

5.01 Enforcement. Failure of the Owner or Occupant to comply with any of the Restrictions specifically applicable to it shall be grounds for the Department, by reason of this Covenant, to require that the Owner modify or remove any improvements ("Improvements" herein shall include all buildings, roads, driveways, and paved parking areas, constructed or placed upon any portion of the Property constructed in violation of the Restrictions). Violation of this Covenant by the Owner or Occupant may result in the imposition of civil and/or criminal remedies including nuisance or abatement against the Owner or Occupant as provided by law. The State of California shall have all remedies as provided in California Civil Code, Section 815.7, as that enactment may

be from time to time amended.

ARTICLE VI

MODIFICATION AND TERMINATION

6.01 Modification. Any Owner or, with the Owner's written consent, any Occupant of the Property or any portion thereof may apply to the Department for a written modification from the provisions of this Covenant. Such application shall be made in accordance with H&S Code section 25202.6. The Department will grant the modification only after finding that such a modification would be protective of human health, safety and the environment.

6.02 Termination. Any Owner, and/or, with the Owner's written consent, any Occupant of the Property, or any portion thereof, may apply to the Department for a termination of the Restrictions or other terms of this Covenant as they apply to all or any portion of the Property. Such application shall be made in accordance with H&S Code section 25202.6. The Department will grant the termination only after finding that such a termination would be protective of human health, safety and the environment. No termination of the Restrictions or other terms of this Covenant shall extinguish or modify the retained interest held by the United States.

ARTICLE VII

MISCELLANEOUS

7.01 No Dedication Intended. Nothing set forth in this Covenant shall be construed to be a gift or dedication, or offer of a gift or dedication, of the Property, or any portion thereof to the general public or anyone else for any purpose whatsoever,

7.02 Recordation In accordance with HSC Section 25235, the Department will record this Covenant, with all referenced Exhibits, in the County of [name of county] within ten (10) days of the Department's receipt of a fully executed original.

7.03 Notices. Whenever any person gives or serves any notice ("Notice" as used herein includes any demand or other communication with respect to this Covenant), each such Notice shall be in writing and shall be deemed effective: (1) when delivered, if personally delivered to the person being served or to an officer of a corporate party being served, or (2) three (3) business days after deposit in the mail, if mailed by United States mail, postage paid, certified, return receipt requested:

To Owner: *[include name and address of Owner and name of person to receive service]*

To Department: *[include name, address, and appropriate name of Department person to be served]*

Any party may change its address or the individual to whose attention a notice is to be sent by giving written notice in compliance with this paragraph.

7.04 Partial Invalidity. If any portion of the Restrictions or other term set forth herein is determined by a court of competent jurisdiction to be invalid for any reason, the surviving portions of this Covenant shall remain in full force and effect as if such portion found invalid had not been included herein.

7.05 Statutory References. All statutory references include successor provisions.

IN WITNESS WHEREOF, the Parties execute this Covenant.

"Covenantor"

Date:_____ By:_____

"Department"

Date:_____ By:_____

Approved as to form:

Date: 9 March 00 By: M X Fayer

Approved as to form:

Date: March 16, 2000 By: Harold M Thomas

Ratification of Document endorsed 3-2-00

STATE OF CALIFORNIA)
)
COUNTY OF _____)

On this _____ day of _____, in the year _____,

before me _____, personally appeared

_____,

personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is /are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

Attachment 3 – Applicable or Relevant and Appropriate Requirements

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Attachment 3 – Applicable or Relevant and Appropriate Requirements

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Table 1: Federal Chemical-Specific[a] ARARs by Medium

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Safe Drinking Water Act (42 U.S.C., ch. 6A, § 300[f]–300[j]-26)[c]				
National primary drinking water standards are health-based standards for public water systems (MCLs).	Public water system.	40 C.F.R. 141.61(a)	Relevant and Appropriate (for IRP Site 2 groundwater response action only)	MCLs for VOCs reported in groundwater are considered to be relevant and appropriate requirements for IRP Site 2 groundwater that is a potential source of drinking water.
MCLGs pertain to known or anticipated adverse health effects (also known as recommended MCLs).	Public water system.	40 C.F.R. § 141.50 (b)	Relevant and Appropriate (for IRP Site 2 groundwater response action only)	MCLGs for VOCs reported in groundwater set at levels above zero are considered to be relevant and appropriate requirements for IRP Site 2 groundwater that is a potential source of drinking water (40 C.F.R. § 300.430[e][2][I][B]-[D]).
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste.	Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether waste is hazardous.

Table 1 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
Groundwater protection standards: Owners/operators of RCRA treatment, storage, or disposal facilities must comply with conditions in this section that are 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 Cal. Code Regs. tit. 22, § 66264.94 in the uppermost aquifer underlying the waste management area of concern at the POC.	A regulated unit that receives or has received hazardous waste before 26 July 1982 or regulated units that ceased receiving hazardous waste prior to 26 July 1982 where constituents in or derived from the waste may pose a threat to human health or the environment.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b)	Relevant and Appropriate	Relevant and appropriate for groundwater monitoring at IRP Sites 1 and 2. The groundwater will be cleaned up to lesser of the federal MCL, federal *non-zero* MCLGs, and California MCL.
SOIL				
Resource Conservation and Recovery Act (42 U.S.C., ch. 82, §§ 6901–6991[i])[c]				
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	Waste.	Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable	Applicable for determining whether the soil cuttings generated as a result of well installation at IRP Sites 1 and 2 are hazardous.

