United States Air Force

Installation Restoration Program

5-Year Review Report
for
Former March Air Force Base
and
March Air Reserve Base
Riverside County, California

September 2003

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for
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Approved by: **Date:**

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EXECUTIVE SUMMARY

This report provides the first statutory 5-year review for Operable Unit (OU) 1 sites at March Air Reserve Base (ARB) and former March Air Force Base (AFB) in Riverside County, California. The review was conducted in accordance with the draft *Comprehensive Five-Year Review Guidance* issued by the United States Environmental Protection Agency (540R-98-050).

The protection of human health and the environment by the remedial actions at OU 1 is discussed in this document. The results of the 5-year review indicate that the remedies implemented at the sites are expected to be protective of human health and the environment. Overall, the remedies were functioning as designed and were operated and maintained in an appropriate manner. No deficiencies impacting the protectiveness of the remedies were noted during this review. Since the OU1 Record of Decision (ROD) was signed, the Air Force and regulatory agencies have recognized that institutional controls (ICs) and land use controls are an important part of any remedy where waste is left in place above unrestricted levels. For Base Realignment and Closure (BRAC) properties, these ICs take the form of deed restrictions and a state land use covenant that "runs with the land." At this time the Air Force and regulatory agencies are in formal dispute on several IC issues. Once the IC issues are resolved, the Air Force will submit an OU1 ROD modification that will include ICs. For Installation Restoration Program (IRP) sites that are situated within the current Air Force Reserve Command (AFRC) property, the AFRC will place land use controls within the Base Comprehensive Plan to ensure that each site is protective of human health and the environment. In addition, any construction project that requires digging or excavation requires that the agency conducting the work follow the Base Digging Permit Process. The Base Digging Permit Process must be reviewed and approved by the Base Environmental Office before work can begin. If proposed construction is within an IRP site with contamination above unrestricted levels, the Base Environmental Office will gain regulatory approval.

Operable Unit 1

OU1 consists of 14 different sites with the potential for soil and groundwater contamination and a plume of contaminated groundwater. The sites include IRP Sites 4, 5, 7, 9, 10, 13, 14, 15, 16, 18, 29, 31, 34, and 38. OU1 also includes the off-base plume area along the eastern boundary of the Base. The remedies at OU1 are protective of human health and the environment. Detailed analysis of each site is provided in the document and are summarized in Table ES-1.

Operable Unit 2

OU2 comprises 25 IRP sites. They include: Sites 1, 2, 3, 6, 8, 11, 12, 17, 19, 20, 22, 23, 24, 25, 26, 27, 28, 30, 32, 35, 36, 37, 39, 40, and 42. Sites 1, 2, 8, 11, 27, 36, 37, and 39 are situated within the cantonment area on land to be retained by the AFRC. The remaining sites are on property that has been or will be transferred out of Air Force control. Sites that have contamination remaining in place above unrestricted levels will be evaluated in the 5-year review subsequent to the signing of each respective ROD. Table ES-1 summarizes the OU2 sites and their current status.

Operable Unit 3

OU3 is the site of the former Panero aviation fueling facility, which was installed in 1952 and dismantled in 1991. OU3 comprises one IRP site, IRP Site 33, also known as the Panero Site. The entire OU encompasses approximately 45 acres within an area at March ARB that will be retained by the Base after

other portions of the Base are released to the public. The AFRC will continue to operate in OU3 for the indefinite future. Since Site 33 is a fuel only site, the Air Force and regulatory agencies are currently in discussions to remove this site from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process and the Air Force will manage this site as a fuel only corrective action site that will have the Regional Water Quality Control Board, Santa Ana Region as the regulatory oversight. Table ES-1 summarizes the current status of OU3, Site 33.

Other Sites

The Basewide/OU 4 sites include five IRP sites and four non-IRP sites; IRP Sites 21, 41, 42 (including Building 3404), 43, and 44; non-IRP sites include Building 3410 (Water Tower), Building 6601 (Water Tank), Hospital Mercury Investigation (Buildings 2990 and 2995), and Site L. These sites are currently being evaluated in an ongoing Basewide/OU 4 remedial investigation/feasibility study.

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 1	Aircraft Isolation Area/Fuel Drainage Area	2	AFRC	AFRC OU2 ROD	Fuels and solvents	Contaminated soil was removed in December 1995. Closure document was approved. AFRC OU2 ROD site.
Site 2	Waste Oil Pits/Solvent tanks	2	AFRC	AFRC OU2 ROD	Fuels, oils, and solvents	Interim remedial action (SVE) in place. AFRC OU2 ROD site.
Site 3	Landfill No. 5	2	AFRPA	AFPRA OU2 ROD	Household waste, oil, and solvents	Waste was consolidated in the Site 6 landfill. No waste is present. AFRPA OU2 ROD site.
Site 4	Landfill No 6	**1**	AFRPA	OU1 ROD	Household waste, oil, and solvents	Landfill was capped in 1995. Waste remains on site. Site is evaluated in this 5-year review.
Site 5	Landfill No. 3	**1**	AFRC	OU1 ROD	Sanitary waste and construction rubble	Approved for no further action in the OU1 ROD. Waste remains in place. Site is evaluated in this 5-year review.
Site 6	Landfill No 4	2	AFRPA	AFPRA OU2 ROD	Household waste and construction rubble	Closed with a newly engineered landfill design. Waste remains in place. AFRPA OU2 ROD site

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 7	Fire Protection Training Area No 2	**1**	AFRPA	OU1 ROD	Fuels, oils, and solvents	Identified as no further action in the OU1 ROD. Contamination remains above unrestricted levels. Evaluated in this 5-year review.
Site 8	Flight Line Shop Area/Operations	2	AFRC	AFRC OU2 ROD	Fuels, oils, and solvents	Some contaminated soils were removed. Contamination remains in place. AFRC OU2 ROD site.
Site 9	Oil/Water Separator	**1**	AFRC	OU1 ROD	Fuels and solvents	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 10	Flightline Drainage Ditch	**1**	AFRC	OU1 ROD	Fuels, oils, and solvents, with PAHs in surface soils	Contaminated soils were removed in 1995. No Contamination remains at Site. ESD issued to change remedy. Site is evaluated in this 5-Year Review
Site 11	Bulk Fuels Storage Area	2	AFRC	AFRC OU2 ROD	Fuels	OU2 RI determined levels do not pose risk. AFRC OU2 ROD site

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 12	Civil Engineering Yard	2	AFRPA	AFPRA OU2 ROD	Oils and solvents	Soil was excavated and placed at the Site 6 landfill. Long-term groundwater monitoring is being done. AFRPA OU2 ROD site.
Site 13	Tank Truck Spill Site (Located within Site 5 Landfill)	**1**	AFRC	OU1 ROD	Fuels	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 14	Liquid Fuel Pump Station Overflow (Near Site 16 Sludge Drying Beds)	**1**	AFRC	OU1 ROD	Jet fuel	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 15	Fire Protection Training Area No. 3	**1**	AFRC	OU1 ROD	Fuels, BTEX	Contaminated soils were removed in 1995. No contamination remains at Site. ESD issued to change remedy. Site is evaluated in this 5-Year Review
Site 16	East March Sludge Drying Beds	**1**	AFRC	OU1 ROD	Sludge	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 17	Swimming Pool Fill (off Graeber)	2	AFRPA	AFPRA OU2 ROD	Solvents, shop wastes, and demolition debris	Pool structure and contents were removed in 1994. Contamination remains above unrestricted levels. AFRPA OU2 ROD site
Site 18	Engine Test Cell	**1**	AFRC	OU1 ROD	Fuel and BTEX	Ongoing discussions with regulators to remove Site 18 from the CERCLA process and manage as a fuels only site, regulatory oversight by RWQCB only. Site is evaluated in this 5-year review.
Site 19	West March Sludge Drying Beds	2	AFRPA	AFPRA OU2 ROD	Sludge	No remedial action required. Contamination remains above unrestricted levels. AFRPA OU2 ROD site.
Site 20	Landfill No. 7, West March	2	AFRPA	AFPRA OU2 ROD	Household waste	Soil and waste was excavated and placed at Site 6. No contamination remains above unrestricted levels at the site. AFRPA OU2 ROD site.
Site 21	Effluent Pond (Cordures Property)	BW/OU4	AFRPA	OU4 RI/FS*	Treated waste water	Site is currently being investigation in the Basewide/OU4 RI.

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 22	Landfill No. 2, main Base	2	AFRPA	AFPRA OU2 ROD	None	Site could not be found. No evidence of a waste was identified. AFRPA OU2 ROD site.
Site 23	East March Effluent Pond, Nadina and Heacock Street	BW/OU4	AFRPA	AFPRA OU2 ROD	Treated wastewater	No soil contamination was found. No further action recommended. AFRPA OU2 ROD site
Site 24	Landfill No. 1, West March, Incinerator Area	2	AFRPA	AFPRA OU2 ROD	Household waste and incinerator ash	Waste and soil was excavated in 1995 and placed at Site 6. No contamination remains above unrestricted levels at the site. AFRPA OU2 ROD site.
Site 25	Munitions Residue Burial Site, West March	2	AFRPA	AFPRA OU2 ROD	Munitions residue	Nonhazardous waste was removed and placed at Site 6 in 1995. No contamination remains above unrestricted levels. AFRPA OU2 ROD site
Site 26	Water Treatment Sludge, West March	2	AFRPA	AFPRA OU2 ROD	Sludge	Contamination was removed and placed at Site 6. No contamination remains above unrestricted levels. AFRPA OU2 ROD site

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 27	Building 422 Underground POL Tanks	2	AFRC	AFRC OU2 ROD	Fuels, oil, and solvent	Tanks were removed. An SVE system will be installed in 2004. AFRC OU2 ROD site.
Site 28	Basewide Groundwater Monitoring Wells	2	AFRC	OU1/OU2 RI/FS	Zone monitoring wells	Well network was part of the basewide groundwater monitoring network. No specific site identified. Not discussed further.
Site 29	Fire Protection Training Area No. 1	**1**	AFRC	OU1 ROD	Fuels, oils, and solvents	Identified as no further action in the OU1 ROD. Contamination remains above unrestricted levels. Evaluated in this 5-year review.
Site 30	Construction Rubble Site	2	AFRPA	AFPRA OU2 ROD	Construction rubble	Debris was removed in 1996. Cleanup to unrestricted levels reached. AFRPA OU2 ROD site
Site 31	Building 1211 Solvent Spill TCE Source Area	**1**	AFRC	OU1 ROD	Solvents	A soil and groundwater treatment system installed in 1996. Surface soil contamination remains above unrestricted levels. Site is evaluated in this 5-Year Review.

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 32	Building Demolition Areas	2	AFRPA	AFRPA OU2 ROD	Assumed to contain construction rubble	Not currently located. Site was removed from the IRP list because the sites were not considered to present a risk for adverse affects on human health or the environment.
Site 33	Panero Aircraft Refueling Facility	3	AFRC	OU3 Decision Document	Fuels and BTEX	Ongoing discussions with regulators to remove Site 18 from the CERCLA process and manage as a fuels only site. Regulatory oversight by RWQCB only. Site is not evaluated in this 5-year review.
Site 34	Pritchard Refueling System	**1**	AFRC	OU1 ROD	Fuels and BTEX	A biovent pilot study was used to clean the soil. Surface soil contamination remains above unrestricted levels. Site is evaluated in this 5-Year Review.
Site 35	15th Headquarters Leaking UST	2	AFRPA	AFRPA OU2 ROD	Fuels	The USTs were removed and bioventing was used to clean the site. Contamination remains above unrestricted levels. AFRPA OU2 ROD site

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 36	Building 458 Leach Pit	2	AFRC	AFRC OU2 ROD	Solvents	Some contaminated soil removed in 1994. Groundwater and SVE units are in place and operating. AFRC OU2 ROD site.
Site 37	PCB Spill Site at Building 317	2	AFRC	AFRC OU2 ROD	PCBs	Contaminant levels do not represent elevated risk. AFRC OU2 ROD site.
Site 38	PCB Spill Site (former SAC Alert Facility)	**1**	AFRPA	OU1 ROD	PCBs	The contamination was removed and the OU1 RI did not identify additional contamination. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 39	Base Gas Station, Building 2406, Main Base	2	AFRC	AFRC OU2 ROD	Fuels	Cleanup is complete. AFRC OU2 ROD site.
Site 40	Landfill No. 8, West March	2	AFRPA	AFPRA OU2 ROD	Household waste	Waste was removed in 1996 and placed at Site 6. No contamination remains above unrestricted levels. AFRPA OU2 ROD site.
Site 41	Hawes Radio Relay Facility, Barstow	BW/OU4	AFRPA	OU4 RI/FS*	Fuels and oil	Four USTs were removed in 1995. The structure is going to be removed. AFRPA OU2 ROD site.

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 42	15th Headquarters Building 3404 PCB Spill Site	2	AFRPA	AFPRA OU2 ROD	PCBs	Removal and disposal of contaminated soil is complete. Contamination remains above unrestricted levels. AFRPA OU2 ROD site.
Site 43	Former Automotive Maintenance Area/Cal Trans UST Site	2	AFRPA	AFRPA OU2 ROD	Fuels and BTEX	Removal and disposal of contaminated soil is complete. Groundwater requires LTM. AFRPA OU2 ROD site.
Site 44	Base Water Tower No. 407	BW/OU4	AFRC	OU4 RI/FS	Mercury	Contaminated soil was removed in 1997. Site is being evaluated in the Basewide/OU4 RI Basewide/OU4 ROD site.
OU 1 Groundwater Plume	OU1 Groundwater Plume	**1**	AFRPA/AFRC	OU1 ROD	Solvents	Long-term groundwater monitoring is ongoing. The site is evaluated in this 5-year review.
Site 2/27 Groundwater Plume	Sites 2/27 Groundwater Plume	2	AFRC	AFRC OU2 ROD	Fuels and solvents	The site has a groundwater treatment system installed. AFRC OU2 ROD site.

Summary Table ES-1. CERCLA Sites at March AFB
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Non-IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site L	Former NCO Club Swimming Pool/PCB Site	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	PCBs	Contaminated surface soil has been removed. Subsurface contamination remains at depth. The site has been capped. Long-term monitoring is ongoing. AFRPA OU2 ROD site.
Water Tank – Building 6601	Water Tank	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	Mercury	Contaminated soil has been removed. Site is being investigated in the Basewide/OU4 RI Basewide/OU4 ROD site.
Water Tank Building 3410	Water Tank	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	Mercury	Contaminated soil has been removed. Site is being investigated in the Basewide/OU4 RI Basewide/OU4 ROD site.
March Base Hospital/Dental Clinic	Mercury Characterization	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	Mercury	The site was investigated and no contamination was found. Basewide/OU4 ROD site.

Summary Table ES-1. CERCLA Sites at March AFB
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IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status

AFRC = Air Force Reserve Command
AFRPA = Air Force Real Property Agency
BTEX = benzene, toluene, ethylbenzene, xylene
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
ESD = explanation of significant difference
IRP = Installation Restoration Program
LTM = long-term monitoring
NCO = Non-Commissioned Officer
OU = Operable Unit
PAH = polyaromatic hydrocarbon
PCB = polychlorinated biphenyl
POL = petroleum, oil, and lubricants
RI = remedial investigation
ROD = Record of Decision
RWQCB = Regional Water Quality Control Board
SVE = soil vapor extraction
UST = underground storage tank

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LIST OF ACRONYMS

AFB	Air Force Base
AFRPA	Air Force Real Property Agency
AFCEE	Air Force Center for Environmental Excellence
AFFF	aqueous film-forming foam
AFRC	Air Force Reserve Command
AIW	air injection wells
ANG	Air National Guard
ARB	Air Reserve Base
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
BCP	Base Comprehensive Plan
BGMP	Basewide Groundwater Monitoring Program
bgs	below ground surface
BPW	base production well
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm/s	centimeters per second
CCR	California Code of Regulations
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	chemical of potential concern
DCA	Dichloroethane
DCE	dichlorethene
DPEW	dual phase extraction well
DTSC	Department of Toxic Substances Control
EC	engineering control
EGETS	expanded groundwater extraction and treatment system
EPA	Environmental Protection Agency
ESD	Explanation of Significant Difference
ESI	Expanded Site Investigation
FFA	Federal Facilities Agreement
FOSL	Finding of Suitability to Lease
GAC	granular-activated carbon
GETS	groundwater extraction and treatment system
gpm	gallons per minute
GWEW	groundwater extraction well
HASP	Health and Safety Plan
Hg	mercury

LIST OF ACRONYMS (Continued)

I-215	Interstate 215
IC	institutional control
IRP	Installation Restoration Program
JPA	Joint Powers Authority
JP-4	jet propulsion fuel
LOX	liquid oxygen
LFG	landfill gas
MCL	Maximum Contaminant Level
µg/l	micrograms per liter
MSL	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	operations and maintenance
OPS	Operating Properly and Successfully
OU	Operable Unit
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	perchloroethylene (tetrachloroethylene; tetrachloroethene)
POC	point of compliance
PRG	Preliminary Remediation Goal
RAB	Restoration Advisory Board
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROL	Regional Operating Location
scfm	standard cubic feet per minute
SVE	soil vapor extraction
SVOC	Semivolatile organic compound
TCE	trichloroethylene (trichloroethene)
TPH	Total Petroleum Hydrocarbon
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compound
WSA	Weapons Storage Area

1.0 INTRODUCTION

The Air Force Real Property Agency (AFRPA) and the Air Force Center for Environmental Excellence (AFCEE) directed Earth Tech, Inc. (Earth Tech), to perform the first 5-year review of the remedial actions implemented at March Air Reserve Base (ARB) and the former March Air Force Base (AFB) in Riverside County, California. The review was conducted from March 2000 to August 2003. This report documents the results of the review. This report documents the first statutory 5-year review for Operable Unit (OU) 1 Sites. The timing of this 5-year review is driven by the signature date of the OU1 Record of Decision (ROD). The purpose of 5-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in 5-year reports. In addition, 5-year review reports identify deficiencies found during the review, if any, and propose recommendations to address them.