Notes:

[a] many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables

[b] only the substantive provisions of the requirements cited in this table are ARARs

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

Acronyms/Abbreviations:

ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
C.F.R. – *Code of Federal Regulations*
ch. – chapter
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
POC – point of compliance
RCRA – Resource Conservation and Recovery Act

§ – section
TCLP – toxicity characteristic leaching procedure
tit. – title
U.S.C. – *United States Code*

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Table 2: Federal Location-Specific ARARs

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Wetland	Avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and avoid support of new construction in wetlands if practicable alternatives exist.	Wetland meeting definition of Section 7(c) of the Exec. Order No. 11990.	40 C.F.R. § 6.302(a) and 40 C.F.R. pt. 6, app. A, § 6(a)(1), (3), and (5) (at the end of § 6.1007)	Relevant and Appropriate (only for IRP Site 1)	Potential disturbed wetland habitat occurs at the bottom of the Ephemeral pond at IRP Site 1. It consists of a sparse cover of a variety of weedy and wetland species including mulefat, black willow, mustard, tocalote, and soft chess. There is approximately 0.29-acre of disturbed wetland on IRP Site 1. Therefore, substantive provisions of 40 C.F.R. § 6.302 (a) and 40 C.F.R. pt. 6, app. A, § 6(a)(1), (3), and (5) (at the end of § 6.1007) are ARARs for response actions at IRP Site 1. The disturbed wetland habitat is not expected to be adversely impacted by the groundwater remedial action at IRP Site 1.

Table 2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Exec. Order No. 11988, Floodplain Management[b]					
Within floodplain	Evaluate potential effects of actions in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain.	Action that will occur in a floodplain (i.e., lowlands) and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 C.F.R. § 6.302(b) and 40 C.F.R. pt. 6, app. A, § 6(a)(1), (3), and (5) (at the end of § 6.1007)	Relevant and Appropriate	Areas overlying the IRP Site 1 perchlorate-impacted groundwater in the vicinity of IRP Site 2 landfill and the VOC-impacted groundwater at IRP Site 2 are located within the 100-year floodplain. Therefore, substantive requirements of 40 C.F.R. § 6.302(b) and 40 C.F.R. pt. 6 Appendix A, § 6(a)(1), (3), and (5) (at the end of § 6.1007), are ARARs for IRP Sites 1 and 2 groundwater remedial action.
Clean Water Act of 1977, as Amended, Section 404 (33 U.S.C. § 1344)[b]					
Waters of the United States	Action to prohibit discharge of dredged or fill material into waters of the United States without permit.	Discharge into Waters of the United States.	33 U.S.C. § 1344	Applicable	Discharge of dredged or fill material to waters of the United States is possible as part of the response action at IRP Sites 1 and 2. Therefore, the substantive requirements of 33 U.S.C. § 1344 are ARARs for the remedial action at IRP Sites 1 and 2. The evaluation of pertinent action-specific provisions of 40 C.F.R §§ 230.10 (a), (c), and (d); and 33 C.F.R §§ 323.3(a) and (b); and 330.1(b) and (c) are presented in Table 3.

Table 2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])[b]					
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.18(b)	Relevant and Appropriate (only for IRP Site 1 groundwater response action if groundwater recirculation system is implemented as part of in-situ bioremediation)	Areas overlying the IRP Site 1 perchlorate-impacted groundwater in the vicinity of IRP Site 2 landfill and IRP Site 2 VOC-impacted groundwater are located within the 100- year floodplain. The requirements of Cal. Code Regs. tit. 22, § 66264.18(b) were evaluated to determine if they constitute ARARs for groundwater remedial action. This evaluation indicated that flood plain protection requirements of Cal. Code Regs. tit. 22, §66264.18(b) are ARARs for only IRP Site 1 groundwater response action if groundwater recirculation system is implemented as part of in-situ bioremediation.

Table 2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Endangered Species Act of 1973 (16 U.S.C. §§ 1531–1543)[b]					
Habitat upon which endangered species or threatened species depend	Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented.	Determination of effect upon endangered or threatened species or its habitat. Critical habitat upon which endangered species or threatened species depend.	16 U.S.C. § 1536(a), (h)(1)(B); 16 U.S.C. § 1538(a)(1)(B)and (G); and 16 U.S.C. § 1538(a)(2)(B) and (E)	Applicable	IRP Site 1 is located in an area that supports special status species (including the Riverside fairy shrimp and the California gnatcatcher) or habitat. IRP Site 2 is located in an area that supports special status species or habitat and supports one breeding pair of California gnatcatchers. Therefore, the substantive provisions of the Endangered Species Act are ARARs. However, the proposed response actions at IRP Sites 1 and 2 are not anticipated to adversely affect the endangered species, threatened species, or designated critical habitat. A biological opinion has been issued for the remedial action activities associated with the landfill closure at IRP Site 2. Provisions of this biological opinion will be considered during the groundwater remedial action activities. In addition, as part of the CERCLA process, the Navy will provide United States Fish and Wildlife Service and/or National Marine Fisheries Service with the opportunity to participate in the routine review of CERCLA documents.