This review is required by statute. The U.S. Environmental Protection Agency (EPA) must implement 5-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121 (c) as amended, states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first 5-year review for March AFB/ARB. The triggering action for this review is the OU1 ROD signature date of June 20, 1996. Due to the fact that hazardous substances, pollutants, or contaminants remain at March AFB/ARB above levels that allow for unrestricted use and unlimited exposure, a 5-year review is required.

The technical assessments performed during this 5-year review examined the following questions:

- Question A – Is the remedy functioning as intended by the decision documents?
- Question B – Are the assumptions used at the time of the remedy still valid?
- Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

To answer these questions, the 5-year review included:

- Review of applicable site documents such as RODs, remedial action design documents, and site operations and maintenance (O&M) records and reports

- Review of newly promulgated standards and applicable or relevant and appropriate requirements (ARARs)

- Interviews with site managers, O&M staff, and local regulatory authorities

- Performing site inspections, including general site inspections, system operations, and institutional or access controls.

Upon completion of the document reviews, interviews, and site inspections, conclusions of the 5-year review were developed. These conclusions include identification of remedy deficiencies, recommendations and follow-up actions, and a determination of whether the remedy is or is not expected to be protective of human health and the environment.

The draft version of this 5-year review document was issued in June 2001 based on the data available at the time of compilation. Data in the final version of the 5-year review document has been updated with more recent data in response to review comments received from regulators.

2.0 SITE CHRONOLOGY

Table 2.1-1 lists the chronology of events for the March AFB/ARB OU1, while Tables 2.1-2 and 2.1-3 list the chronology of events for OU2 and OU3, respectively.

Table 2.1-1. Operable Unit 1 Chronology of Site Events

Date	Event
March 1983	March AFB IRP process began (Phase I)
March 1985	Phase II, Stage 1 began
March 1987	Plan of action development for 28 sites identified by the Phase I assessments
June 1987	Phase II, Stage 2 investigations began
July through December 1988	Phase II, Stage 3 performed
December 1988	Phase II, Stage 4 began
November 1989	March AFB listed on the National Priorities List (NPL)
September 1990	Federal Facilities Agreement (FFA) signed by the Air Force, U.S. EPA, and State of California; Base divided into three separate OUs to facilitate environmental restoration planning and implementation
November 1990	Phase II, Stage 4 completed – total of 39 IRP sites identified basewide
April 1991	Additional site characterization investigations performed
1992	Expanded Site Investigation (ESI)/RCRA Facility Assessment (RFA) began
July 1994	Final OU1 Remedial Investigation (RI)/Feasibility Study (FS) published
March 1995	Draft Final Record of Decision (ROD) issued
December 1995	Final ROD issued
June 1996	Final ROD signed

AFB = Air Force Base
EPA = Environmental Protection Agency
IRP = Installation Restoration Program
OU = Operable Unit
RCRA = Resource Conservation and Recovery Act

Table 2.1-2. Operable Unit 2 Chronology of Site Events

Date	Event
March 1983	March AFB IRP process began (Phase I)
March 1985	Phase II, Stage 1 began
March 1987	Plan of action development for 28 sites identified by the Phase I assessments
June 1987	Phase II, Stage 2 investigations began
July through December 1988	Phase II, Stage 3 performed
December 1988	Phase II, Stage 4 began
November 1989	March AFB listed on the NPL
September 1990	FFA signed by the Air Force, U.S. EPA, and State of California; Base divided into three separate OUs to facilitate environmental restoration planning and implementation
November 1990	Phase II, Stage 4 completed – total of 39 IRP sites identified basewide
April 1991	Additional site characterization investigations performed
1992	ESI/RFA began
1993	Three additional sites identified (one eventually excluded from the OU; Stage 4 Site Characterization Report issued
July 1997	Final RI/Draft FS report published
November 1998	Draft Final ROD issued
1999	Air Force determines need for separate AFRPA and AFRC RODs
October 2000	Draft Final ROD for AFRPA sites submitted to regulatory agencies
December 2001	Draft Final ROD for AFRPA sites re-submitted as Draft ROD per regulatory request
December 2001	Draft ROD for AFRC sites submitted to regulatory agencies

AFB = Air Force Base
AFRC = Air Force Reserve Command
AFRPA = Air Force Real Property Agency
ESI = Expanded Site Investigation
EPA = Environmental Protection Agency
FFA = Federal Facilities Agreement
FS = feasibility study
IRP = Installation Restoration Program
NPL = National Priorities List
OU = Operable Unit
RFA = RCRA Facility Agreement
RI = remedial investigation
ROD = Record of Decision

Table 2.1-3. Operable Unit 3 Chronology of Site Events

Date	Event
March 1983	March AFB IRP process began (Phase I)
March 1985	Phase II, Stage 1 began
March 1987	Plan of action development for 28 sites identified by the Phase I assessments
June 1987	Phase II, Stage 2 investigations began
July through December 1988	Phase II, Stage 3 performed
December 1988	Phase II, Stage 4 began
September 1989	Site investigation began for soil and water contamination
November 1989	March AFB listed on the NPL
September 1990	FFA signed by the Air Force, U.S. EPA, and State of California; Base divided into three separate OUs to facilitate environmental restoration planning and implementation
November 1990	Phase II, Stage 4 completed – total of 39 IRP sites identified basewide
1992	ESI/RFA began
August 1994	Remedial Investigation Report issued
September 1994	Feasibility Study Report issued
April 1995	Draft Final ROD issued
October 1996	OU3 Decision Document, Removal Action Upgrade issued

AFB = Air Force Base
EPA = Environmental Protection Agency
FFA = Federal Facilities Agreement
ESI = Expanded Site Investigation
IRP = Installation Restoration Program
NPL = National Priorities List
OU = Operable Unit
RFA = RCRA Facility Agreement
ROD = Record of Decision

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3.0 BASE AND OU BACKGROUND

This section provides an overview of the base and OU background and history.

3.1 LOCATION

March AFB/ARB is in Moreno Valley, Riverside County, California. It is approximately 5 miles east of the city of Riverside, at the northern end of the Perris Valley. Los Angeles is approximately 60 miles west of the Base and San Diego is approximately 90 miles to the southwest (Figure 3.1-1). March AFB/ARB lies in sections of Township 3 South, Range 4 West and covers portions of the Riverside East, Steele Peak, and Sunnymead 15-minute quadrangle maps. Interstate 215 (I-215) bisects the base property in a northwest-southeast direction. The Main Base is situated east of I-215, and the section to the west of the I-215 is designated as West March.

3.2 POPULATION

The total population in the vicinity of March AFB/ARB is approximately 405,000, including the cities of Moreno Valley, Riverside, and Perris (California Department of Finance, 1993).

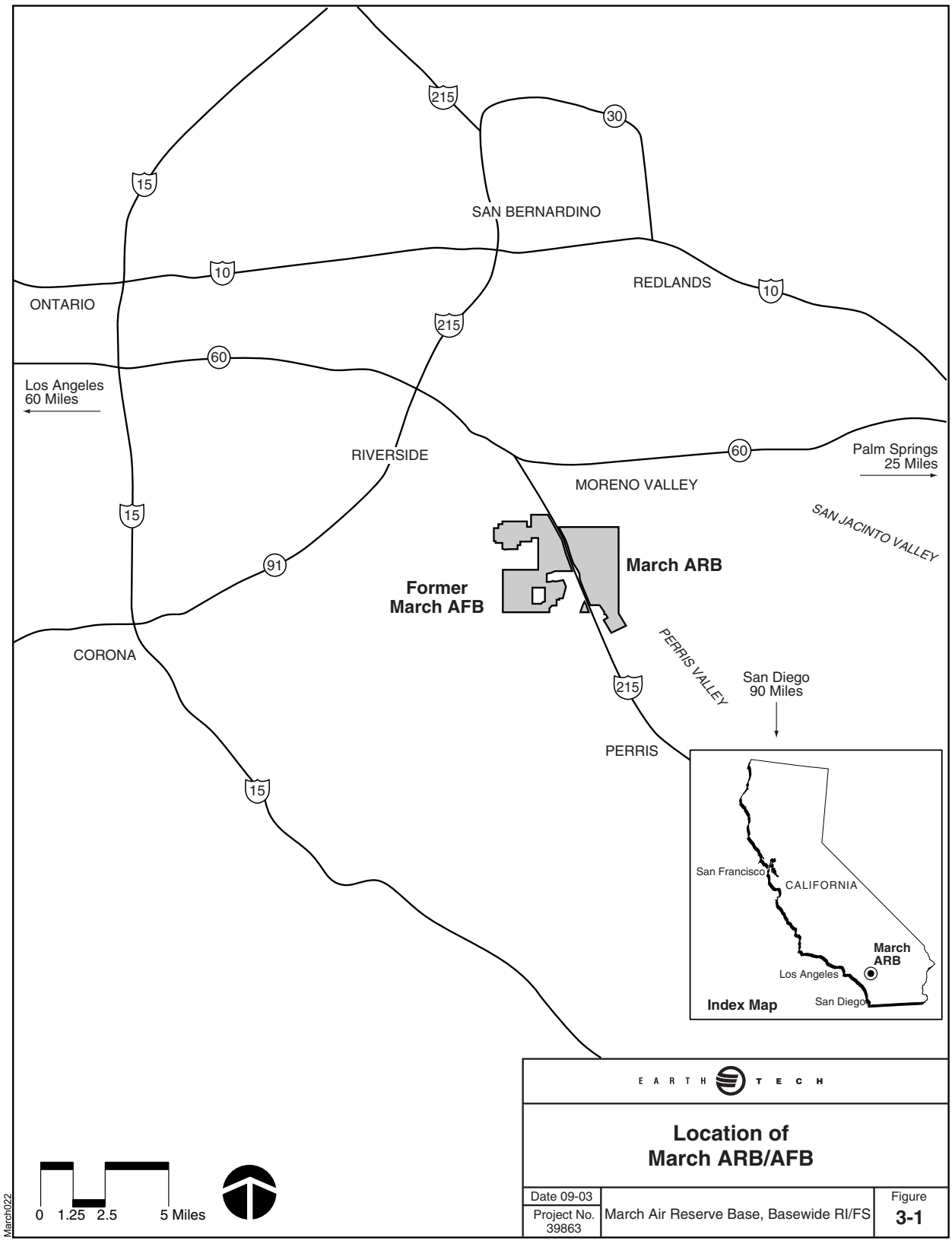
3.3 LAND USE

The primary land use surrounding the Main Base is residential to the east and agricultural to the south of the property boundary, while commercial and some light industrial uses occur to the north along Cactus Avenue. The western boundary of the Main Base is parallel to I-215. Current land use on the Main Base is classified as primarily industrial and comprised of repair, maintenance, and operation of military aircraft activities.

Industrial activities are not currently conducted at West March. Most of this area is comprised of undeveloped land, with a few riparian habitats at former quarry locations and along the paths of surface drainage. The formerly secured Weapons Storage Area (WSA), situated in the northwest corner of West March, is no longer operational, and the property was transferred. Recently (June 2003), maintenance operational data at the WSA identified a potential radiological waste stream. Currently, the Air Force and regulators are developing an appropriate CERCLA response. A few administrative facilities in the former 15th Air Force Headquarters area continue to be used. Arnold Heights, a former housing area for active duty military personnel and their dependents, is vacant. The local school authority to accommodate students from nearby communities currently operates the Arnold Heights elementary school. A civilian housing development, Orange Crest, lies to the west of the West March boundary. The military retirement community of Air Force Village West and the Riverside National Cemetery are encompassed within the West March area. Most of the property has either been, or is scheduled to be, transferred out of Air Force control/ownership.

3.4 CLIMATE

The climate of the March AFB/ARB area is characterized as Mediterranean to semi-arid, with warm to hot summers and mild winters. Precipitation in the area averages about 14 inches of annual rainfall and primarily occurs from November through March. Snowfall is generally confined to the higher slopes surrounding the Perris Basin to the north and east.


215
30
15
SAN BERNARDINO
10
REDLANDS
10
ONTARIO
215
60
Los Angeles
60 Miles
RIVERSIDE
60
Palm Springs
25 Miles
MORENO VALLEY
15
SAN JACINTO VALLEY
91
March ARB
Former
March AFB
CORONA
PERRIS VALLEY
215
San Diego
90 Miles
PERRIS
15
San Francisco
CALIFORNIA
March
ARB
Los Angeles
San Diego
Index Map
0 1.25 2.5 5 Miles
March022
EARTH TECH
Location of
March ARB/AFB
Date 09-03
Project No. 39863
March Air Reserve Base, Basewide RI/FS
Figure
3-1

3.5 GEOLOGY AND HYDROLOGY

Specifically, the West March and the Main Base are on the Perris Erosional Surface and the Paloma Surface, with the exception of a narrow strip of granitic bedrock outcropping along the west side of I-215. A thin soil veneer cut by relatively small drainage channels locally covers the shallow bedrock.

March AFB/ARB is on the Perris Block, a crustal block bounded by faults to the west, east, and north. The southern boundary is poorly defined. The Perris Surface at West March slopes to the east where it disappears under the alluvium of the Main Base. Granitic dikes up to 6 feet thick cut the older igneous rock in some places. The dominant joint pattern is to the northwest with a relatively steep dip to the northeast. The exposed rocks are moderately fractured and have weathered into large, rounded boulders. Sand and gravel have been quarried in several places.

The Main Base is situated on an alluvial plain of the Paloma Surface. These alluvial sediments were deposited within bedrock valleys (Woodford, 1971). The deposits beneath the Main Base are sub-horizontal interlayered strata of low permeability, fine- to medium-grained clayey and silty sands, with higher permeability fine- to coarse-grained sands and silty sands. These strata are laterally discontinuous and often interfere with, and/or grade into, adjacent alluvial units. The in-situ bedrock is believed to be non-water bearing. The only exception may be where possible fracture flow exists.

Many of the sandy strata are separated vertically due to the lateral interfingering of sedimentary units beneath the Main Base and frequently connect at some distance horizontally. Aquifer conditions beneath March AFB/ARB can be summarized as a sequence of relatively thin, complexly interconnected, sub-horizontal sandy strata separated by leaky confining beds composed of finer-grained sediments. Field observations, including core examinations and pumping test data, suggest that the aquifers are semi-confined to confined and that one or more of the semi-confining layers may be sufficiently extensive as to act as regional aquitards. These aquitards, each comprised of complexly interconnected sandy strata, may separate the aquifer system into several aquifer units. Even the uppermost aquifer is generally confined by clayey layers and is a water table aquifer in only limited areas. Investigations indicate that fine-grained sediments tend to predominate in the northwestern portion of the Main Base (near Sites 2, 8, 27, and 36), and the sandy strata thicken and become more interconnected to the southeast.

The Main Base groundwater flow directions are complex. Based on depth-to-groundwater measurements only, the predominant groundwater flow direction over most of Main Base is generally toward the southeast. Mounding of shallow groundwater in this area has occurred due to significant recharge from the unlined Heacock Storm Drain along the eastern base boundary. This has resulted in westerly flow directions in the northeast corner of the Base. A groundwater divide is situated in the Site 2/27 area. To the north of Site 2/27 groundwater flows to the northwest, while flow is to the southeast south of Site 2/27.

Groundwater at West March is essentially unconfined. Flows are generally towards the east with southeast and northeast components within a relatively thin mantle of weathered bedrock and the overlying alluvial soils. These aquifer conditions fundamentally differ from conditions beneath the Main Base.

The OU1 Remedial Investigation/Feasibility Study (RI/FS) (U.S. Air Force, 1995), OU2 RI/FS (U.S. Air Force, 1997), and OU3 RI/FS (U.S. Air Force, 1994) provide more detailed discussions of the March AFB/ARB geology and hydrogeology.

3.6 SOIL

The Cieneba-Rockland-Fallbrook association and the Monserate-Arlington-Exeter association are the two major soil associations in the March AFB/ARB area. The Cieneba-Rockland-Fallbrook association is derived from granitic rock and occurs on the western portion of Base property. These soils are typically 1 to 3 feet thick, with a surface layer of sandy loam to fine sandy loam; they are well drained, and coarse- to medium-grained, with slopes ranging from 2 to 50 percent. The Monserate-Arlington-Exeter association is derived from granitic alluvium and occurs on the eastern portion of the Base. These well-drained soils have a surface layer of sandy loam to loam, are fine to medium grained, and generally form gentle slopes.

3.7 SURFACE WATER AND WETLANDS

Permanent surface water impoundments do not exist on the Main Base. Small wetlands are associated with some of the West March sites, particularly Sites 6 and 40. Former quarries have filled with water since abandonment and now support riparian habitats in these areas. Lake Perris, a 130,000-acre reservoir, is situated approximately 4 miles southeast of the Base. Water from the State Water Project is temporarily stored here, treated, and used for municipal and agricultural purposes in the surrounding communities, including March AFB/ARB. The California Aqueduct, which runs north and east of the Base, contributes water to Lake Perris. A portion of the Colorado River Aqueduct extends approximately 3.5 miles south of the Base. This aqueduct empties into Lake Matthews, approximately 10 miles west of the Base.

The U.S. Army Corps of Engineers (USACE) has performed a delineation of jurisdictional wetlands associated with the Cactus and Heacock flood control channels. These artificial channels act as ephemeral streams, support scattered wetland vegetation, and are considered waters of the United States. The USACE determined that approximately 2.17 acres of jurisdictional wetlands exist in the Heacock storm drain. The locations of these intermittent, localized patches of wetland vegetation change each year in accordance with the high volume, high velocity storm water flow through these channels during periods of rain.

Evidence remains inconclusive about the current existence of small areas of vernal pools on the March ARB flight line. Further study is anticipated to resolve this issue.

3.8 WATER USE AND WELL INVENTORY

Water supply wells exist to the south, east, and north of March ARB. These base production wells (BPWs) have been used for industrial, agricultural, and domestic water supplies. The Eastern Municipal Water District and the California Department of Water Resources maintain and provide access to data for these wells. There are low-yield domestic wells, not on file with government agencies, which are known to exist on properties surrounding the Base and are potentially impacted by the off-base plume. For those wells that are potentially impacted by the off-base plume, the Air Force continues to collect and analyze water samples from these wells on a regular basis.