Table 2 (continued)

Location	Requirement	Prerequisite	Citation[a]	ARAR Determination	Comments
Migratory Bird Treaty Act of 1972 (16 U.S.C. §§ 703–712)					
Migratory bird area	Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	Presence of migratory birds.	16 U.S.C. § 703	Relevant and Appropriate	Migratory birds have been observed at IRP Sites 1 and 2; therefore, this is a relevant and appropriate ARAR.

Notes:

[a] only the substantive provisions of the requirements cited in this table are ARARs

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

Acronyms/Abbreviations:

app. – appendix
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
C.F.R. – *Code of Federal Regulations*
DON – Department of the Navy
Exec. Order No. – executive order number

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Table 3: Federal Action-Specific ARARs

Selected Remedy for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs

Selected Remedy for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-2: MNA and ICs

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Resource Conservation and Recovery Act (42 U.S.C. §§ 6901–6991[i])*					
On-site waste generation	Person who generates waste shall determine if that waste is a hazardous waste.	Generator of waste.	Cal. Code Regs. tit. 22, § 66262.10(a), 66262.11	Applicable	Applicable for any operation where hazardous waste is generated. The determination of whether groundwater and/or wastes generated during remedial activities, such as soil cutting from well installation and treatment residues, are hazardous will be made at the time the wastes are generated.
On-site waste generation	Requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste.	Cal. Code Regs. tit. 22, § 66264.13(a) and (b)	Applicable	Applicable when analyzing waste generated during the groundwater remedial actions at IRP Sites 1 and 2.
Hazardous waste accumulation	On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers in accordance with § 66262.171–178 or in tanks, on drip pads, inside buildings, is labeled and dated, etc.	Accumulate hazardous waste `	Cal. Code Regs. tit. 22, § 66262.34	Applicable	Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during response action activities, such as soil cuttings from well installation and treatment residues, are hazardous will be made at the time the wastes are generated.
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 before treatment, disposal, or storage elsewhere, in a container.	Cal. Code Regs. tit. 22, § 66264.171, .172, .173	Applicable	Substantive requirements are applicable for accumulation of waste for less than 90 days if the waste is RCRA hazardous waste and is stored on site in accordance with § 66262.34.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Container storage (continued)	Inspect container storage areas weekly for deterioration.		Cal. Code Regs. tit. 22, § 66264.174	Applicable	Substantive requirements are applicable if hazardous wastes are generated and stored on site for less than 90 days in accordance with § 66262.34.
	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.	Storage in a container of RCRA hazardous waste not meeting small-quantity generator criteria before treatment, disposal, or storage elsewhere.	Cal. Code Regs. tit. 22, § 66264.175(a) and (b)	Applicable	Applicable if hazardous wastes are generated and stored on site for less than 90 days in accordance with § 66262.34.
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		Cal. Code Regs. tit. 22, § 66264.177	Applicable	Applicable for temporary storage of incompatible materials in accordance with § 66262.34.
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners.		Cal. Code Regs. tit. 22, § 66264.178	Applicable	Applicable if RCRA hazardous wastes are generated and stored on site for less than 90 days in accordance with § 66262.34.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Use of tank systems or piping	Requirements for the design and installation of new tank systems including strength, tightness testing, damage control, support, corrosion control, etc. Requirements for secondary containment of tank systems. Requirements for secondary containment of ancillary equipment. Requirements for operation of tank systems including spill prevention and prohibitions of material that could cause failure. Requirements for inspection of tank systems including inspection of overflow protection, corrosion, release, detection equipment, and cathodic protection. Requirements for response to leaks and spills from tank systems including removal of system from use if appropriate, containment, cleanup, emergency procedures, etc. Requirements for closure and postclosure care of tank systems decontamination, clean closure and leaving waste in place at closure.	Tank systems for transferring, storing, or treating hazardous waste.	Cal. Code Regs. tit. 22, §66264.192(a), (b),(c), e),(f), and (g) Cal. Code Regs. tit. 22, §66264.193(b), (c), (d), and (e) Cal. Code Regs. tit. 22, § 66264.193(f) Cal. Code Regs. tit. 22, § 66264.194(a) and (b) Cal. Code Regs. tit. 22, §66264.195(a), (b), and (c) Cal. Code Regs. tit. 22, § 66264.196(b) except (b)(5) and (b)(7) Cal. Code Regs. tit. 22, § 66264.197(a) and (b)	Applicable (for IRP Site 1 response action only if groundwater recirculation system is implemented as part of in-situ bioremediation)	The substantive requirements of the cited regulations are ARARs for IRP Site 1 response action only if the groundwater recirculation system implemented as part of in-situ bioremediation handles hazardous waste.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Monitoring	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.	Cal. Code Regs. tit. 22, § 66264.91(a)(4)and (c), except as it cross-references permit requirements	Relevant and appropriate	Relevant and appropriate for groundwater monitoring.
	Requirements for monitoring groundwater, surface water, and the vadose zone.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.97 (b)(1)(A), (b)(1)(D)(1) and (2), (b) (4-7), (e)(6), (12)(A) and (B), (13), and (15)	Relevant and appropriate	Relevant and appropriate for groundwater monitoring.