Six March ARB water supply wells have previously been in production. Four of these (BPW-1 through BPW-4) were situated on the Main Base, and two (BPW-5 and BPW-6) were situated off base. Production well use on the Main Base ceased in 1983 and the wells (BPW-1 through BPW-4) were destroyed in May 1997. Use of the off-base production wells was discontinued in 1988 and the wells (BPW-5 and BPW-6) were destroyed in 1999 and 2000.

3.9 SITE LOCATIONS AND ACTIVITIES

The 640-acre Alessandro Aviation Field, opened March 1, 1918, was used during World War I as a training center for "Jenny" pilots. At the end of World War I, the Base closed for approximately 4 years and then reopened in 1927. The facility was considered the central location for bombing and gunnery training on the West Coast by 1938. The Strategic Air Command took control of what became March AFB in 1949. The Base became an Air Mobility Command installation in 1992, and the primary mission became dedicated to air refueling activities. Prior to realignment in 1996, the Base served as a main location for bombers as well as refueling and cargo aircraft. In addition, the Air Force Reserve Command (AFRC) and California Air National Guard (ANG) units have operated cargo and fighter missions at the Base.

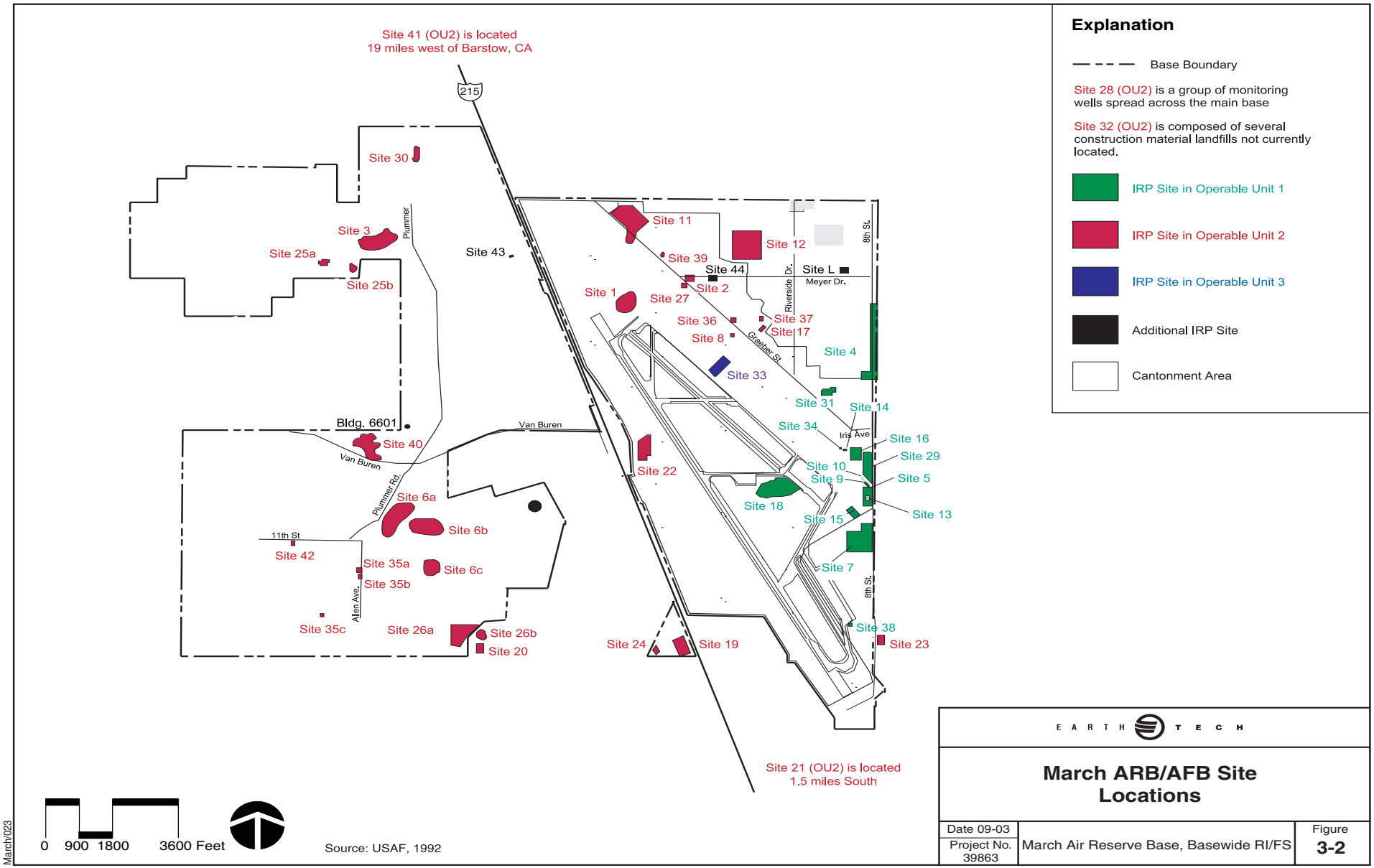
The former Camp Haan Army Base was constructed during World War II along the west side of what is now I-215. Camp Haan extended south from Alessandro Boulevard towards the south for approximately 5 miles. The facility was used primarily as an anti-aircraft artillery camp and staging area for General Patton's tank force. As many as 80,000 personnel were reportedly stationed there at one time, and many of the old building foundations remain. Following World War II, Camp Haan became a part of March AFB.

March AFB was designated for realignment in September 1993. This resulted in the transfer of most active-duty Air Force personnel and aircraft to Travis AFB, California, by April 1, 1996. The AFRC and California ANG units remained, and the Base was designated as March ARB. Due to reduced operations, substantial areas of the Base (particularly at West March) are scheduled to be transferred to civilian agencies. This property transfer will decrease the size of the Base by approximately two-thirds. Figure 3.1-2 shows the current base boundary, areas designated for transfer, and areas to be retained by the Air Force. The figure also shows the locations of the OUs and sites at March AFB/ARB.

Air Force activities at March AFB, as elsewhere, involved a wide variety of operations that required the use, storage, and disposal of hazardous materials, including fuel and solvents. Past waste disposal practices resulted in contamination of soil and groundwater at several areas on both the Main Base and on West March.

In 1980, the Air Force developed the Installation Restoration Program (IRP) to address soil and groundwater contamination at installations nationwide. The IRP process at March AFB began in 1983. A record search, including interviews with Base personnel and research of Base records and historic aerial photographs, was performed. The record search identified 30 potentially contaminated sites, and further investigation was recommended for most of those sites. Since then, numerous investigations have been conducted to delineate contaminants in the soil and groundwater. Table 3.1-1 is a summary of the IRP and non-IRP sites identified at March AFB/ARB currently being investigated.

In 1989, the U.S. EPA placed the Base on the National Priorities List (NPL) as a result of documented groundwater contamination by chlorinated solvents and fuel hydrocarbons. In 1990, the Air Force entered a Federal Facilities Agreement (FFA) with the U.S. EPA and the State of California to facilitate the assessment and cleanup process at the base. The FFA establishes procedures for involving federal and state regulatory agencies, as well as the public, in the restoration process at March AFB. Three OUs were designated to facilitate the restoration process. The OU categorization was primarily based on geographical location and similarities in contaminant types and distribution.


Site 41 (OU2) is located
19 miles west of Barstow, CA
215
Site 30
Site 3
Site 25a
Site 25b
Plummer
Site 43
Site 11
Site 12
Site 39
Site 44
Site L
Meyer Dr.
Site 2
Site 1
Site 27
Riverside Dr.
8th St.
Site 36
Site 37
Site 17
Site 8
Graeber St.
Site 4
Site 33
Site 31
Site 14
Bldg. 6601
Van Buren
Site 34
Iris Ave
Site 16
Site 40
Van Buren
Site 29
Site 10
Site 9
Site 5
Site 22
Plummer Rd.
Site 6a
Site 18
Site 13
Site 15
Site 6b
11th St
Site 42
Site 35a
Site 6c
Site 7
Site 35b
Allen Ave.
8th St.
Site 38
Site 35c
Site 26a
Site 26b
Site 24
Site 19
Site 23
Site 20
Site 21 (OU2) is located
1.5 miles South
Explanation
Base Boundary
Site 28 (OU2) is a group of monitoring wells spread across the main base
Site 32 (OU2) is composed of several construction material landfills not currently located.
IRP Site in Operable Unit 1
IRP Site in Operable Unit 2
IRP Site in Operable Unit 3
Additional IRP Site
Cantonment Area
0 900 1800 3600 Feet
Source: USAF, 1992
March/023
EARTH TECH
March ARB/AFB Site Locations
Date 09-03
Project No. 39863
March Air Reserve Base, Basewide RI/FS
Figure 3-2

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 1 of 11

IRP Site Sites

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 1	Aircraft Isolation Area/Fuel Drainage Area	2	AFRC	AFRC OU2 ROD	Fuels and solvents	Contaminated soil was removed in December 1995. Closure document was approved. AFRC OU2 ROD site.
Site 2	Waste Oil Pits/Solvent tanks	2	AFRC	AFRC OU2 ROD	Fuels, oils, and solvents	Interim remedial action (SVE) in place. AFRC OU2 ROD site.
Site 3	Landfill No. 5	2	AFRPA	AFPRA OU2 ROD	Household waste, oil, and solvents	Waste was consolidated in the Site 6 landfill. No waste is present. AFRPA OU2 ROD site.
Site 4	Landfill No 6	**1**	AFRPA	OU1 ROD	Household waste, oil, and solvents	Landfill was capped in 1995. Waste remains on site. Site is evaluated in this 5-year review.
Site 5	Landfill No. 3	**1**	AFRC	OU1 ROD	Sanitary waste and construction rubble	Approved for no further action in the OU1 ROD. Waste remains in place. Site is evaluated in this 5-year review.
Site 6	Landfill No 4	2	AFRPA	AFPRA OU2 ROD	Household waste and construction rubble	Closed with a newly engineered landfill design. Waste remains in place. AFRPA OU2 ROD site

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 2 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 7	Fire Protection Training Area No 2	**1**	AFRPA	OU1 ROD	Fuels, oils, and solvents	Identified as no further action in the OU1 ROD. Contamination remains above unrestricted levels. Evaluated in this 5-year review.
Site 8	Flight Line Shop Area/Operations	2	AFRC	AFRC OU2 ROD	Fuels, oils, and solvents	Some contaminated soils were removed. Contamination remains in place. AFRC OU2 ROD site.
Site 9	Oil/Water Separator	**1**	AFRC	OU1 ROD	Fuels and solvents	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 10	Flightline Drainage Ditch	**1**	AFRC	OU1 ROD	Fuels, oils, and solvents, with PAHs in surface soils	Contaminated soils were removed in 1995. No Contamination remains at Site. ESD issued to change remedy. Site is evaluated in this 5-Year Review
Site 11	Bulk Fuels Storage Area	2	AFRC	AFRC OU2 ROD	Fuels	OU2 RI determined levels do not pose risk. AFRC OU2 ROD site

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 3 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 12	Civil Engineering Yard	2	AFRPA	AFPRA OU2 ROD	Oils and solvents	Soil was excavated and placed at the Site 6 landfill. Long-term groundwater monitoring is being done. AFRPA OU2 ROD site.
Site 13	Tank Truck Spill Site (Located within Site 5 Landfill)	**1**	AFRC	OU1 ROD	Fuels	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 14	Liquid Fuel Pump Station Overflow (Near Site 16 Sludge Drying Beds)	**1**	AFRC	OU1 ROD	Jet fuel	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 15	Fire Protection Training Area No. 3	**1**	AFRC	OU1 ROD	Fuels, BTEX	Contaminated soils were removed in 1995. No contamination remains at Site. ESD issued to change remedy. Site is evaluated in this 5-Year Review
Site 16	East March Sludge Drying Beds	**1**	AFRC	OU1 ROD	Sludge	No contaminants identified above unrestricted levels. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 4 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 17	Swimming Pool Fill (off Graeber)	2	AFRPA	AFPRA OU2 ROD	Solvents, shop wastes, and demolition debris	Pool structure and contents were removed in 1994. Contamination remains above unrestricted levels. AFRPA OU2 ROD site
Site 18	Engine Test Cell	**1**	AFRC	OU1 ROD	Fuel and BTEX	Ongoing discussions with regulators to remove Site 18 from the CERCLA process and manage as a fuels only site, regulatory oversight by RWQCB only. Site is evaluated in this 5-year review.
Site 19	West March Sludge Drying Beds	2	AFRPA	AFPRA OU2 ROD	Sludge	No remedial action required. Contamination remains above unrestricted levels. AFRPA OU2 ROD site.
Site 20	Landfill No. 7, West March	2	AFRPA	AFPRA OU2 ROD	Household waste	Soil and waste was excavated and placed at Site 6. No contamination remains above unrestricted levels at the site. AFRPA OU2 ROD site.
Site 21	Effluent Pond (Cordures Property)	BW/OU4	AFRPA	OU4 RI/FS*	Treated waste water	Site is currently being investigation in the Basewide/OU4 RI.

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 5 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 22	Landfill No. 2, main Base	2	AFRPA	AFPRA OU2 ROD	None	Site could not be found. No evidence of a waste was identified. AFRPA OU2 ROD site.
Site 23	East March Effluent Pond, Nadina and Heacock Street	BW/OU4	AFRPA	AFPRA OU2 ROD	Treated wastewater	No soil contamination was found. No further action recommended. AFRPA OU2 ROD site
Site 24	Landfill No. 1, West March, Incinerator Area	2	AFRPA	AFPRA OU2 ROD	Household waste and incinerator ash	Waste and soil was excavated in 1995 and placed at Site 6. No contamination remains above unrestricted levels at the site. AFRPA OU2 ROD site.
Site 25	Munitions Residue Burial Site, West March	2	AFRPA	AFPRA OU2 ROD	Munitions residue	Nonhazardous waste was removed and placed at Site 6 in 1995. No contamination remains above unrestricted levels. AFRPA OU2 ROD site
Site 26	Water Treatment Sludge, West March	2	AFRPA	AFPRA OU2 ROD	Sludge	Contamination was removed and placed at Site 6. No contamination remains above unrestricted levels. AFRPA OU2 ROD site

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 6 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 27	Building 422 Underground POL Tanks	2	AFRC	AFRC OU2 ROD	Fuels, oil, and solvent	Tanks were removed. An SVE system will be installed in 2004. AFRC OU2 ROD site.
Site 28	Basewide Groundwater Monitoring Wells	2	AFRC	OU1/OU2 RI/FS	Zone monitoring wells	Well network was part of the basewide groundwater monitoring network. No specific site identified. Not discussed further.
Site 29	Fire Protection Training Area No. 1	**1**	AFRC	OU1 ROD	Fuels, oils, and solvents	Identified as no further action in the OU1 ROD. Contamination remains above unrestricted levels. Evaluated in this 5-year review.
Site 30	Construction Rubble Site	2	AFRPA	AFPRA OU2 ROD	Construction rubble	Debris was removed in 1996. Cleanup to unrestricted levels reached. AFRPA OU2 ROD site
Site 31	Building 1211 Solvent Spill TCE Source Area	**1**	AFRC	OU1 ROD	Solvents	A soil and groundwater treatment system installed in 1996. Surface soil contamination remains above unrestricted levels. Site is evaluated in this 5-Year Review.

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 7 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 32	Building Demolition Areas	2	AFRPA	AFRPA OU2 ROD	Assumed to contain construction rubble	Not currently located. Site was removed from the IRP list because the sites were not considered to present a risk for adverse affects on human health or the environment.
Site 33	Panero Aircraft Refueling Facility	3	AFRC	OU3 Decision Document	Fuels and BTEX	Ongoing discussions with regulators to remove Site 18 from the CERCLA process and manage as a fuels only site. Regulatory oversight by RWQCB only. Site is not evaluated in this 5-year review.
Site 34	Pritchard Refueling System	**1**	AFRC	OU1 ROD	Fuels and BTEX	A biovent pilot study was used to clean the soil. Surface soil contamination remains above unrestricted levels. Site is evaluated in this 5-Year Review.
Site 35	15th Headquarters Leaking UST	2	AFRPA	AFRPA OU2 ROD	Fuels	The USTs were removed and bioventing was used to clean the site. Contamination remains above unrestricted levels. AFRPA OU2 ROD site

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 8 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 36	Building 458 Leach Pit	2	AFRC	AFRC OU2 ROD	Solvents	Some contaminated soil removed in 1994. Groundwater and SVE units are in place and operating. AFRC OU2 ROD site.
Site 37	PCB Spill Site at Building 317	2	AFRC	AFRC OU2 ROD	PCBs	Contaminant levels do not represent elevated risk. AFRC OU2 ROD site.
Site 38	PCB Spill Site (former SAC Alert Facility)	**1**	AFRPA	OU1 ROD	PCBs	The contamination was removed and the OU1 RI did not identify additional contamination. Approved for no further action in the OU1 ROD. Site is not evaluated in this 5-Year Review.
Site 39	Base Gas Station, Building 2406, Main Base	2	AFRC	AFRC OU2 ROD	Fuels	Cleanup is complete. AFRC OU2 ROD site.
Site 40	Landfill No. 8, West March	2	AFRPA	AFPRA OU2 ROD	Household waste	Waste was removed in 1996 and placed at Site 6. No contamination remains above unrestricted levels. AFRPA OU2 ROD site.
Site 41	Hawes Radio Relay Facility, Barstow	BW/OU4	AFRPA	OU4 RI/FS*	Fuels and oil	Four USTs were removed in 1995. The structure is going to be removed. AFRPA OU2 ROD site.

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 9 of 11

IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site 42	15th Headquarters Building 3404 PCB Spill Site	2	AFRPA	AFPRA OU2 ROD	PCBs	Removal and disposal of contaminated soil is complete. Contamination remains above unrestricted levels. AFRPA OU2 ROD site.
Site 43	Former Automotive Maintenance Area/Cal Trans UST Site	2	AFRPA	AFRPA OU2 ROD	Fuels and BTEX	Removal and disposal of contaminated soil is complete. Groundwater requires LTM. AFRPA OU2 ROD site.
Site 44	Base Water Tower No. 407	BW/OU4	AFRC	OU4 RI/FS	Mercury	Contaminated soil was removed in 1997. Site is being evaluated in the Basewide/OU4 RI Basewide/OU4 ROD site.
OU 1 Groundwater Plume	OU1 Groundwater Plume	**1**	AFRPA/AFRC	OU1 ROD	Solvents	Long-term groundwater monitoring is ongoing. The site is evaluated in this 5-year review.
Site 2/27 Groundwater Plume	Sites 2/27 Groundwater Plume	2	AFRC	AFRC OU2 ROD	Fuels and solvents	The site has a groundwater treatment system installed. AFRC OU2 ROD site.

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 10 of 11

Non-IRP Site Sites (Continued)

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status
Site L	Former NCO Club Swimming Pool/PCB Site	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	PCBs	Contaminated surface soil has been removed. Subsurface contamination remains at depth. The site has been capped. Long-term monitoring is ongoing. AFRPA OU2 ROD site.
Water Tank – Building 6601	Water Tank	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	Mercury	Contaminated soil has been removed. Site is being investigated in the Basewide/OU4 RI Basewide/OU4 ROD site.
Water Tank Building 3410	Water Tank	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	Mercury	Contaminated soil has been removed. Site is being investigated in the Basewide/OU4 RI Basewide/OU4 ROD site.
March Base Hospital/Dental Clinic	Mercury Characterization	BW/OU4	AFRPA	AFRPA BW/OU4 ROD	Mercury	The site was investigated and no contamination was found. Basewide/OU4 ROD site.

Summary Table 3.1-1. CERCLA Sites at March AFB
Page 11 of 11

IRP Sites/Alphabet Soup Sites	Site Description	OU	AFRPA vs AFRC Site	Supporting References	Contaminants	Actions/Current Status

AFRC = Air Force Reserve Command
AFRPA = Air Force Real Property Agency
BTEX = benzene, toluene, ethylbenzene, xylene
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
ESD = explanation of significant difference
IRP = Installation Restoration Program
LTM = long-term monitoring
NCO = Non-Commissioned Officer
OU = Operable Unit
PAH = polyaromatic hydrocarbon
PCB = polychlorinated biphenyl
POL = petroleum, oil, and lubricants
RI = remedial investigation
ROD = Record of Decision
RWQCB = Regional Water Quality Control Board
SVE = soil vapor extraction
UST = underground storage tank

3.10 OPERABLE UNIT SITES

3.10.1 OU1

Aircraft maintenance, fuel storage operations, fire-training exercises, and base operations have generated a variety of hazardous wastes. Past waste disposal practices have resulted in contamination of soil and groundwater at several areas within OU1. The scope of the OU includes groundwater containing trichloroethylene (TCE) and other compounds over the majority of OU1 sites and off base, groundwater containing primarily perchloroethylene (PCE) at Site 4, groundwater containing petroleum fuel products at Site 18, and sources of these contaminants in soils above the groundwater that have caused the plumes. Investigations identified a possible source for TCE contamination at Site 31, although other sites within the OU1 groundwater plume area may be contributing TCE to the groundwater plume. The scope of the OU also includes soils containing polyaromatic hydrocarbons (PAHs) at Sites 4, 10, 15, 31, and 34. The latest investigation at OU1 was performed from November 1991 to November 1993; the RI/FS report was issued in 1994. The overall objectives of the investigation were to collect additional data to confirm contaminant source areas, better define contamination boundaries, assess potential risks to human health or the environment, and evaluate the feasibility of alternative remedies at OU1 sites. A final OU1 ROD identifying the selected remedies for OU1 was issued in 1995 and signed in 1996.

OU1 consists of 14 different sites with the potential for soil and groundwater contamination and a plume of contaminated groundwater. The sites include IRP Sites 4, 5, 7, 9, 10, 13, 14, 15, 16, 18, 29, 31, 34, and 38. OU1 also includes the off-base plume area along the eastern boundary of the Base. The OU1 sites originally included Sites 21 and 23. It was determined that Site 21 will be addressed in the Basewide RI/FS and Site 23 was reassigned to OU2. Eight of the sites have no further action planned by the Air Force based on the results of a risk assessment performed as part of the OU1 Remedial Investigation. These sites include IRP Sites 5, 7, 9, 13, 14, 16, 29, and 38. The U.S. EPA and the State of California concurred with the Air Force on the designation of no further action. The remaining six sites require cleanup of soil, groundwater, or both. Complete site descriptions, including site history and waste types, are provided in Chapter 4.0 of this report. Table 3.1-1 summarizes the site descriptions and whether the site is under AFRPA or AFRC control.

3.10.2 OU2

Soil and groundwater contamination within OU2 has resulted from several decades of Base operations. The primary contaminants identified include aromatic hydrocarbons, chlorinated solvents, fuels, polychlorinated biphenyls (PCBs), and PAHs. The PAH and PCB contamination appears to be restricted to surface and near-surface soils, whereas fuel hydrocarbons and solvents tend to be the predominant contaminants in subsurface soils and groundwater. Cleanup methods have been identified for sites identified as presenting a potential threat to human health and the environment. Preferred cleanup methods have been proposed for each site and identified groundwater contamination.

An RI/FS was performed at OU2 sites between 1992 and 1997. The RI objectives were to collect additional data to confirm contaminant source areas, delineate contaminant boundaries, assess potential risks to human health and the environment, and evaluate remedial alternatives for soil and groundwater cleanup.

The 25 identified IRP sites comprising OU2 are: Sites 1, 2, 3, 6, 8, 11, 12, 17, 19, 20, 22, 23, 24, 25, 26, 27, 28, 30, 32, 35, 36, 37, 39, 40, and 42. The Hawes site near Barstow, California (Site 41), was

originally included in OU2. It was subsequently removed from OU2 and was investigated under the Basewide RI/FS. Sites 1, 2, 8, 11, 27, 36, 37, and 39 are situated within the cantonment area on land to be retained by the AFRC. The remaining sites are on property to be transferred to civilian agencies.

The RI/FS has investigated to some extent all but two of the 25 sites. Sites 28 and 32 were excluded from the RI/FS as separate sites because portions of these sites were evaluated as part of other sites or source areas. As described in the FFA, Site 28 is a "sampling site only" consisting of a series of groundwater monitoring wells dispersed across the Main Base. Most of these wells (such as Sites 2, 8, 27, and 36) lie within the boundaries of established sites and have been investigated as part of these sites and/or under the Basewide Groundwater Monitoring Program (BGMP). Site 32 is referred to in the FFA as a "building demolition area" consisting of the debris of buildings and structures demolished at the Base; no other site descriptions, including locations and boundaries, are given. The consensus is that Site 32 consists of debris that may have been disposed at other sites, including Sites 17 and 30.

Four of the 25 sites investigated under the RI/FS (Sites 22, 23, 30, and 37) were determined not to require remedial action. This was based upon either no contamination found (Sites 22 and 23), or the risks from detected contaminants were within levels considered to be protective of human health and the environment (Sites 30 and 37).

The Draft Final OU2 ROD was submitted November 1998. The Air Force elected in 1999 to separate AFRPA and AFRC sites to facilitate transfer of AFRPA property, necessitating the preparation of two separate OU2 RODs. Table 3.1-2 presents the sites and their controlling authorities. The AFRPA Draft Final ROD was submitted in October 2000. The AFRPA Draft Final ROD was subsequently re-submitted as a Draft again in December 2001 and as a Draft Final in February 2003. The AFRC Draft ROD was also submitted for regulatory review in December 2001 and the AFRC Draft Final ROD was submitted in September 2003. At the time of completion of this 5-Year Review, both the AFRPA and AFRC RODs are still in regulatory review.

The following paragraphs summarize the ROD determinations that have been made in the respective draft final ROD documents.

3.10.2.1 AFRPA Sites.

Primarily situated on West March, IRP Sites 3, 6, 12, 17, 19, 20, 22, 23, 24, 25, 30, 35, 40, and 42 are in areas that have been declared excess property and will be transferred from Air Force control.

Interim removal actions have been performed at the following 11 sites: 3, 6, 12, 17, 20, 24, 25, 26, 35, 40, and 42. Removal actions have achieved cleanup levels allowing for the unrestricted use of the following eight sites: 3, 20, 24, 25, 26, 35, 40, and 42.

Residual contamination remains at the following sites: 12 (groundwater and surface and subsurface soils), 17 (subsurface soils), and 19 (surface and near surface soils). Institutional controls (ICs) are proposed for these sites and for Site 6 (engineered waste cell location).

The ICs include groundwater and/or land restrictions and land use covenants. Site 6 monitoring and maintenance of the associated waste cell structures will be required, in addition to periodic groundwater monitoring. Groundwater monitoring has also been proposed at Site 12 to observe changes in contaminant concentrations.

3.10.2.2 AFRC Sites.

The eight March AFRC IRP Sites are as follows: 1, 2, 8, 11, 27, 36, 37, and 39. Interim removal actions have been performed for all of these sites except Site 11. Removal actions at Sites 37 and 39 have allowed for unrestricted use. Residual contamination remaining in the surface soils at Sites 1 and 11 has resulted in proposed ICs in the form of land use restrictions for these sites. Active additional cleanup is required for Sites 2, 8, 27, and 36.

Table 3.1-2. Operable Unit 2 Site Authority

Site Number	Description	Controlling Agency
1	Aircraft Isolation Area	Air Force Reserve Command
2	Waste Oil Tanks/Solvent Pits	Air Force Reserve Command
3	Landfill No. 5	Air Force Real Property Agency
6	Landfill No. 4	Air Force Real Property Agency
8	Flightline Shop Zone	Air Force Reserve Command
11	Bulk Fuel Storage Area	Air Force Reserve Command
12	Civil Engineering Yard	Air Force Real Property Agency
17	Swimming Pool Fill	Air Force Real Property Agency
19	West March Sludge Drying Beds	Air Force Real Property Agency
20	Landfill No. 7	Air Force Real Property Agency
22	Landfill No. 2	Air Force Real Property Agency
23	East March Effluent Pond	Air Force Real Property Agency
24	Landfill No. 1	Air Force Real Property Agency
25	Munitions Residue Burial Site	Air Force Real Property Agency
26	Water Treatment Sludge	Air Force Real Property Agency
27	Building 422 Underground POL Tanks	Air Force Reserve Command
28[1]	Main Base Monitoring Well Network	Air Force Reserve Command
30	Construction Rubble Burial Site	Air Force Real Property Agency
32[2]	Construction Debris Areas	Air Force Real Property Agency
35	15th Air Force Headquarters Leaking Underground Storage Tanks	Air Force Real Property Agency
36	Building 458 Leach Pit	Air Force Reserve Command
37	PCB Spill at Building 317	Air Force Reserve Command
39	Abandoned Gas Station	Air Force Reserve Command
40	Landfill No. 8	Air Force Real Property Agency
41[3]	Hawes Site	Air Force Real Property Agency
42	Building 3404 Transformers	Air Force Real Property Agency

Notes:
[1] Investigated by potential source areas such as Sites 2 and 8. Required remedial action for these sources is provided under the site containing the source.
[2] No additional construction debris disposal locations could be identified for RI. Any additional sites will be identified and assessed as part of the Resource Conservation and Recovery Act (RCRA) Facilities Assessment program.
[3] Site 41 will be discussed in a separate decision document.
PCB = polychlorinated biphenyl
POL = petroleum, oil, and lubricants

A variety of applicable cleanup methods have been evaluated for each site requiring remediation. A number of considerations, including cost, were assessed in the identification of a preferred alternative for each site. Table 3.1-1 summarizes the site descriptions, including site history and waste types for sites within OU2.

3.10.3 OU3

OU3, one of the three operable units at March AFB/ARB, is the site of the former Panero aviation fueling facility, which was installed in 1952 and dismantled in 1991. Site 33, also known as the Panero Site, is the only site within OU3. The entire OU encompasses approximately 45 acres within an area at March ARB that will be retained by the Base after other portions of the Base are released to the public. The AFRC will continue to operate in OU3 for the indefinite future.

Subsurface contamination was detected at the Panero Site in 1987 during installation of a cathodic protection system. The source of the fuel contamination is considered to be the former underground storage tank farm and its related piping system. OU3 site investigations began in September 1989 with subsurface investigations, including a soil gas survey, soil borings, and groundwater samples indicating extensive contamination at the site. The presence of jet propulsion fuel (JP-4) free product was found on the water table beneath the Panero facility. The nature and the extent of contamination at OU3 were further characterized during a CERCLA RI that was conducted between September 1992 and April 1993. The OU3 FS report identified benzene, toluene, ethylbenzene, xylene (BTEX) as unsaturated zone soil contaminants of concern (COCs). Groundwater COCs include BTEX, PCE, TCE, and chloroform. The Draft Final ROD for OU3 was submitted in April 1995. The following summarizes the ROD determinations.

Previous responses at the site include (a) removing thirty-four 50,000-gallon underground fuel storage tanks; removing other tanks; removing or grouting in place all associated piping; removing, thermally treating, and replacing approximately 15,000 tons of contaminated soil; and (b) recovering free product. Free product skimming operations began in July 1990. An expanded free product recovery system began operating in July 1994 as a CERCLA Non-Time Critical Removal Action.

ICs, including fencing and site use restrictions of groundwater use in affected areas are proposed at the site. Quarterly groundwater monitoring of OU3 wells to measure concentrations of contaminants of concern in OU3 groundwater is to continue. Groundwater and subsurface soil remediation are required at the site.

A variety of applicable cleanup methods have been evaluated for Site 33. A number of considerations, including cost, were assessed in the identification of a preferred alternative for the site. Table 3.1-1 summarizes the site characteristics for Site 33. The Air Force and regulatory agencies are currently in discussions to remove Site 33 from the CERCLA process and manage the site as a fuel release site. This site would be handled as a Fuels Only Corrective Measures Program with regulatory oversight by only the Regional Water Quality Control Board, Santa Ana Region.

3.10.4 Basewide OU

Due to conflicts between FFA schedules and ongoing site investigations, some sites were removed from their respective OU RODs to create a fourth OU, or Basewide OU. The Basewide/OU4 OU was established in the early 1990s and also includes some sites that were never assigned to previous OU RODs.

The Basewide/OU4 sites included five IRP and four non-IRP sites; IRP Sites 21, 41, 42 (including Building 3404), 43, and 44; non-IRP sites include Building 3410 (Water Tower), Building 6601 (Water Tank), the Base Hospital and Dental Clinic Mercury Investigation, and Site L.

Appendix A presents site inspection forms completed during this 5-year review.
Appendix B provides interview forms.
Appendix C provides a list of reviewed O&M documents.
Appendix D presents a Glossary of Terms.
Appendix E presents the Draft 5-Year Review Comment/Response Matrix.

4.0 OPERABLE UNIT 1 SITES

This section presents the procedures and results of the 5-year review for the OU1 sites.

4.1 INSTALLATION RESTORATION PROGRAM SITE 4 – LANDFILL NO. 6

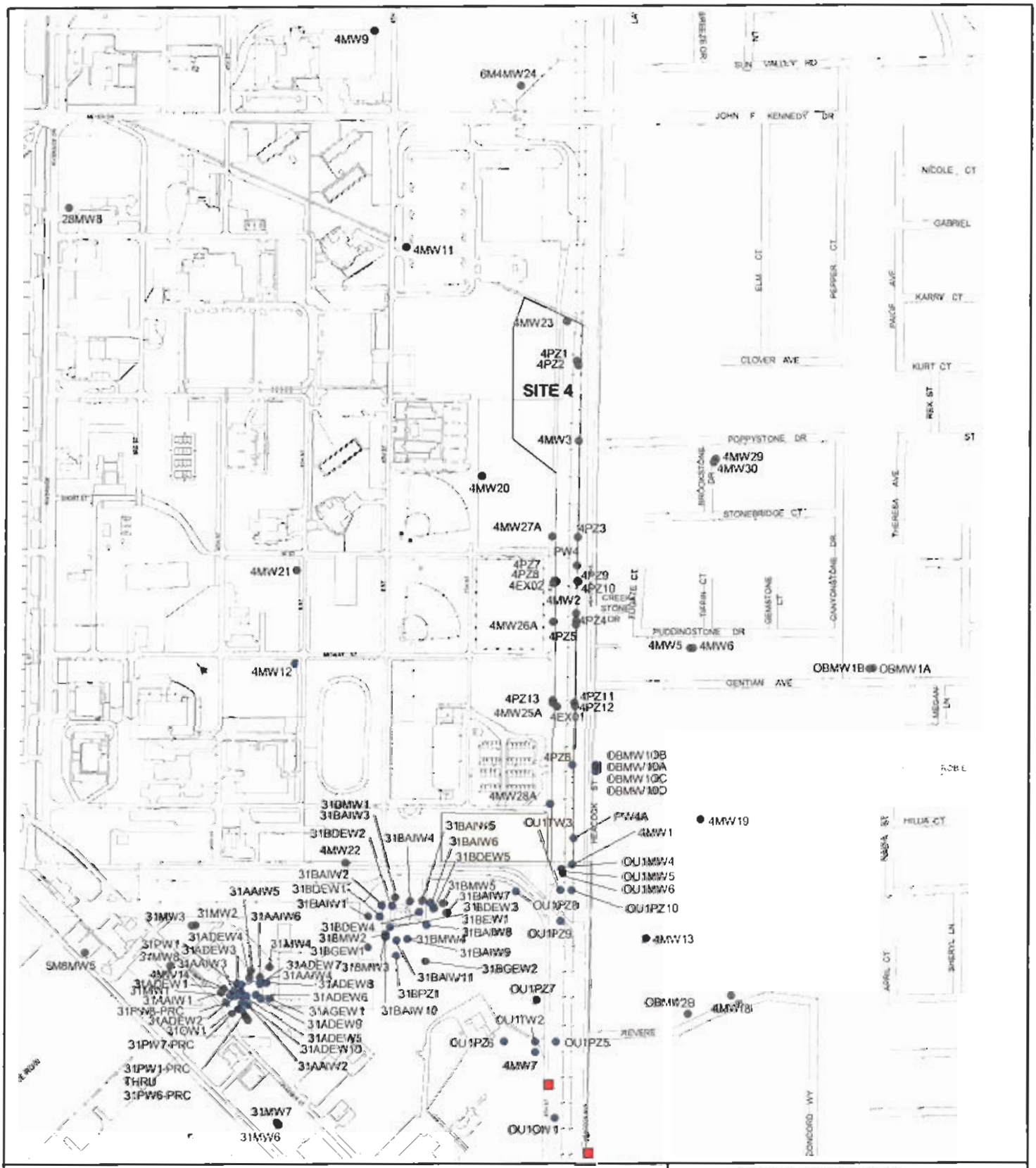
IRP Site 4 (Site 4) covers approximately 8.5 acres and is situated along the eastern boundary of the former base (Figure 4.1-1). A section of the Heacock storm drain runs southwardly adjacent to the site's eastern boundary. Heacock Street is approximately 250 feet from the eastern boundary of the site. A residential housing area is situated across Heacock Street along the northern two thirds of the site. Grassy fields and abandoned buildings, formerly part of the base property, are to the west of the site.