	Requirements for a detection monitoring program.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.98(e) (1-5), (i), (j), (k)(1-3), (4)(A) and (D),(5), (7)(C) and (D),(n)(1),(2) (B), and (C)	Relevant and appropriate	The requirements of detection monitoring program are only relevant and appropriate following completion of corrective action monitoring.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Corrective action	An owner or operator required pursuant to section 66264.91 to establish a corrective action program for a regulated unit shall, at a minimum, comply with the requirements of this section for that unit.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(a)	Relevant and appropriate	Relevant and appropriate for groundwater monitoring
	The owner or operator required to take corrective action under Cal. Code Regs. tit. 22, § 66264.91 shall take corrective action to remediate releases from the regulated unit and to ensure that the regulated unit achieves compliance with the water quality protection standard.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(b)	Relevant and appropriate	In accordance with the settlement between the DON and DTSC and the fact that wastes at IRP Site 1 are similar to RCRA hazardous wastes, substantive provisions of cited regulations are “relevant and appropriate” federal ARARs for groundwater remedial action at IRP Site 1. IRP Site 2 is not a RCRA regulated unit, therefore, the requirements are not applicable. However, the requirements are relevant and appropriate for the groundwater remedial action at IRP Site 2.
	The owner or operator shall implement corrective action measures that ensure that constituents of concern achieve their respective concentration limits at all monitoring points and throughout the zone affected by the release, including any portions of the affected zone that extend beyond the facility boundary, by removing the waste constituents or treating them in place. The owner or operator shall take other action to prevent noncompliance due to a continued or subsequent release including, but not limited to, source control.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(c)	Relevant and appropriate	In accordance with the resolution between the DON and DTSC and the fact that wastes at IRP Site 1 are similar to RCRA hazardous wastes, substantive provisions of cited regulations are “relevant and appropriate” federal ARARs for groundwater remedial action at IRP Site 1. IRP Site 2 is not a RCRA regulated unit, therefore, the requirements are not applicable. However, the requirements are relevant and appropriate for the groundwater remedial action at IRP Site 2.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Corrective action (continued)	The owner or operator shall establish and implement, in conjunction with the corrective action measures, a water quality monitoring program that will demonstrate the effectiveness of the corrective action program and be effective in determining compliance with the water quality protection standard and in determining the success of the corrective action measures under subsection (c) of this section.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(d)	Relevant and appropriate	Relevant and appropriate for groundwater monitoring.
	The corrective action program is complete when compliance with the water quality standard is demonstrated based on the results of sampling and analysis for all constituents of concern for a period of 1 year.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(g)(1)	Relevant and appropriate	Relevant and appropriate for groundwater monitoring.
Completion of response action	Corrective action measures taken pursuant to this section may be terminated when the owner or operator demonstrates to the satisfaction of the Department that the concentrations of all constituents of concern are reduced to levels below their respective concentration limits.	Hazardous waste treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.100(f)	Relevant and appropriate	Relevant and appropriate for groundwater monitoring.
Solid Waste Management Unit/Permitted Hazardous Waste Management Unit	Media impacted by RCRA hazardous waste must be considered for corrective action regardless of the date of original impact.	Hazardous waste transfer, treatment, storage, or disposal facility.	Cal. Code Regs. tit. 22, § 66264.101(a)	Relevant and appropriate	Relevant and appropriate for groundwater monitoring.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Discharge of dredged /fill material	Guidelines for specification of disposal sites for dredged material. The discharge must represent the least damaging, practicable alternative. The discharge of dredged material must not result in significant degradation of the aquatic ecosystem. All practicable means must be utilized to minimize adverse environmental impacts.	Discharge of dredged material to waters of the United States.	40 C.F.R. § 230.10(a), (c), and (d)	Applicable	Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).
	Where the proposed discharge and extraction sites are adjacent and are comprised of similar materials and subject to the same sources of contaminants, disposal may be conducted without further testing because discharge is not likely to result in degradation of the discharge site, as long as the potential spread of contaminants to less contaminated areas can be prevented.		40 C.F.R. § 230.60(c)	Applicable	Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Discharge of dredged /fill material (continued)	The discharge of dredged material may be conducted without further testing if constraints are available to reduce contamination to acceptable levels within the discharge site and to prevent contaminants from being transported beyond the proposed discharge site boundaries.		40 C.F.R. § 230.60(d)	Applicable	Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).
	U.S. Army Corps of Engineers requirements for permitting discharges of dredged material to waters of the United States.	Discharge of dredged material to waters of the United States.	33 C.F.R. §§ 323.3(a) and (b); and 330.1(b) and (c)	Applicable	Remedial actions for IRP Site 1 perchlorate-impacted groundwater and IRP Site 2 VOC-impacted groundwater may lead to discharge of fill material (as defined at 40 C.F.R. § 232.2) into waters of the United States. The discharge of fill material will comply with substantive provisions of the cited regulation by complying with substantive provisions of the Nationwide Permit 38 issued by the U.S. Army Corps of Engineers. The CERCLA response actions are not required to obtain permits as provided in 42 U.S.C. § 9621(e).

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Safe Drinking Water Act (42 U.S.C. § 300[f]–300[j]-26)*					
Injection	The UIC program prohibits injection activities that allow movement of contaminants into underground sources of drinking water that may result in violations of MCLs or adversely affect health.	An approved UIC program is required in states listed under SDWA Section 1422. Class I wells and Class IV wells are the relevant classifications for CERCLA sites. Class I wells are used to inject hazardous waste beneath the lowermost formation that contains a USDW within 0.25 mile of the well.	40 C.F.R. § 144.12, excluding the reporting requirements in § 144.12(b) and 144.12(c)(1)	Relevant and appropriate (only for IRP Site 1)	Injection wells would be Class V wells under the UIC program. There are currently no specific technical requirements for injection into Class V wells. Substantive provisions of the UIC rules are relevant and appropriate for injection of treatment amendments into groundwater proposed as part of the IRP Site 1 groundwater response action
	Injection pressure may not exceed a maximum level designed to ensure that injection does not initiate new fractures or propagate existing ones and cause the movement of fluids into a USDW. Continuously monitor injection pressure, flow rate, and volume, and annual pressure, if required. Demonstration of mechanical integrity is required every 5 years. Groundwater monitoring may also be required.		40 C.F.R. § 146.13(a), (b), (d)	Relevant and appropriate (for IRP Site 1 groundwater response action only if groundwater recirculation system is implemented as part of in-situ bioremediation)	Relevant and appropriate for groundwater reinjection. The substantive requirements of the cited regulations are ARARs for IRP Site 1 groundwater response action only if groundwater recirculation system is implemented as part of in-situ bioremediation.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Injection (continued)	Wastes that no longer exhibit a hazardous characteristic are not prohibited if the wastes are disposed into a nonhazardous or hazardous injection well as defined under 40 C.F.R. § 146.6(a).	Characteristically hazardous wastewaters.	40 C.F.R. § 148.1(d)	Relevant and appropriate (for IRP Site 1 groundwater response action only if groundwater recirculation system is implemented as part of in-situ bioremediation)	Relevant and appropriate for groundwater reinjection. The substantive requirements of the cited regulations are ARARs for IRP Site 1 groundwater response action only if groundwater recirculation system is implemented as part of in-situ bioremediation.
Resource Conservation and Recovery Act					
Hazardous waste management system	Definitions.		40 C.F.R. § 260.10	Applicable	Applicable for the groundwater remedial action alternatives at IRP Sites 1 and 2.
Federal Hazardous Materials Transportation Law (49 U.S.C. §§ 5101–5127)*					
Transportation of hazardous material	No person shall represent that a container or package is safe unless it meets the requirements of 49 U.S.C. §§ 5101–5127.	Interstate carriers transporting hazardous waste and substances by motor vehicle. Transportation of hazardous material under contract with any department of the executive branch of the federal government.	49 C.F.R. § 171.2(f)	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.
	No person shall unlawfully alter or deface labels, placards or descriptions, packages, containers, or motor vehicles used for transportation of hazardous materials.		49 C.F.R. § 171.2(g)	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Hazardous materials marking, labeling, and placarding	Each person who offers hazardous material for transportation or each carrier that transports it shall mark each package, container, and vehicle in the manner required.	Person who offers hazardous material for transportation; carries hazardous material; or packages, labels, or placards hazardous material.	49 C.F.R. § 172.300	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.
	Each person offering nonbulk hazardous materials for transportation shall mark the proper shipping name and identification number (technical name) and consignee's name and address.		49 C.F.R. § 172.301	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.
	Hazardous materials for transportation in bulk packages must be labeled with proper ID number, specified in 49 C.F.R. § 172.101 table, with required size of print. Packages must remain marked until cleaned or refilled with material requiring other marking.		49 C.F.R. § 172.302	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.

Table 3 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Hazardous materials marking, labeling, and placarding (continued)	No package marked with a proper shipping name or ID number may be offered for transport or transported unless the package contains the identified hazardous material or its residue.		49 C.F.R. § 172.303	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.
	The markings must be durable, in English, in contrasting colors, unobscured, and away from other markings.		49 C.F.R. § 172.304	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.
	Nonbulk combination packages containing liquid hazardous materials must be packed with closures upward, and marked with arrows pointing upward.		49 C.F.R. § 172.312	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.
	Labeling of hazardous material packages shall be as specified in the list.		49 C.F.R. § 172.400	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.
	Each bulk packaging or transport vehicle containing any quantity of hazardous material must be placarded on each side and each end with the type of placards listed in Tables 1 and 2 of 49 C.F.R. § 172.504.	Each person who offers for transport or transports any hazardous materials shall comply with these placarding requirements.	49 C.F.R. § 172.504	Relevant and appropriate	Substantive requirements are relevant and appropriate for transportation of hazardous materials (if any) on site.