The Site 4 landfill was in operation from 1955 to 1969. The RI/FS performed at Site 4 noted that the landfill is up to 25 feet deep and contains primarily sanitary waste, construction rubble, and debris. Small amounts of medical wastes and empty fuel containers are also present. An estimated 150,000 cubic yards of waste were deposited at the landfill during its operation.

Soil samples from boreholes, test pits, and surface locations as well as soil gas and groundwater samples, were collected from Site 4. Based on the results of the sampling, it was noted that beryllium and several PAHs were present in the surface soil (0 - 2 feet below ground surface [bgs]) at concentrations that exceed U.S. EPA Region IX Preliminary Remediation Goals (PRGs). The analytical data also indicated the presence of very low concentrations of chlorinated solvents in the subsurface soil and soil gas beneath the site.

In the Site 4 groundwater plume, six organic contaminants were detected at concentrations exceeding applicable cleanup standards. A groundwater monitoring well situated in the southeast corner of the site (4MW1) has consistently contained elevated concentrations of PCE and TCE. Both PCE and TCE are found in solvents that were used to clean and degrease military equipment.

Vinyl chloride has also been detected in Site 4 groundwater. Vinyl chloride is a breakdown product of PCE and TCE. Other groundwater contaminants detected in excess of the cleanup standards include bis(2-ethylhexyl)phthalate, cis-1,2-dichloroethene, and methylene chloride. As a result of the rising groundwater throughout the base, a comparison of water level measurements made in November 2001 to depth of waste reported in the borehole logs during the RI/FS suggest that the waste may now be in contact with the groundwater, particularly along the northern portion of the Site 4 landfill. Water level measurements collected as part of the basewide groundwater monitoring program in November 2001 show that the water table is at approximately 1,501 feet above mean sea level (MSL) near the northern limit of the landfill (4PZ-01 and 4PZ-02) and is at approximately 1,479 feet MSL near the southern limit of the landfill (4PZ-11 and 4PZ-12). A review of borehole logs made during the RI/FS suggests that waste is about 1,491 feet MSL and ranges from 1,488 feet MSL to 1,495 feet MSL across the site, thus indicating that there is a high probability that the waste is in contact with the groundwater, especially at the northern portion of the landfill. Groundwater extraction wells have been installed along the western perimeter of the landfill to control the off-site migration of groundwater contaminants under Site 4. Modeling of the static water level suggests that any contamination originating from Site 4 is being contained by groundwater extraction wells 4-EX01 and 4-EX02 (see Figure 4.1-1). If contaminant loading is occurring due to waste in contact with the groundwater, the contaminants are likely being contained as a result of groundwater extraction.



DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 4
Operable Unit 1 5-Year Review
March Air Force Base

EARTH TECH
A tyco INTERNATIONAL LTD COMPANY

Project No. 39863

Date: 09-03

Figure 4.1-1

Risk assessments were conducted for Site 4 following U.S. EPA Region IX and California EPA guidance. The risk assessments produced estimates of the potential risks to public health that could result from ingesting the contaminants detected at Site 4. Beryllium did not require remediation based on the results of the surface soil risk assessment. The PAH contamination, however, was found to present a potential human health risk and, therefore, required remediation. The groundwater contamination was also found to present a potential risk to human health and required remediation.

Site 4 remains Air Force property and it will remain Air Force property until the Operating Properly and Successfully (OPS) determination/covenant is made. Site 4 will not be transferred by deed until OPS is complete. Currently, the Site 4 property is enclosed by a security fence and is not being used for any residential, commercial, or municipal activities. There are no current users of groundwater from the site. In addition, the landfill was capped in accordance with the regulations contained in Title 23, Chapter 15, of the California Code of Regulations (CCR). Since 1994, when the landfill was capped, regulations dealing with landfills and how they are closed have been consolidated into CCR Title 27, Division 2, Solid Waste.

4.1.1 Remedial Actions

This section describes the remedy selection, implementation, system operations, and cleanup progress for Site 4.

4.1.1.1 Remedy Selection.

The remedial action objectives as stated in the OU1 ROD are to:

- Prevent ingestion of or direct contact with contaminated groundwater and soils
- Eliminate contaminant loading to the groundwater
- Prevent contaminants from migrating to off-base water supplies
- Pump and treat contaminated groundwater and discharge treated water.

The remedial actions selected to achieve theses objectives are as follows:

- Obtain closure of the landfill in accordance with California regulations (Title 23, Chapter 15, Article 8). This included installation of a cap over the landfill, protection of the cap from erosion, long-term maintenance of the cap, and groundwater monitoring.

- Secure the site by enclosing it in fencing that will limit access except for monitoring and maintenance activities.

- Implement groundwater extraction and treatment.

- Implement ICs through deed restrictions to prohibit the use of site groundwater, until groundwater cleanup standards have been achieved. Deed restrictions will be implemented upon transfer of land ownership.

The plume will be considered remediated when the groundwater meets the specified cleanup levels. The cleanup levels, as they appeared in the OU1 ROD, are presented in Table 4.1-1. The cleanup levels are based on either Federal or State Maximum Contaminant Levels (MCLs) for drinking water, depending on which one is more stringent. The table also presents the maximum observed contaminant levels found at the site during the RI/FS activities.

Table 4.1-1. Site 4 Groundwater Cleanup Standards*

Contaminant	Maximum Concentration (μg/l) (RI/FS 1994)	Cleanup Standard (State or Federal MCL) (μg/l)
Methylene Chloride	9	5 (federal)[1]
Perchloroethylene (PCE)	260	5 (state and federal)[1,2]
Trichloroethylene (TCE)	85	5 (state and federal)[1,2]
Vinyl Chloride	8	0.5 (state)[2]
Bis(2-ethylhexyl)phthalate	290	4 (state)[2]
Cis-1,2-Dichloroethene	21	6 (state)[2]

Note: * Values presented in the Final OU1 ROD, 1996.
[1] 40 Code of Federal Regulations (CFR) 141.61 Maximum Contaminant Levels (MCLs) for Organic Contaminants.
[2] Title 22, California Code of Regulations (CCR), Division 4, Chapter 15, Article 5.5, Section 64444.5, MCLs for Organic Chemicals.
μg/l = micrograms per liter
MCLs = Maximum Contaminant Level
RI/FS = remedial investigation/feasibility study

4.1.1.2 Remedy Implementation.

Groundwater

An operational groundwater extraction and treatment system (GETS) is situated along the eastern base boundary. The system was installed in 1992 as an interim remedy to prevent the further migration of TCE and PCE plumes off site. In the OU1 ROD, the preferred remedy for the Site 4/OU1 groundwater plume was to utilize the existing GETS system, supplemented with additional extraction wells and granular-activated carbon (GAC) treatment units as necessary, to stop the migration of the on-base plume off base and to treat the contaminated groundwater in the existing plume. Contaminated groundwater extracted from Site 4 would be combined for treatment with groundwater extracted from the OU1 Plume. Treated groundwater would be discharged to either the base wastewater treatment plant, the Heacock Storm Drain downgradient of the designated wetlands, or reinjected into the aquifer. Implementation of a groundwater extraction and treatment program would provide for capture of on-base contaminated groundwater and prevent further escape of on-base contaminated groundwater off base (USAF, 1995). The GETS system was expanded in 1995 with the approval of the regulators and the name was changed from GETS to the expanded groundwater extraction and treatment system (EGETS). The EGETS system currently consists of 17 extraction wells and 5 injection wells designed and placed to interdict the OU1 plume at the former base boundary. The extraction well network at Site 4 includes two extraction wells at the southern end of Site 4 (4MW1 and OU1TW3) and two extraction wells along the west-central boundary of Site 4 (4EX01 and 4EX02). The purpose of the extraction wells are to capture contaminants emanating from the landfill and to hydraulically control the contaminant plume that is present along this portion of the former base boundary.

EGETS performance was evaluated for OPS determinations using September 1998, January 1999, and December 1999 data. These OPS determinations were intended to estimate the hydraulic capture zone of the EGETS system using actual groundwater levels measured during EGETS operations. The OPS determinations also intended to ascertain if the field-measured EGETS hydraulic capture zone fully enclosed the on-base volatile organic compound (VOC) plume (Tetra Tech, Inc., 2000). The analysis concluded that a 500-foot-long area near OU1MW12 and a 200-foot-long area at the north boundary of

the injection system were found to be uncontained along the base boundary. In addition, an ambiguous area extending 500 to 700 feet north of 4MW1 may also be uncontained. Rates at extraction well OU1MW12 and all EGETS injection wells were increased in October 1998 to address these concerns, and a monitoring well cluster (OBMW10A-D) was installed in the winter of 1998-1999 to fill the data gap north of the EGETS well 4MW1. The January 1999 water levels indicated containment along the entire EGETS, with the exception of the unmonitored area north of 4MW1; therefore, the increased extraction and injection rates appeared to have resulted in full containment at OU1MW12 and the north end of the injection system (Tetra Tech, Inc., 2000).

Analytical results from samples collected from OBMW10A through D showed contaminants were present in these monitoring wells north of 4MW1 in February 1999. As a result, four additional monitoring wells (4MW25A through 4MW28A) and six piezometers (4PZ01 through 4PZ06) were installed during 1999 to delineate the plume boundaries along Site 4 north of 4MW1. Data from these wells indicated that an uncontained area of the on-base plume along the east side of the Site 4 landfill north of EGETS well 4MW1 was present. Based on the January 1999 rates and water levels, the EGETS appeared to have contained all other areas of the on-base plume (Tetra Tech, Inc., 2000).

Two new extraction wells (4EX01 and 4EX02) and associated monitoring wells were installed along the western boundary of the Site 4 landfill in July 2000 with the goal of achieving full plume containment. Installation and operation of 4EX01 and 4EX02, with combined operation of 4MW1 and OU1TW3 were designed to capture and control contamination that was present beneath the central and southern portion of Site 4. These wells began full-scale operation in late 2001. Operational data indicate that extracted groundwater contained up to 38 micrograms per liter (µg/l) of PCE and up to 36 µg/l of cis,1-2, dichloroethene (DCE). However, extraction wells 4EX01 and 4EX02 have not operated long enough to assess their impact on contaminant concentrations beneath the landfill (MWH, 2003).

In 2000, Tetra Tech performed another capture zone analysis using MODFLOW and MODPATH. Results of this evaluation predicted complete containment of the on-base plume between the north end of Site 4 and the south end of the EGETS (OU1MW12). An isolated pocket of VOC contamination at monitoring well OU1MW3 was not captured by the EGETS; however, this area is cut off from the on-base plume by a bedrock high, and capture is not required by EGETS (Tetra Tech, 2001).

The modified EGETS resumed operations in November 2001. A final OPS determination for the EGETS capture zone was conducted, and the results were submitted to the regulators in January 2003 for their review (MWH, 2003).

Landfill

USACE issued a delivery order in 1994 for stabilization and closure of March AFB Landfill 6 (Site 4). Site 4 closure efforts began in June 1994 with the construction of a test pad. The test pad was used to determine if the proposed cap design would meet CCR landfill closure criteria. When testing indicated that the proposed cap would meet the specified permeability of $1x10^{-6}$ centimeters per second (cm/s) or less for the final cover barrier layer, construction of the cap began.

Construction of the cap was considered in two increments. One increment involved placing a cap over the western stream bank of the Heacock storm drain, where the area is sloped and more subject to erosion. The other increment involved placing a cap over the rest of the site. The cap over the channel bank consists of (from bottom to top): a compacted subgrade layer, a 1-foot compacted foundation layer, an 18-inch clay barrier layer, a 6-inch sand filter layer, a 6-inch gravel bedding layer, a non-woven

geotextile, and 2 to 4 feet of rip-rap. Concrete was placed over the rip-rap in some areas to prevent erosion. The cap over the rest of the landfill consists of (from bottom to top): a 1-foot undisturbed native cover layer, a 6-inch compacted native foundation layer, a 6-inch screened native foundation layer, a barrier layer, a 9-inch screened cover layer, and a 9-inch vegetative layer. The area was seeded to prevent erosion after all of the layers were in place in November 1994. In addition to the cap, a flood channel was cut into the existing topography along the western boundary of the site to provide a precipitation runoff flow path around the landfill. Other features of the closure efforts included emplacement of fencing, sub-drain installation, road construction, and well installation.

4.1.1.3 System Operations/Operations and Maintenance.

In 1994, regulatory closure was obtained for the Site 4 landfill. The site is currently considered a nonhazardous site for O&M activities. Black and Veatch, Inc., were contracted by the base to perform O&M activities at the Site 4 landfill cap. A list of all O&M documents reviewed during this 5-year review is included as Appendix C.

System operations were conducted in accordance with the approved O&M plan (Black and Veatch, July 1999). System operations, as they were described in the O&M plan, are as follows.

- Security fencing is visually inspected on a quarterly basis or after major storm events. Repairs are performed as needed.

- Annual surveying of the landfill is performed by a licensed land surveyor in order to monitor settlement and determine if areas of the landfill top deck drain at the required slope.

- Five settlement monuments are inspected quarterly and after major storm events to ensure that they are intact and no areas have been disturbed. Repairs are performed as needed.

- The rip-rap protective layer is visually inspected quarterly and after major storm events to ensure that no erosion is taking place and that no areas have been disturbed. Repairs are performed as needed.

- The clean out risers, drainage ditches, and the overflow channel are visually inspected quarterly and after major storm events to ensure they are in good working condition, free of any debris, and that no areas have been disturbed. Repairs are performed as needed.

- Visual inspections of the vegetative cover are performed quarterly to note areas of erosion, subsidence, or other damage. Areas of sparse or dead grass are to be remulched and reseeded.

- The membrane liner is to be inspected quarterly and after major storm events to ensure that no erosion is taking place and that no areas have been disturbed. Repairs are performed as needed.

- Surface runoff water is monitored in order to note any discharging of contaminants.

- Groundwater monitoring at point-of-compliance (POC) wells and background monitoring wells occurs on a semiannual basis as specified in the Closure Post Closure Plan and in accordance with CCR Title 27.

Currently, groundwater is being removed from four wells at Site 4 (4MW1, OU1TW3, 4EX01, and 4EX02). These wells are tied into the EGETS where groundwater from Site 4 is combined with OU1 groundwater for treatment. O&M of these extraction wells includes monitoring of pump performance, maintenance and

overhaul of the well pumps, and routine groundwater sampling and monitoring in accordance with the OU1 Treatment System O&M plan.

In 2000, the AFRC approved a groundwater-monitoring plan for the OU1 plume, which includes Site 4. Certain Site 4 wells that have been designated to be sampled as part of the landfill closure efforts serve as POC and background monitoring points in adherence to CCR Title 27. For the most part groundwater monitoring at the site is part of a basewide corrective action program mandated by the Regional Water Quality Control Board, Santa Ana Region. Future system operations will involve maintenance and sampling of the extraction wells, which will eventually become part of the Site 4 remedial actions.

The five downgradient Site 4 POC wells have been sampled semiannually (June/July and November/December) for VOCs and general minerals. The one upgradient well (6M4MW24) is sampled on an annual basis. VOCs have been detected in both the upgradient and downgradient wells at Site 4. Other phthalates and semivolatile organic compounds (SVOCs) were not detected during the first four quarters of sampling and, therefore, analysis for SVOCs was discontinued. At least six quarters of metals data had been collected at Site 4 before metals analyses were also discontinued. Since installation of groundwater extraction wells along the western perimeter of the site, the Air Force considers the landfill to be in active remediation rather than passive landfill compliance monitoring and as such, the groundwater monitoring program will change to reflect this. The Air Force is currently reviewing the groundwater monitoring program for Site 4.

In response to concerns from the California EPA, Department of Toxic Substances Control (DTSC), a landfill gas (LFG) survey was conducted in October 2002 at IRP Site 4. The primary health and safety concern is the subsurface migration of methane into residential areas east of Site 4 and the accumulation of methane gas within subsurface structures at sufficient concentrations to present a hazard to human health and the environment. As part of the LFG survey, ten LFG sampling probes were installed within and adjacent to the Site 4 landfill. Five LFG probes were installed along the eastern perimeter of the landfill to determine if methane is being produced within Site 4 itself. Three LFG probes were installed east of the landfill and east of the Heacock Storm Drain to determine if methane is present within soil east of the landfill boundary and potentially migrating toward homes east of the landfill. Two probes were installed along the western perimeter of the landfill to determine if methane is present in subsurface soil west of the landfill. All LFG probes were installed with screened intervals at approximately 9.5 to 10 feet bgs. These probes correspond to the approximate center of the landfill waste.