Note:

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

Acronyms/Abbreviations:
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – *Code of Federal Regulations*
DON – Department of the Navy
IR – Installation Restoration (Program)
MCAS – Marine Corps Air Station
RCRA – Resource Conservation and Recovery Act
§ – section
SDWA – Safe Drinking Water Act
tit. – title
UIC – underground injection control
U.S. – United States
U.S.C. – *United States Code*
VOC – volatile organic compound

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Table 4: State Chemical-Specific[a] ARARs by Medium

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
GROUNDWATER				
Cal/EPA Department of Toxic Substances Control				
Definition of "non-RCRA hazardous waste."	Waste.	Cal. Code Regs. tit. 22, § 66261.3(a)(2)(C) or 66261.3(a)(2)(F), 66261.22(a)(3) and (4), 66261.24(a)(2)–(a)(8), 66261.101(a)(1) and (a)(2)	Applicable	Applicable for determining whether a waste is a non-RCRA hazardous waste.
State MCL list (Organics).	Source of drinking water.	Cal. Code Regs. tit. 22, § 64444	Relevant and Appropriate (for IRP Site 2 groundwater response action only)	Like federal MCLs, these are tap water standards and are relevant and appropriate since aquifer underlying IRP Site 2 is a Class II aquifer.
State MCL list (Inorganics).	Source of drinking water.	Cal. Code Regs. tit. 22, § 64431 (Perchlorate MCL of 6 µg/L)	Relevant and Appropriate (for IRP Site 1 groundwater response action only)	Like federal MCLs, these are tap water standards and are relevant and appropriate since aquifer underlying IRP Site 1 is a Class II aquifer.

Table 4 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
Describes the water basins in Santa Ana Region, establishes beneficial uses of groundwater and surface water, establishes WQOs, including narrative and numerical standards, establishes implementation plans to meet WQOs and protect beneficial uses, and incorporates statewide water quality control plans and policies.		Comprehensive Water Quality Control Plan for the Santa Ana Region (Basin Plan) (Cal. Water Code § 13240)	Relevant and Appropriate	Substantive requirements pertaining to beneficial uses, WQOs, and certain statewide water quality control plans are state ARARs for the surface water and groundwater components of this response action.
Authorizes the SWRCB and RWQCB to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.		Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269 (Identified for IRP Sites 1 and 2), and 13360 (Identified for IRP Site 2 only) (Porter-Cologne Act)	Applicable	The DON accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, WQOs, waste discharge requirements, promulgated policies of the Basin Plan for the Santa Ana Region, as ARARs.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the TDS is greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonably be treated for domestic use using either best management practices or best		SWRCB Res. 88-63 (Sources of Drinking Water Policy) and Regional Board Resolution 89-42	Applicable	Substantive requirements are ARARs. The aquifer underlying IRP Sites 1 and 2 does not meet the exclusion criteria specified in the Res. 88-63, and therefore is a potential drinking water source.

Table 4 (continued)

Requirement	Prerequisite	Citation[b]	ARAR Determination	Comments
economically achievable treatment practices.				
Definitions of designated waste, nonhazardous waste, and inert waste.		Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230	Applicable	Applicable for classifying waste and determining ARAR status of other requirements.
Dischargers shall be responsible for accurate characterization of wastes, including determinations of whether or not wastes will be compatible with containment features and other wastes at a Unit, and whether or not wastes are required to be managed as hazardous wastes under Chapter 11 of Division 4.5 of Title 22 of this code.		Cal. Code Regs. tit. 27, §§ 20200(c)	Applicable (for IRP Site 1 groundwater response action only)	Applicable for accurate characterization of wastes.

Notes:

[a] many action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables

[b] only the substantive provisions of the requirements cited in this table are ARARs

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

Acronyms/Abbreviations:

ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
Cal/EPA – California Environmental Protection Agency
Cal. Water Code – *California Water Code*
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – *Code of Federal Regulations*
div. – division
DON – Department of the Navy
gpd – gallons per day
MCL – maximum contaminant level
NPDES – National Pollutant Discharge Elimination System
Porter-Cologne Act – Porter-Cologne Water Quality Control Act
ppm – parts per million
RCRA – Resource Conservation and Recovery Act

RWQCB – (California) Regional Water Quality Control Board
§ – section
SWRCB – (California) State Water Resources Control Board
TDS – total dissolved solids

Table 5: State Action-Specific ARARs

Selected Remedy for Perchlorate-Impacted Groundwater at IRP Site 1: Alternative G1-5: In-Situ Bioremediation at the Source Area, Downgradient of the Source Area and Near the Station Boundary, Monitoring, and ICs

Selected Remedy for VOC-Impacted Groundwater at IRP Site 2: Alternative G2-2: MNA and ICs

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
State Water Resources Control Board and Regional Water Quality Control Board*					
Discharges to high-quality waters	Incorporated into all Regional Board Basin Plans. Requires that quality of waters of the state that is better than needed to protect all beneficial uses be maintained unless certain findings are made. 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 Res. 68-16 (Policy With Respect to Maintaining High Quality of Waters in California) (Cal. Water Code § 13140, CWA regulations 40 C.F.R. § 131.12)	Relevant and appropriate (for IRP Site 1 groundwater response action only if groundwater recirculation system is implemented as part of in-situ bioremediation)	SWRCB Res. 68-16 is an ARAR for reinjection only. The DON has determined that perchlorate migration in groundwater at IRP Site 1 is not a discharge governed by the language in SWRCB Res. 68-16. The groundwater remedial alternative will comply by extracting and treating of groundwater from the low COC concentration portion of the aquifer and injecting it into high concentration portion of the aquifer with similar total dissolved solids and nitrate concentrations. The state does not agree with the DON position regarding the ARAR status. The substantive requirements of the cited regulations are ARARs for IRP Site 1 groundwater response action only if groundwater recirculation system is implemented as part of in-situ bioremediation.

Table 5 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Cal/EPA Department of Toxic Substances Control*					
Land Use Covenants	A land use covenant imposing appropriate limitations on land use shall be executed and recorded when Facility closure, corrective action, remedial or removal action, or other response actions are undertaken and Hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Property transfer by federal government to non-federal entity.	Cal. Code Regs. tit. 22, § 67391.1(a) and (e)(1)	Relevant and appropriate	These requirements are ARARs in the event of the transfer of the IRP Sites 1 and 2 property to a non-federal entity. Cal. Code Regs. tit. 22, § 67391.1 provides for a land-use covenant to be executed and recorded when remedial actions are taken and hazardous substances will remain at the property at concentrations that are unsuitable for unrestricted use of the land. The substantive provisions of this regulation have been determined to be "relevant and appropriate" state ARARs by the DON.
California Civil Code*					
Land-use controls	Provides conditions under which landuse restrictions will apply to successive owners of land.	Transfer property from the DON to a nonfederal agency.	Cal. Civ. Code § 1471	Relevant and appropriate	These requirements are ARARs in the event of the transfer of the IRP Sites 1 and 2 property to a non-federal entity. Generally, Cal. Civ. Code § 1471 allows an owner of land to make a covenant to restrict the use of land for the benefit of a covenantee. The covenant runs with the land to bind successive owners, and the restrictions must be reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials, as defined in Cal. Health & Safety Code § 25260.

Table 5 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
					Substantive provisions are the following general narrative standard: "to do or refrain from doing some act on his or her own (land . . . where (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence of hazardous materials, as defined in Section 25260 of the California Health and Safety Code." This narrative standard would be implemented through incorporation of restrictive covenants in the deed and Environmental Restriction and Covenant Agreement at the time of transfer.
Land-use controls (continued)	Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code § 25202.5	Relevant and Appropriate	These requirements are ARARs in the event of the transfer of IRP Sites 1 and 2 property to a non-federal entity. The substantive provisions of Cal. Health & Safety Code § 25202.5 are the general narrative standards to restrict "present and future uses of all or part of the land on which the . . . facility . . . is located . . ."

Table 5 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Land-use controls (continued)	Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions of Cal. Health & Safety Code § 25232(b)(1)(A)–(E).	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code §§ 25222.1 and 25355.5(a)(1)(C)	Relevant and Appropriate	These requirements are ARARs in the event of the transfer of IRP Sites 1 and 2 property to a non-federal entity. Generally, Cal. Health & Safety Code §§ 25222.1 and 25355.5(a)(1)(C) provide the authority for the DTSC to enter into voluntary agreements with land owners to restrict the use of property. The agreements run with the land restricting present and future uses of the land. The substantive requirements of the following Cal. Health & Safety Code § 25222.1 provisions are "relevant and appropriate": (1) the general narrative standard: "restricting specified uses of the property…" and (2) "…the agreement is irrevocable, and shall be recorded by the owner, …as a hazardous waste easement, covenant, restriction or servitude, or any combination thereof, as appropriate, upon the present and future uses of the land." The substantive requirements of the following Cal. Health & Safety Code § 25355.5(a)(1)(C) provisions are "relevant and appropriate": "…execution and recording of a written instrument that imposes an easement, covenant, restriction, or servitude, or combination thereof , as appropriate, upon the present and future uses of the land."

Table 5 (continued)

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Land-use controls (continued)	Provides processes and criteria for obtaining written variances from a landuse restriction and for removal of the land use restrictions.	Transfer property from the DON to a nonfederal agency.	Cal. Health & Safety Code §§ 25233(c) and 25234	Relevant and Appropriate	These requirements are ARARs in the event of the transfer of IRP Sites 1 and 2 property to a non-federal entity. Cal. Health & Safety Code § 25233(c) sets forth "relevant and appropriate" substantive criteria for granting variances based upon specified environmental and health criteria. Cal. Health & Safety Code § 25234 sets forth the following "relevant and appropriate" substantive criteria for the removal of a land-use restriction on the grounds that "…the waste no longer creates a significant existing or potential hazard to present or future public health or safety."
Air Emission	T-BACT must be employed for new stationary equipment when the operation of that equipment results in a higher than allowable maximum individual cancer risk.	Stationary source that emits carcinogenic air contaminants.	SCAQMD Rule 1401	Applicable (for IRP Site 1 groundwater response action only if groundwater recirculation system is implemented as a remedy	Requires that applicant demonstrate that the cumulative impact of emissions from new or modified source and all other permitted units within 100 meters owned or operated by the applicant are below a maximum individual cancer risk of 10^{-6}. T-BACT is required if maximum individual cancer risk exceeds this limit. VGAC will be designed to achieve maximum individual cancer risk of less than 10^{-6} threshold.