Results from the initial landfill gas survey conducted in October 2002 showed that methane gas is present in all probes installed within the landfill itself, with methane concentrations ranging from 16.2 to 45.7 percent by volume, with the highest concentrations being present in the northern half of the landfill. LFG samples collected around the perimeter of the landfill did not contain concentrations of methane greater than 5 percent by volume. Additional LFG probes were installed adjacent to the Heacock Storm Drain to monitor LFG near the bottom of the waste. The deeper LFG probes were set approximately 1 foot above the first encountered groundwater. All probes will be sampled on a quarterly basis to determine variations in LFG concentrations over time.

4.1.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review on all sites at March AFB/ARB.

4.1.2 Site 4 5-Year Review Process.

The March AFB/ARB 5-year review was directed by Mr. Michael Zabaneh, AFBCA/DD March Regional Operating Location (ROL). The following team members performed the review:

- Mr. Manish Joshi, Earth Tech
- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The 5-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a site inspection, where warranted. The public was informed regarding the review during the Restoration Advisory Board (RAB) meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.1.3 Site 4 5-Year Review Findings

This section describes findings of the 5-year review for Site 4.

4.1.3.1 Interviews.

The following individual was contacted by Earth Tech as part of the 5-year review process:

- Mr. Bill Lever, Black and Veatch, Inc. (telephone interview on May 5, 2000).

Mr. Lever stated that he had visited the site on May 4, 2000. He said the cap was in good shape, the fence was secured, and there were no signs of trespassing.

4.1.3.2 Site Inspection.

Ms. Pearson and Mr. Tucker performed a site visit on August 23, 2000. No activities were being performed at the site. Ms. Pearson and Mr. Tucker walked through the site and did not note any signs of cap breaching, erosion, settlement, bulges, etc. The drainage ditch vegetation on the north and east perimeters appeared healthy. There was no evidence of vandalism, and the monitoring wells at and near the site were locked and in good condition.

4.1.3.3 Risk Information Review.

The following chemical-specific standards were identified as ARARs in the OU1 ROD and reviewed for changes that could affect protectiveness:

- U.S. EPA Region IX PRGs

- MCLs for Primary Drinking Water (Title 22, CCR, Division 4, Chapter 15, Article 5.5, Section 64444.5)

- National Primary Drinking Water Regulations (40 CFR 141.61 MCLs for Organic Contaminants).

Concentrations of contaminants detected in the surface soil at Site 4 were compared to U.S. EPA Region IX Residential PRGs (December 1991) in order to determine potential present risks. The PRGs have changed since the OU1 ROD was signed. The new PRGs (October 2002) are slightly less stringent, as shown in Table 4.1-2; therefore, these changes do not affect protectiveness.

Table 4.1-2. Site 4 Changes in PRGs*

Contaminant	Media	Previous Residential PRG (mg/kg) (December 1991)	Current Residential PRG (mg/kg) (October 2002)
Benzo(a)anthracene	Soil	0.61	0.62
Benzo(a)pyrene	Soil	0.061	0.062
Benzo(b)fluoranthene	Soil	0.61	0.62
Benzo(g,h,i)perylene	Soil	19[1]	56.0[2]
Chrysene	Soil	6.1[3]	62.0
Dibenz(a,h)anthracene	Soil	0.061	0.062
Indeno(1,2,3-c,d)pyrene	Soil	0.61	0.62
Beryllium	Soil	0.14	150.0

Notes: * Values taken from OU1 ROD, 1996.
[1] A PRG was not available for this PAH. The PRG for anthracene (December 1991), which was the most conservative PRG for noncarcinogenic PAHs, was used as a surrogate.
[2] A PRG was not available for this PAH. The PRG for naphthalene (October 2002), which is now the most conservative PRG for noncarcinogenic PAHs, was used as a surrogate.
[3] The California EPA PRG (December 1991) was used for this chemical because it was more restrictive than the U.S. EPA Region IX PRG.
mg/kg = milligrams per kilogram
PRG = Preliminary Remediation Goal

Although there are no current users of groundwater in the immediate vicinity of March AFB/ARB, the State of California considers groundwater beneath the base to be a potential source of drinking water. Therefore, federal and state MCLs for drinking water were used to develop groundwater cleanup standards for Site 4. The federal MCLs are established in 40 CFR 141.61(a) and the California MCLs are established in Title 22 CCR 64444.5. Where the federal and state MCLs for a contaminant are not the same, the more stringent of the two is used. In comparing the MCLs that appear in the OU1 ROD to the current MCLs, it was noted that none of the cleanup standards has changed (see Table 4.1-1).

There have been no changes in location-specific or action-specific ARARs since the OU1 ROD was signed that affect the requirements for this site. Regulations dealing with landfill closure requirements have changed from CCR Title 23 to CCR Title 27. Actual physical requirements have not changed.

4.1.3.4 Data Review.

A review of the 1995 closure report indicates that the landfill cap has met the remedial action objective of preventing direct contact or ingestion of contaminated soils. The cap was constructed to adhere to all of the applicable CCR Title 23, Division 3, Chapter 15 landfill closure regulations. Compaction and permeability tests performed on the cap indicated that the cap meets specifications necessary to prevent precipitation from leaching through the landfill and causing contaminant loading to the groundwater.

Currently the cleanup of the Site 4 groundwater plume is limited to the extraction and treatment of groundwater from four wells. Extraction wells OU1TW3 and 4MW1 are situated at the southern end of the site, while 4EX01 and 4EX02 are situated on the western edge of the Site 4 landfill. These wells were installed as part of the GETS and the EGETS to interdict migration of contamination off base. Wells OU1TW3 and 4MW1 have shown decreases in concentrations of PCE and TCE over successive years.

In 1991, the first year of extraction from 4MW1, PCE and TCE were detected at concentrations as high as 260 and 40 μg/l, respectively. Extraction from OU1TW3 began in 1995, and PCE and TCE were detected at concentrations as high as 42 and 10 μg/l, respectively. Since then there has been a general decreasing trend observed in these extraction wells. For example, PCE and TCE concentrations in July 1999 were detected at 33 and 7.1 μg/l in 4MW1, respectively, and at 15 and 5.3 μg/l, respectively, in OU1TW3. These concentrations, however, are still above the cleanup levels specified in the OU1 ROD. Table 4.1-3 lists chemicals of potential concern (COPCs) that were identified in the OU1 ROD for Site 4 groundwater as well as the latest maximum concentrations identified during routine groundwater monitoring conducted on a semiannual and annual basis. The data suggest that contaminant levels have generally decreased since closure of the Site 4 landfill; although several constituents are above the regulated MCLs. Seven groundwater monitoring wells are sampled to monitor landfill post-closure compliance with CFR, Title 40, part 258 (40 CFR 248) and CCR Title 27, Subchapter 3, Article 1 (27 CCR) (wells 4-MW11, 4-MW19, 4-MW20, 4-MW21, 4-MW22, and 4-MW6 and the upgradient/background well 4-MW24). Samples are analyzed for VOCs and general minerals (TDS, chloride, nitrate, sulfate, and alkalinity). Statistical comparisons between downgradient and background wells were made in accordance with U.S. EPA guidance. Based on the statistical analysis, the Site 4 landfill is not leaking (MWH, 2003). The 2001-2002 Annual Groundwater Monitoring Report (MWH 2003) indicates that five groundwater monitoring wells around Site 4 show decreasing trends in PCE concentrations over time (4-MW11, 4-MW19, 4-MW21, 4-MW7, and 4-MW1). Two wells show decreasing TCE trends over time (4-MW11 and 4-MW1). Two wells show decreasing trends of cis-1,2-DCE (4-MW11 and 4-MW1) over time and one well (4-MW7) shows decreasing trends of 1,1-DCE. A total of eight wells show increasing trends over time (4-MW20, 4-MW23, and 4-MW28A show increasing trends of PCE; 4-MW22, 4-MW25A, and 4-MW26A show increasing trends of TCE; and 4-MW20 and 4-MW26A show increasing trends of cis-1,2-DCE).

Table 4.1-3. Comparison of Concentrations of Chemicals of Potential Concern 1994 - 2003

Contaminant	Maximum Concentration OU1 ROD (1994)	Maximum Concentration 2001-2002 AMR, (MWH, 2003)	2003 MCLs
Methylene Chloride	9 µg/l	--	4.3 µg/l*
PCE	260 µg/l	39 µg/l	5 µg/l
TCE	85 µg/l	18 µg/l	5 µg/l
Vinyl Chloride	8 µg/l	0.51 µg/l	0.5 µg/l
Bis(2-ethylhexal) phthalate	290 µg/l	--	4.8 µg/l*
Cis-1,2-DCE	respectively		respectively

-- = No Data
* = U.S. EPA Region IX Tap Water PRG (October 2002)
µg/l = micrograms per liter
DEC = dichloroethene
OU = Operable Unit
PCE = perchloroethylene
ROD = Record of Decision
TCE = trichloroethylene

4.1.4 Site 4 Assessment

The following conclusions support the determination that the remedial actions performed at Site 4 are expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: The Health and Safety Plan (HASP) for Site 4 is incorporated in the Basewide RI/FS HASP, which is in place and properly implemented.

Implementation of Institutional Controls and Other Measures: The OU1 ROD did not contain ICs as part of the remedy at Site 4 (or any other OU1 sites). It did include the following statement in the Site 4/OU1 groundwater selected remedy: "*As an additional safety precaution, the Air Force is notifying County officials of the identity of property owners whose properties may be affected by the downgradient plume and requesting that the County not issue permits to install wells until the contaminants have been reduced below cleanup standards*." This notification was made contemporaneously with the OU1 ROD signature.

Since the OU1 ROD's signature the Air Force and regulatory agencies have recognized that ICs are an important part of any remedy where waste is left in place above unrestricted levels. For Base Realignment and Closure (BRAC) property (e.g., Site 4), these ICs take the form of deed restrictions and a state land use covenant that "runs with the land." At this time, the Air Force and regulatory agencies are in formal dispute on several IC issues. The Air Force recognizes the need for ICs at Site 4, and is committed to submitting an OU1 ROD modification that includes ICs once the dispute is resolved.

Site 4 is currently retained Air Force property, and will not be transferred by deed until the Air Force receives regulatory concurrence that all remedial actions, including ICs, are in place and operating properly and successfully. Until that time, the Air Force has implemented the following land use controls and engineering controls to protect human health and the environment:

- Prohibit any use of the property except for the O&M of the landfill remedy as specified in the regulatory approved Site 4 Landfill O&M Plan
- Construction and maintenance of the perimeter fence to control Site 4 access
- Posting and maintenance of signs on the perimeter fence notifying the public of the landfill and including Air Force Point of Contact information.

Remedial Action Performance: Closure of the Site 4 landfill included construction of an engineered landfill cap, modifications to the Heacock Storm Drain along the eastern boundary of the landfill, and modification to the road and the 500-year flood plain along the western edge of the site. The cap was designed to prevent the infiltration of groundwater into the waste. During site closure, the Heacock Storm Drain was improved to enhance drainage characteristics adjacent to the landfill. A clay liner was also placed between the Heacock Storm Drain and the waste and lined with rip-rap to prevent erosion. The landfill cap is in compliance with CCR Title 27, and appears to be in good condition preventing direct exposure to the buried waste. As part of the engineering controls (ECs), the Air Force has installed new groundwater extraction wells along the western edge of the landfill to gain hydraulic control of contaminants originating at Site 4. Additional monitoring wells and piezometers have also been installed to monitor groundwater contaminants and water levels to ensure hydraulic control of the contaminants. In

addition, soil gas monitoring probes have been installed within and adjacent to the landfill to evaluate landfill gas generation and migration potential. All groundwater extraction wells, groundwater monitoring wells (including piezometers), and landfill gas monitoring probes have been installed with the approval of the regulators. The existing EGETS system is designed to prevent the off-site migration of contaminants beyond the site boundary, and the Air Force continues to conduct groundwater monitoring under the Comprehensive Groundwater Monitoring Program at landfill POC wells on a semiannual basis in accordance with the approved Closure/Post Closure Plan and CCR Title 27. Quarterly and annual O&M reports and routine groundwater monitoring reports are prepared and submitted for regulatory review, and concerns and problems are addressed as they become apparent to the Air Force and regulators. As a result of newly installed groundwater extraction wells being operated at Site 4, the Air Force considers that Site 4 is undergoing active remediation, and as such, is re-evaluating the groundwater monitoring program around Site 4. If necessary, the Air Force may change the groundwater monitoring program at Site 4, with regulatory approval.

System Operations/O&M: The current O&M landfill procedures consist of routine cap inspections and monitoring of groundwater from wells around the landfill. These procedures serve to maintain the effectiveness of the remedial actions by assuring that the landfill cap is well maintained to prevent contributing contamination to the surrounding areas. As part of the continued O&M, LFG gas monitoring probes have been installed at the request of the regulators. As part of the closure/post closure requirements, the Air Force prepares quarterly and annual inspection reports for regulatory review and comments. EGETS operation and monitoring will continue until cleanup goals are achieved.

Opportunities for Optimizations: Currently, there have been no opportunities for optimization identified. However, the potential for optimization could become more apparent as OPS determination is conducted.

Early Indicators of Potential Remedy Failure: While the landfill cap prevents infiltration of rainwater and direct contact to buried waste, rising groundwater may cause additional contaminant loading in groundwater and possible loss of containment. Continued monitoring of groundwater contaminant concentrations within and downgradient of the site is required to provide data to evaluate remedy effectiveness.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and To Be Considered: This 5-year review identifies standards that have changed since the OU1 ROD was signed. These changes are not significant enough to affect the protectiveness of the remedy.

Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified in the course of the 5-year review. There were no current or future planned changes in land use and no new contaminants, sources, or routes of exposure identified.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Water levels at Site 4 have been monitored since 1992 and data indicate that groundwater levels have risen steadily at approximately 2 feet per year within the Site 4 area with some local variations attributed to recent groundwater extraction. Since 2000, the rising groundwater trends have leveled off and the water table surface has remained relatively constant at about 20 feet below grade (an elevation of approximately 1,492 feet above MSL) at the site. The waste is approximately 25 deep and based on data from the RI/FS, the average elevation to the bottom of the waste is about 1,491 feet MSL, thus raising concerns about waste in contact with the groundwater at Site 4. In addition, the water table is shallowest at the north end of the landfill, where standing water is present most of the year and the static water table is approximately 1,500 feet MSL (November 2002). Over the last 5 years, the Air Force and the regulatory community have identified and responded to questions concerning the protectiveness of the remedy. These concerns have been addressed through several rounds of groundwater modeling, the installation of several new groundwater monitoring wells, the installation of two new groundwater extraction wells, and the installation and sampling of several LFG monitoring probes. ECs (fences, monitoring well enclosures, extraction well enclosures, etc.) are continuously monitored and upgraded as necessary. The O&M tasks identified in the O&M plan are conducted on a quarterly basis, and deficiencies are identified and corrected, as required. Quarterly and annual O&M reports are submitted to the regulators for review, and any concerns raised are addressed in a timely manner. Once the IC dispute is resolved and the property is transferred through deed, ICs in the form of deed restrictions and state land use covenants that "run with the land" will be part of the transfer document. These deeds will restrict specific land uses from occurring on Site 4 that are not compatible with, or protective of, human health and the environment.

4.1.5 Site 4 Issues

No outstanding major deficiencies were noted during the 5-year review. Several deficiencies have been identified between the time of OU1 ROD signature and this 5-year review. These deficiencies include data gaps in groundwater nature and extent and containment (addressed by installation of additional monitoring wells), lack of groundwater capture at the base boundary (addressed by the installation of additional extraction wells), and data gaps in LFG migration and Title 27 compliance (addressed by the installation of new LFG monitoring probes). The Air Force's O&M contractor is currently in the process of reviewing and updating the Site 4 O&M plan to ensure that O&M tasks are up to date and inclusive of the above response modifications. The issue of rising groundwater levels and potential for waste in contact with the groundwater will continue to be evaluated as part of the landfill O&M project and the Basewide Groundwater Monitoring Program. Once IC issues have been resolved and the property is to be transferred, appropriate language will be placed in the deed in the form of deed restrictions and state land use covenants that will prohibit specific land uses and that will identify specific actions that will be required to ensure protection of human health and the environment.

4.1.6 Site 4 Assessment

All of Site 4 OU1 ROD remedies, including closure of the landfill, securing the site within a fence, implementing groundwater extraction and treatment, and notification of the county officials requesting that they not issue well installation permits, have been accomplished. Groundwater modeling has predicted that the plume at Site 4 is captured, and analytical results from groundwater extraction wells show a slight decreasing trend in on-base concentrations. Water level measurements, particularly along the northern end of the landfill, specifically where standing water is present along the Heacock drainage suggests that

the waste may be in contact with the groundwater. This may call into question the effectiveness of the remedial action and compliance with CCR Title 27. However, groundwater flow modeling predicts capture of contaminants emanating from Site 4 and extraction wells are effectively lowering water levels in the area of the extraction wells. The site remains Air Force property, and land use controls and ECs are in place to protect human health and the environment. Several follow-up actions have been identified and are listed in the following section.

4.1.7 Site 4 Recommendations and Follow-up Actions

The following recommendations are made:

- Update the Site 4 O&M Plan to include LFG monitoring and reporting in accordance with CCR Title 27, Article 6, Sections 20917 through 20937
- Evaluate the effects of the rising water table and the possibility of waste submergence
- Once the IC dispute is resolved, submit an OU1 ROD modification establishing ICs and state land use covenant as part of the Site 4 remedy.

4.1.8 Site 4 Protectiveness Statements

The remedial actions that have been implemented in the OU1 ROD and modified during the O&M period are protective of human health and the environment. The Air Force will continue to monitor the rising groundwater and LFG migration to ensure compliance with Title 27 requirements. As part of the continued O&M, the Air Force will update the Site 4 O&M Plan to include LFG monitoring and reporting in accordance with CCR Title 27, Article 6. The Air Force will continue to execute and report O&M tasks per the approved O&M plan. Land use and ECs are in place and are preventing exposure to landfill wastes and contaminated groundwater. Once the IC dispute is resolved, the Air Force will submit an OU1 ROD modification establishing ICs and state land use covenants as part of the Site 4 remedy. The Air Force will not transfer the Site 4 parcel until regulatory approved ICs are included in the OU1 ROD, and are in place and OPS. Groundwater remedial actions (pump and treat, monitoring, and use restrictions) will continue until OU1 ROD standards are met. At that time, it is expected that active groundwater cleanup will stop. Once the groundwater cleanup is complete, protectiveness will be assured through groundwater monitoring, LFG monitoring (if still appropriate), and cap inspections. These procedures will continue until Site 4 reaches site closure.

4.1.9 Next Review

This is a statutory review of Site 4 that requires ongoing 5-year reviews. The next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

4.2 IRP SITE 5, LANDFILL NO. 3

IRP Site 5 (Site 5), Landfill No. 3 is situated within the current cantonment area of March ARB and is controlled by the AFRC. Site 5 covers approximately 5 acres and is situated along the southeast end of the flightline area (Figure 4.2-1). The landfill was in operation from the late 1940s to approximately 1960. The OU1 RI/FS performed at Site 5 noted that the landfill waste consisted of construction rubble, newspaper, office waste, bottles, and miscellaneous paper products. The majority of the waste consists of construction rubble, including concrete and wood. The landfill pits range from 12 to 17 feet in depth. The waste is typically intercalated with soil, probably due to the daily placement of soil cover by the landfill operator. It is estimated that approximately 18,500 cubic yards of waste is present at Site 5 based on data collected during the OU1 RI/FS. The waste pits were characterized as being approximately 40 feet wide, 12 to 17 feet deep, and up to 240 feet long.

Soil samples from boreholes, test pits, and surface locations as well as soil gas and groundwater samples were collected from Site 5 during the OU1 RI/FS. Based on the analytical results, there were no significant levels of contaminants found in the soil or soil gas. Analytical results from groundwater samples collected beneath the site suggested that the contaminants that are present here are a result of the contaminant plume that is migrating southeast from the main part of the base and that Site 5 is not the source of these contaminants. Since Site 5 overlies the OU1 Groundwater Plume, contaminants found in the groundwater are being dealt with under the OU1 Groundwater Plume remedy (EGETS) (see Section 4.10).

Risk assessments were conducted for Site 5 following U.S. EPA Region IX and California EPA guidance. The risk assessments produced estimates of the potential risk to public health that could result from ingesting the contaminants detected at Site 5. These risks were determined to be insignificant and the site was approved for no further action in the OU1 ROD.

Site 5 remains Air Force property and it will remain Air Force property for the indefinite future. Site 5 is situated along the southeast end of the flightline apron and is secured from the general public by the base fence. Currently Site 5 is behind a security fence maintained by the AFRC and is not being used for residential, commercial, or municipal activities. There are no current users of groundwater at the site.

4.2.1 Remedial Actions

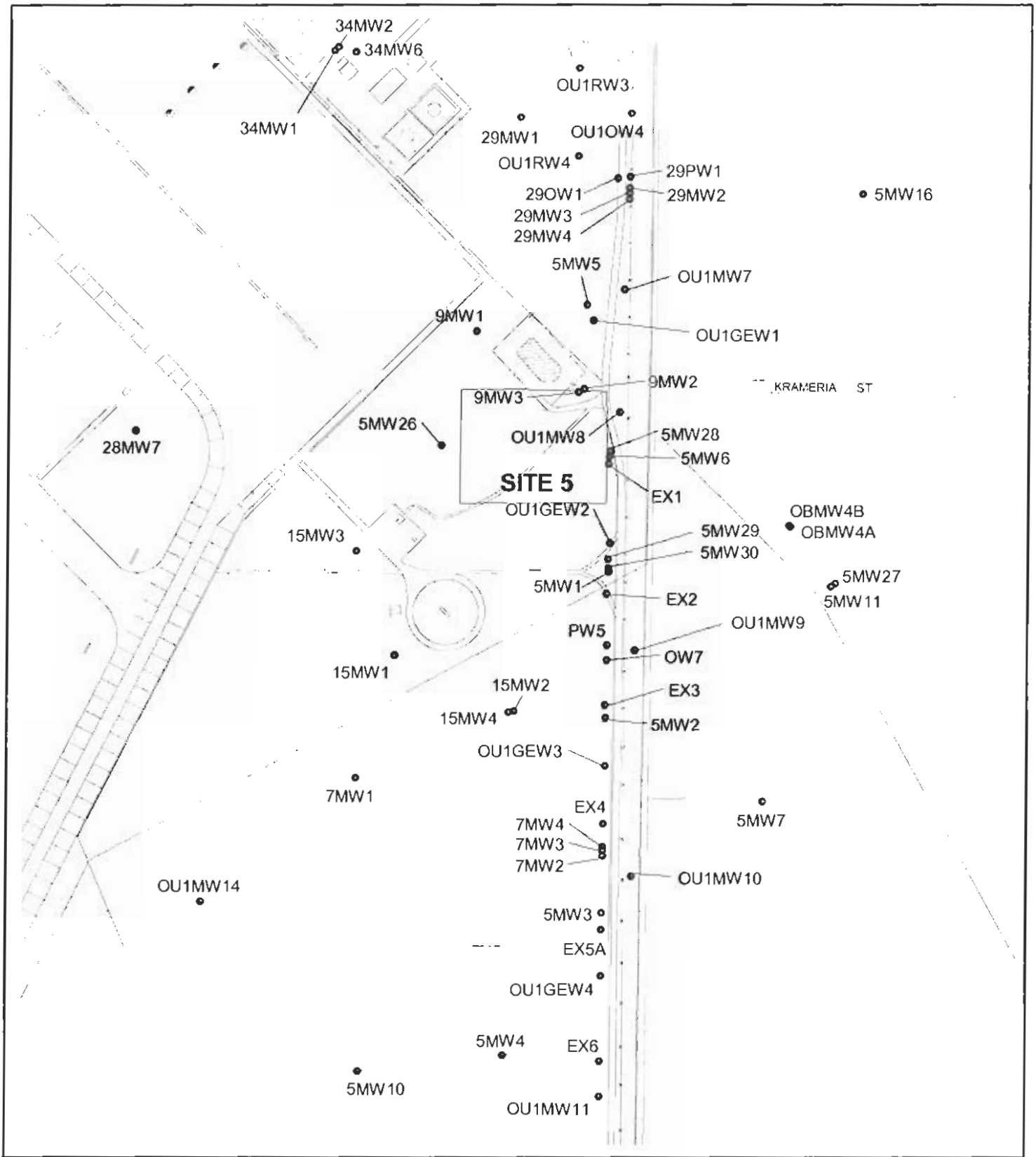
This section describes the remedy selection, implementation, system operations, and cleanup process for Site 5.

4.2.1.1 Remedy Selection.

The remedial action identified in the OU1 ROD for Site 5 was no further action because Site 5 contained no significant levels of contamination in the soil and soil gas. Contaminants identified in the groundwater beneath Site 5 are addressed in the OU1 Groundwater Plume remedy and are being dealt with by the EGETS situated immediately east and downgradient of the site.

4.2.1.2 Remedy Implementation.

The no further action remedy selected did not require any action to be taken on the site.



LEGEND

- Wells
- Structures/ Roads

N

450 0 450 Feet

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 5
Operable Unit 1 5-Year Review
March Air Force Base

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Project No. 35863
Date: 09-03

Figure 4.2-1

4.2.1.3 System Operations/Operations and Maintenance.

There are no O&M activities required at the site since the approved action at Site 5 was no further action.

4.2.1.4 Progress since the Last 5-Year Review.

This is the first 5-year review for all sites at March AFB/ARB.

4.2.2 Site 5 5-Year Review Process

The March AFB/ARB 5-year review at Site 5 was directed by Mr. Phillip Mook, AFRPA/DD March ROL. The following team member performed the review at Site 5:

- Mr. William Muir, Earth Tech.

The Site 5 5-year review consisted of the following activities: a review of related documents, interviews with the local AFRC Environmental Management office, and a site inspection.

4.2.3 Site 5 5-Year Review Findings

This section describes findings of the 5-year review for Site 5.

4.2.3.1 Interviews.

The following individual was contacted by Earth Tech as part of the 5-year review process:

- Mr. Eric Lehto, March ARB Environmental Management Office was contacted on August 26, 2003.

Mr. Lehto stated that the AFRC has direct control over Site 5 and that no trespassing of the general public is allowed. Mr. Lehto stated that the site is secure from the general public because the site is situated on base, immediately adjacent to the flight line, and no unauthorized access can be made without Air Force consent. Air Force security units patrol the perimeter of the site 24 hours a day 7 days a week, 365 days a year because the site is situated adjacent to the flightline parking apron.

4.2.3.2 Site Inspection.

Mr. Muir (Earth Tech) performed a site visit on August 26, 2003, with Mr. Eric Lehto (AFRC). Activities being conducted at the site included a construction lay down area present on the north end of the site that is related to the construction of the new firehouse situated northwest of the site. There has been no excavation within the site boundaries. The construction company has leveled the surface of the lay down yard by importing soil and leveling out the north part of the site with clean soil. Mr. Muir walked the southern portion of the site and did not note any erosion or significant settlement other than that described in the OU1 RI/FS document. Some waste (glass fragments, burnt wood, and some rusted metal pieces that are likely old cans) was observed near rodent holes, and Mr. Lehto indicated that he walks the site occasionally to see what the rodents are bringing to the surface. The amount of waste being brought to the surface is minor in comparison to the size of the site. There was no evidence of unauthorized digging in the area and groundwater monitoring wells that are situated along the perimeter of the site were locked and in good condition.

4.2.3.3 Risk Information Review.

Since the OU1 ROD identified Site 5 as no further action due to insignificant levels of contaminants present at the site, a review of chemical-specific, location-specific, and action-specific standards identified as ARARs in the OU1 ROD was not conducted. However, since the signing of the OU1 ROD, state regulations dealing with landfills and landfill closure requirements have changed from CCR Title 23 to CCR Title 27. To ensure that the Air Force has a safe guard against accidental exposure to base personnel, the Air Force will identify Site 5 as a landfill on the Base Comprehensive Plan (BCP) and before any activity at the base can be conducted at the site, the Base Environmental Office and the regulators must be made aware of any proposed activities. According to Air Force protocol, any excavation of any kind, anywhere on base requires that the individuals conducting the work get approval from all facility groups before work can begin (Base Digging Permit).

4.2.3.4 Data Review

A review of the OU1 RI/FS prepared in 1994 indicated that the site did not pose a threat to human health or the environment and was considered and approved for no further action. As a matter of review, the site is still a landfill and as such, the AFRC will designate this area as a landfill in their BCP. In addition, the Air Force process for conducting any excavation at any site on base requires that the Base Environmental Office be notified and must approve the Base Digging Permit before any work can be initiated. Since the site is an IRP site, the regulatory agencies would also be notified if any land use changes are proposed. This process reduces the risk to human health through ICs.

4.2.4 Site 5 Assessment

The following conclusions support the determination that the actions performed at Site 5 are expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision document?

HASP/Contingency Plan: The Base Digging Permit Process requires that any excavating or digging on base requires review and approval of the Base Environmental Office before any work can be conducted. This ensures that the site is managed in a safe manner and that any work proposed in the area must be approved before work can be done. Should the AFRC propose any construction or excavation within Site 5, the regulatory agencies would be notified as well.

Implementation of Institutional Controls and Other Measures: The OU1 ROD did not contain institutional or land use controls as part of the remedy at Site 5. Since the OU1 ROD's signature, the Air Force and regulatory agencies have recognized that the ICs and land use controls are an important part of any remedy where waste is left in place above regulatory levels. Site 5 is currently part of March ARB and will not be transferred by deed in the indefinite future. The AFRC, however, will identify the site as a landfill in the BCP and all intrusive work anywhere on base requires approval from the Base Environmental Office through the Base Digging Permit process. Therefore, any work to be conducted on or around Site 5 would require approval from the Base Environmental Office prior to the work being conducted. These steps assure that no one will excavate waste or build structures within the Site 5 landfill unless approval is received from both the Base Environmental Office and the regulatory agencies.

Remedial Action Performance: The OU1 ROD required no further action at Site 5. Therefore, there are no remedial action performance criteria to evaluate. The AFRC will identify the site as a landfill in the

BCP and will continue to monitor groundwater downgradient of the site as part of the Basewide Groundwater Monitoring Program and EGETS O&M.

System Operations/O&M: There are no O&M procedures at Site 5 since the site was approved for no further action in the OU1 ROD. The base ensures that no excavation occurs at the site, without proper notification (Base Digging Permit). The site visit identified minor amounts of waste in the form of burnt wood fragments, glass fragments, and metal debris are being brought to the surface by burrowing animals. While the amount of waste is small, exposure to waste may become an issue.

Opportunities for Optimization: There have been no opportunities for optimization because there is no active remediation ongoing at the site.

Early Indicators of Potential Remedy Failure: The OU1 ROD required no further action at the site. As part of the BCP, the AFRC will identify the area encompassing Site 5 as a landfill and will review any proposed development of the site before work can be started. Any excavation proposed by the Air Force anywhere on base requires that the Base Environmental Office approve the work before work can be conducted. In addition, because the site is an IRP site, the regulatory agencies would also require review and approval of any proposed construction activities at Site 5.

Groundwater monitoring conducted as part of the Basewide Groundwater Monitoring Program has not shown an increase in landfill related contaminants in downgradient wells southeast of the site.

A site visit did show that rodent activity has brought pieces of glass, burnt wood, and rusted cans to the surface in some areas of the site. The observed material consists of solid waste that poses no significant threat to health, safety, or the environment. Mr. Eric Lehto indicated that he occasionally visits the site to observe what is being brought to the surface from rodent activity.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in "Standards" and "To Be Considered": This 5-Year Review identifies standards that have changed since the OU1 ROD was signed. These changes are not significant enough to affect the protectiveness of the remedy.

Changes in Exposure Pathway: No changes in site conditions that affect exposure pathways were identified in the course of the 5-year review. There were no current or future planned changes in land use and no new contaminants, sources, or routes of exposure identified. Waste material being brought to the surface by rodent activity may become an issue in the future.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in risk assessment methodologies since the OU1 ROD was signed.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Site 5 has not been evaluated since the OU1 RI/FS because the site was approved as no further action in the OU1 ROD. Since the OU1 ROD was signed, regulations dealing with landfills have changed from CCR Title 23 to CCR Title 27. Groundwater monitoring as part of the operation and monitoring of the EGETS system situated immediately downgradient of the site has not identified contaminants that would

suggest contaminants are originating from Site 5. The Base Digging Permit Process requires that the Base Environmental Office review and approve any proposed work at Site 5. These steps assure that no one will excavate waste or build structures within the Site 5 landfill unless approval is received from both the Base Environmental Office and the regulatory agencies. In addition, the AFRC will identify the area comprising Site 5 in the BCP as a landfill.

4.2.5 Site 5 Issues

No outstanding major deficiencies were noted during the 5-year review. The AFRC, Base Environmental Office will ensure that no construction will occur on Site 5 without a thorough review and approval from the Base Environmental Coordinator and the regulatory agencies prior to any proposed work. The area comprising Site 5 should be noted on the BCP as soon as possible.

4.2.6 Site 5 Assessment

Site 5 remains Air Force property and land use and institutional controls are in-place to protect human health and the environment. Through the Air Force Digging Permit process, excavation and other construction activities require approval from the Base Environmental Office before any work can be done at the site. The BCP will also identify this area as an IRP site with contamination above unrestricted cleanup levels and will require a thorough review and approval by the Base Environmental Office and regulatory agencies prior to any intrusive activities at the site.

4.2.7 Site 5 Recommendations and Follow-Up Actions

The following recommendations are made:

- Update the Base Comprehensive Plan to identify the area containing Site 5 as a landfill
- Review Site 5 conditions with CCR Title 27 requirements
- Once the IC dispute is resolved, submit an ROD modification establishing ICs for Site 5
- Continue to monitor the site with site visits to determine the quantity and type of material being brought to the surface by rodents.

4.2.8 Site 5 Protectiveness Statement

No remedial actions have been implemented at the site. The Air Force will update the BCP to identify the site as an IRP site with contamination above unrestricted cleanup levels. Should the Air Force wish to construct facilities on the site, the Base Environmental Office and regulatory agencies would be involved in setting requirements. As part of the base construction process, any excavation proposed at the site requires the review and approval of the Base Environmental office. Because Site 5 is an IRP site, the regulatory agencies would also review and approval any work to be completed at the site. Given the current land use restrictions, Site 5 does not pose a threat to human health or the environment.

4.2.9 Next Review

This is a statutory review of Site 5 that requires ongoing 5-year reviews. The next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

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4.3 SITE 7 – FIRE PROTECTION TRAINING AREA NO. 2

Between 1954 and 1978, fire-training exercises were conducted in unlined training pits at Site 7 situated along the southeast perimeter of the former March AFB boundary, north of the former Alert Facility and south of the March ARB flightline apron (Figure 4.3-1). An estimated 50,000 to 100,000 gallons of waste per year were burned between 1961 and 1978. Wastes used in training exercises reportedly included contaminated fuel, waste oils, and spent solvents. Three distinct burn pits were identified in historic aerial photographs of the Base. A portion of the site may also have been used for crash rescue training.

Initial OU1 RI/FS field investigations took place during the months of April through July, and again in December 1992. During the OU1 RI soil samples from boreholes and surface locations as well as groundwater samples were collected from Site 7. Based on the results of this sampling it was concluded that Site 7 surface soils (0 - 2 feet bgs) were contaminated. The contaminants of concern included beryllium, lead, manganese, and dioxins. These contaminants were detected at concentrations greater than the December 1991 U.S. EPA Region IX residential PRGs, but lower than industrial PRGs. Based on the December 1991 industrial PRGs, site-specific risk assessments, and because Site 7 is situated adjacent to the flightline and the potential for residential reuse was deemed highly unlikely, no unacceptable risks were identified in the OU1 ROD. Therefore, no further action was identified as the remedy for Site 7 in the OU1 ROD. Since the OU 1 ROD was signed, the area comprising Site 7 has been leased to the March Joint Powers Authority (JPA) and an area immediately south of the site has been developed into a major warehouse facility.