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

Acronyms/Abbreviations:

ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
Cal/EPA – California Environmental Protection Agency
Cal. Health & Safety Code – *California Health and Safety Code*
Cal. Water Code – *California Water Code*
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R. – *Code of Federal Regulations*
CWA – Clean Water Act
DON – Department of the Navy
DTSC – (Cal/EPA) Department of Toxic Substances Control
NAWQC – National Ambient Water Quality Control
Res. – resolution
§ – section
SCAQMD – South Coast Air Quality Management District
SWRCB – (California) State Water Resources Control Board
T-BACT – best available control technology for toxics
tit. – title
VOC – volatile organic compound

Attachment 4 - Responsiveness Summary

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Attachment 4 - Responsiveness Summary

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Comment No.	Comment	Response
Comments Received During Public Meeting Held on 27 April 2011		
Comments by Robert Woodings, P.E., RAB Community Co-Chair		
1.	The Short-Term Effectiveness for Proposed Plans for IRP Sites 1 and 2 indicates "good" for the "No Action" Alternative. These relative ratings appear to be too high when considering potential risks to the Community. I suggest the relative ratings are "Fair" at best for the "No Action" Alternative.	The short-term effectiveness ratings assigned to the groundwater alternatives in the Proposed Plan are consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 of the Code of Federal Regulations, Section 300.430) and United States Environmental Protection Agency's (U.S. EPA's) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (October 1988). In accordance with the NCP and U.S. EPA guidance, the short-term effectiveness addresses potential risks *during the implementation* of an alternative. Some examples of these risks include, adverse air quality impacts from groundwater treatment operations (such as air strippers), and risks posed by transportation of hazardous materials, or dust from excavation. Therefore, the rating of "good" for "No Action" alternative corresponding to the short-term effectiveness criterion is appropriate since under this alternative, no construction/implementation activity will be conducted to generate additional risk to the community or workers. Please note that ratings with respect to other NCP criteria such as overall protection of human health and the environment, and long-term effectiveness reflect the performance of alternatives with respect to risks to human health from impacted groundwater. The Proposed Plan documents that the "No Action" alternative does not meet the threshold criteria of overall protection of human health and the environment for IRP Sites 1 and 2. In addition, the "No Action" alternative is rated poor for long-term effectiveness.

Comments Received During Public Comment Period, 20 April to 20 May 2011		
Comments by Roy L. Herndon, Chief Hydrogeologist, Orange County Water District		
1.	The ultimate determination of successful performance of remedial alternatives G1-5 and G2-2 for Sites 1 and 2, respectively, will depend heavily on a properly designed downgradient monitoring well network. As such, the adequacy of the downgradient monitoring well network with regard to known local hydrogeologic conditions is critical, particularly in cases such as this where monitored natural attenuation is a component of the preferred alternative.	Comment noted. The adequacy of the downgradient monitoring well network with regard to site-specific hydrogeologic conditions will be reevaluated during the Remedial Design phase following finalization of the Record of Decision (ROD). On the basis of this evaluation, additional monitoring wells will be added as appropriate during the remedial action implementation phase.
2.	The hydrogeologic conditions in the vicinity of the downgradient portion of the Sites 1 and 2 groundwater impact areas significantly change as groundwater flows out of the relatively narrow alluvial channel and into the broader Irvine subbasin. Specifically, the direction of groundwater flow markedly changes from southwesterly to northwesterly as groundwater transitions to the Irvine subbasin. This significant change in flow direction is clearly evident in Figure 2-5 Regional Groundwater Potentiometric Evaluation Map for the Shallow Groudnwater Unit – February 1997 (ref. Draft Final CERCLA Groundwater Monitoring Plan, MCAS El Toro, June 1999).	The apparent change in groundwater flow direction from southwest to northwest as groundwater transitions to the Irvine subbasin will be considered during the design of the monitoring well network for the final groundwater remedies for IRP Sites 1 and 2.
3.	The Proposed Plan does not provide a location map of existing and/or proposed monitoring wells to determine if the future remedial performance monitoring well network is adequate for preferred alternatives G1-5 and G2-2. Perhaps this map will be included in a future remedial action design document, but it is worth noting because the estimated costs of the remedial alternatives are listed in the Proposed Plan. Should the requirement for an adequately designed remedial performance monitoring well network dictate that additional monitoring wells be constructed and monitored, then these costs should be included as part of the preferred alternatives' costs.	Per United States Environmental Protection Agency (U.S. EPA) guidance, the Proposed Plan was intended to provide a concise summary of the sites. The Proposed Plan refers the public to documents maintained at the Information Repository and in the Administrative Record File (location provided on page 13 of the Proposed Plan) for additional details including location map of existing monitoring wells for Sites 1 and 2. The reviewer's understanding is correct that the proposed monitoring well network will be presented in the remedial action design document to be prepared in future. The preferred alternative cost estimates included in the Proposed Plan do include estimated costs for the installation of new monitoring wells.

4.	Preferred remedial alternatives G1-5 and G2-2 should include a future remedial performance monitoring well network with a sufficient number of monitoring wells located along flow paths most likely to detect escaping contaminants (if any) based on local hydrogeologic conditions.	The performance monitoring well network for remedial alternatives G1-5 and G2-2 will be designed after the ROD is finalized and will be included in the Remedial Design. The design will be based on the knowledge of site-specific hydrogeology and transport pathways for the chemicals of concern acquired through numerous past investigations conducted at the sites. The Remedial Design will be reviewed and concurred upon by FFA signatories prior to implementation.

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