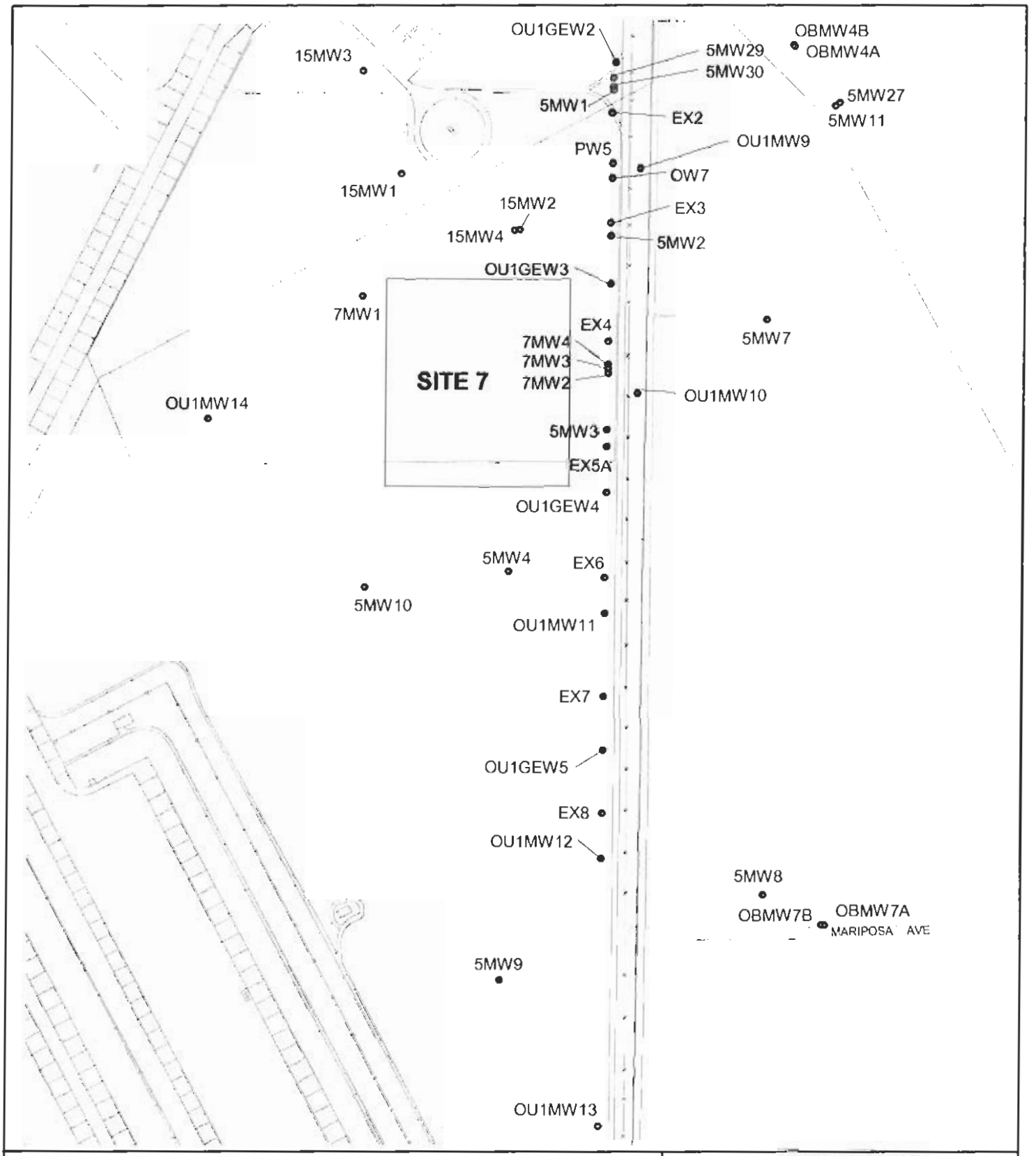
Site 7 is within the OU1 groundwater plume; therefore, information relating to the groundwater contaminants at Site 7 can be found in the OU1 Groundwater Plume review (see Section 4.10 of this document).

4.3.1 Remedial Actions

This section describes the remedial actions implemented at Site 7.

4.3.1.1 Remedy Selection.

The OU 1 ROD identified Site 7 as no further action because the site would continue to be used for industrial purposes. The U.S. EPA and California EPA concurred based on the results of the risk assessment performed under the OU1 RI. Since signing the OU1 ROD, the Air Force and regulatory agencies have recognized that ICs are an important part of any remedy where waste is left in place above unrestricted levels. For BRAC property (e.g., Site 7), these ICs will take the form of deed restrictions and state land use covenants that “run with the land.” At this time, the Air Force and regulatory agencies are in formal dispute on several IC issues. The Air Force recognizes the need for ICs at Site 7, and is committed to submitting an OU1 ROD modification that includes ICs once the dispute is resolved. Currently land use restrictions are stipulated in the lease to the March JPA (e.g., prohibition of residential land use, no digging without approval and coordination with the regulators, and a provision to allow access to conduct investigations and/or cleanup) and the restrictions are at least as restrictive as any future ICs will be. In the Finding of Suitability to Lease (FOSL), the Air Force has the following language:



LEGEND

- Wells
- Structures/ Roads

N

450 0 450 Feet

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 7
Operable Unit 1 5-Year Review
March Air Force Base

EARTH TECH

Project No. 38853
Date 09-03

Figure 4.3-1

> "The Lessee will be advised through lease documents of the locations of past and future remedial actions/investigations. The Lessee will be required under the Lease to comply with the provisions of any health and safety plans in effect under the IRP. The Lessee will be restricted from conducting any type of excavation, digging, drilling, or other ground disturbing activity at these locations without prior written Air Force approval and Air Force coordination with applicable Federal and State regulatory agencies as necessary. Provisions will also be placed in the Lease to allow the Air Force and regulatory agencies unrestricted access to the leased property to conduct necessary investigations and/or cleanup activities."

4.3.1.2 Remedy Implementation.

Site 7 is a no further action site in the OU1 ROD. In compliance with the OU1 ROD, the Air Force has implemented land use controls and restrictions in its lease of the property to the March JPA. Site 7 will not be transferred by deed until the Air Force receives regulatory concurrence that all remedial actions, including ICs, are in place. The Air Force will ensure that Site 7 deed restrictions will prohibit residential land use when the property is transferred.

4.3.1.3 System Operations.

Systems operations and/or O&M Plans are not required for Site 7.

4.3.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review on all sites at March AFB/ARB.

4.3.2 Site 7 5-Year Review Process

The March AFB/ARB 5-year review at Site 7 was directed by Mr. Michael Zabaneh, AFBCA/DD March ROL. The following team members performed the review:

- Mr. Manish Joshi, Earth Tech
- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The five-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a site inspection, where warranted. The public was informed regarding the review during the RAB meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.3.3 Site 7 5-Year Review Findings

This section describes the findings of the 5-year review conducted for Site 7.

4.3.3.1 Interviews.

The following individual was contacted by Earth Tech as part of the 5-year review:

- Mr. Mike Zabaneh, AFBCA/DD March ROL (telephone interview on June 2, 2000).

Mr. Zabaneh stated that the conditions at Site 7 have not changed since the OU1 ROD was issued and there are no current or future planned land use changes. He also stated that ICs would be included in the deed when the land is transferred. The deed restrictions will prohibit residential use of the Site 7 area, and prohibit use of groundwater under the site (see Section 4.10).

4.3.3.2 Site Inspection.

Ms. Pearson and Mr. Tucker performed a site inspection on August 22, 2000. Extraction well #6 (EX-6), situated off base, was fenced and locked. The Phillips Warehouse was constructed within the past 2 years immediately south of, and adjacent to, Site 7. During the site visit, there was no evidence of recent excavations or violations of other restrictions imposed by the lease occurring within the Site 7 boundaries.

4.3.3.3 Risk Information Review.

The U.S. EPA Region IX PRG standards (December 1991) were identified as chemical-specific ARARs in the OU1 ROD and were reviewed for changes that could affect protectiveness.

The U.S. EPA Region IX PRGs (October 2002) have changed since the OU1 ROD was signed. The PRGs for some of the contaminants of concern have become less stringent; therefore, the changes do not affect protectiveness. The changes are noted in Table 4.3-1.

Site-specific risk assessments were performed for the lead and manganese contamination detected at Site 7. For lead, a method developed by the California DTSC was used to determine blood-lead concentrations based on exposure to lead by multiple pathways. Results of this method indicated that lead did not require remediation. In addition, the results of a similar risk assessment indicated that manganese did not require remediation either. No changes in exposure pathways or toxicity factors warranting risk recalculations have been identified since these risk assessments were performed. No action-specific or location-specific ARARs were identified for this site. Therefore, there have been no changes in the conditions at Site 7 that affect protectiveness.

In addition, no changes in exposure pathways or toxicity factors regarding groundwater contamination warranting risk recalculations have been identified.

4.3.3.4 Data Review.

Data from the OU1 RI/FS report and the OU1 ROD were examined in preparing this 5-year review. These records indicate that Site 7 contains residual contamination in the surface soil (0-2 feet bgs) above residential PRGs. Beryllium, lead, manganese, and dioxins were detected at concentrations greater than U.S. EPA Region IX residential PRGs (December 1991) but lower than industrial PRGs (see Table 4.3-1). No additional sampling has been performed at Site 7 since the OU1 ROD was signed.

Table 4.3-1. Site 7 Changes in PRGs*

Contaminant	Media	Range of Concentration (mg/kg)	Residential PRG (mg/kg)		Industrial PRG (mg/kg)	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	Soil	ND-0.00075	Previous* (Dec 1991)	0.0000038[1]	Previous*	0.000024[1]
			New (Oct 2002)	0.0000039[1]	New	0.000016[1]
Heptachlorinated dibenzo-p-dioxins, total	Soil	ND-0.0013	Previous* (Dec 1991)	0.0000038[1]	Previous	0.000024[1]
			New (Oct 2002)	0.0000039[1]	New	0.000016[1]
Hexachlorinated dibenzo-p-dioxins, total	Soil	ND-0.0001	Previous* (Dec 1991)	0.0000038[1]	Previous	0.000024[1]
			New (Oct 2002)	0.0000039[1]	New	0.000016[1]
Beryllium	Soil	ND-0.58	Previous* (Dec 1991)	0.14	Previous	1.1
			New (Oct 2002)	150	New	1900
Manganese	Soil	111.0-449.0	Previous* (Dec 1991)	380	Previous	7800
			New (Oct 2002)	1800	New	19000
Lead	Soil	ND-855.0	Previous* (Dec 1991)	130[2]	Previous	1000
			New (Oct 2002)	150[3]	New	750

Notes: * Values presented in the Final OU1 ROD, 1996.
[1] 2, 3, 7, 8-TCDD is the only dioxin for which Region IX has calculated PRGs (the PRG was previously 3.8E-06 and is currently 3.9E-06). These PRGs have, therefore, been adjusted using toxicity equivalency factors (TEF). The TEF for 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin is 0.01, and the TEF for heptachlorinated dibenzo-p-dioxins, total is 0.01 (TEFs were obtained from "*Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities,*" State of California Environmental Protection Agency [Cal EPA], DTSC, Office of the Science Advisor [July 1992]). Although the PRGs have changed since the OU1 ROD was signed, the TEFs remain the same.
[2] The CAL EPA PRG was used for this chemical because it is more restrictive than the Region IX PRG.
[3] Current CAL EPA PRG (Oct 2002) for lead.
mg/kg = milligrams per kilogram
PRG = Preliminary Remediation Goal

4.3.4 Site 7 Assessment

The following conclusions support the determination that the Site 7 remedy is expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: The site currently has no unacceptable risks to human health and the environment since the land use at the site is industrial and lease restrictions are in place. Based on language in the FOSL, the Basewide Health and Safety Plan is the HASP of record.

Implementation of Institutional Controls and Other Measures: Since signing the OU1 ROD, the area encompassing Site 7 has been leased to the March JPA. In the FOSL, the Air Force identified Site 7 as an IRP site and stipulated that the Lessee would be advised through lease documents of the locations of past and future remedial actions/investigations. The Lessee would then be required under the Lease to comply with the provisions of any health and safety plans in effect under the IRP. These steps assure that no one will excavate or build structures within Site 7 unless approval is received from both the Base Environmental Office and the regulatory agencies. Provisions were also placed in the Lease to allow the Air Force and regulatory agencies unrestricted access to the leased property to conduct necessary investigations and/or cleanup activities. An area of the leased property has been redeveloped and a large warehouse facility is now present immediately south of the site. The current lease restricts residential land use at the site and the Air Force will ensure that the site is used appropriately in the future by implementing deed restrictions prohibiting residential land use and use of groundwater when the property is transferred.

Remedial Action Performance: No remedial action has been performed or planned.

System Operations/O&M: No system operations/O&M have been performed or planned.

Opportunities for Optimizations: There are no optimization opportunities due to the absence of any remedial action at the site.

Early Indicators of Potential Remedy Failure: No early indicators of potential remedy failure were noted during the review.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and To Be Considered: This 5-year review identified that some U.S. EPA Region IX PRGs have changed since the OU1 ROD was signed. These changes are not significant enough to change the protectiveness of the remedy.

Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified in the course of the 5-year review. There are no current or planned changes in land use, and no new contaminants, sources, or routes of exposure identified.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity and other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed that call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

4.3.5 Site 7 Issues

No deficiencies were discovered at Site 7 during this 5-year review.

4.3.6 Site 7 Assessment

Site 7 was approved for no further action in the OU1 ROD. This determination was based on the land use continuing to be industrial. In the OU1 ROD, the Air Force agreed that Site 7 would be used appropriately in the future by implementing deed restrictions that prohibit residential land use when the property is transferred. Since signing of the OU1 ROD, the area comprised of Site 7 has been leased to the March JPA with the stipulation that the area remain industrial. Currently, the lease to the March JPA identifies land use restrictions that are protective of human health and the environment (prohibiting residential reuse, compliance with the provisions of any health and safety plans in effect under the IRP, or being restricted from conducting any type of excavation, digging, drilling, or other ground disturbing activity at these locations without prior written Air Force approval and coordination/approval with applicable Federal and State regulatory agencies as necessary). Provisions are also placed in the Lease to allow the Air Force and regulatory agencies unrestricted access to the leased property to conduct necessary investigations and/or cleanup activities. Redevelopment of the adjacent property into warehousing facilities has been consistent with these land use restrictions. The Air Force recognizes the need for ICs at Site 7, and is committed to submitting an OU1 ROD modification that includes ICs once the dispute is resolved. The OU1 ROD modification will identify land use restrictions that will be protective of human health and the environment. ICs will take the form of deed restrictions and state land use covenants that "run with the land" when the property is transferred.

4.3.7 Site 7 Recommendations and Follow-up Actions

The following recommendations are made:

- The Air Force will continue to work with regulators to establish ICs that are protective of human health and environment,
- Once the IC dispute is resolved, the Air Force will submit an OU1ROD modification establishing ICs and state land use covenants as part of the Site 7 remedy.
- Once IC issues have been resolved and the property is ready for transfer, appropriate language will be placed in the deed in the form of deed restrictions, reservation of rights, and state land use covenants. These deed restrictions will identify specific actions that will be required to ensure protection of human health and the environment.

4.3.8 Site 7 Protectiveness Statements

The OU1 ROD approved the no action remedy for Site 7. The no action remedy is considered protective of human health and the environment because the Air Force has implemented lease restrictions that are protective of human health and the environment. Once the IC dispute is resolved, the Air Force will submit an ROD modification establishing ICs and state land use covenants as part of the Site 7 remedy.

The Air Force will not transfer the Site 7 parcel until regulatory approved ICs are included in the OU1 ROD modification.

4.3.9 Next Review

This is a statutory review of Site 7 that requires ongoing 5-year reviews. The next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

4.4 IRP SITE 10, FLIGHTLINE DRAINAGE CHANNEL

IRP Site 10 is situated within the current cantonment area of March ARB and is controlled by the AFRC. Site 10 is situated southeast of the flightline apron and the industrial shop zone, adjacent to the oil/water separator (Figure 4.4-1). The drainage channel, which was installed prior to 1940, has reportedly received various waste oils, hydraulic fluids, diesel fuel, jet fuel, waste paints, spent solvents (including TCE), paint strippers, and battery acids. Since 1974, the Main Oil/Water Separator (Site 9) has pretreated the discharge before it is disposed off base. Prior to 1974, wastes disposed in the drainage channel may have been discharged directly to the Perris Valley Storm Drain Lateral A. The drainage channel is concrete lined (since the 1960s) to the eastern boundary of the base where it discharges to the unlined Perris Valley Storm Drain.

During the OU1 RI, soil samples were collected from boreholes, hand auger locations, and surface locations in and around Site 10. Two samples were collected from the sediments on top of the concrete-lined drainage channel. In addition, two continuously cored and angled soil borings were installed to intercept the water table directly below the concrete-lined drainage channel. Seven soil samples were collected from those boreholes. In addition, two hand auger sampling locations were also installed to collect soil samples at 0 and 5 feet directly below the concrete-lined channel. Soil samples were also collected off base and down stream of the concrete-lined channel to determine if contaminants had migrated off site. COCs identified during the OUI RI/FS included several PAHs that were detected in the sediments on the concrete-lined channel at concentrations that exceeded U.S. EPA Region IX PRGs.

Risk assessments were conducted for Site 10 following U.S. EPA Region IX and California EPA guidance. The risk assessments produced estimates of the potential risk to public health that could result from ingesting the contaminants detected at Site 10. The levels of PAH contamination in sediments were found to present a potential human health risk and, therefore, required remediation. The PAHs that required remediation included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene.

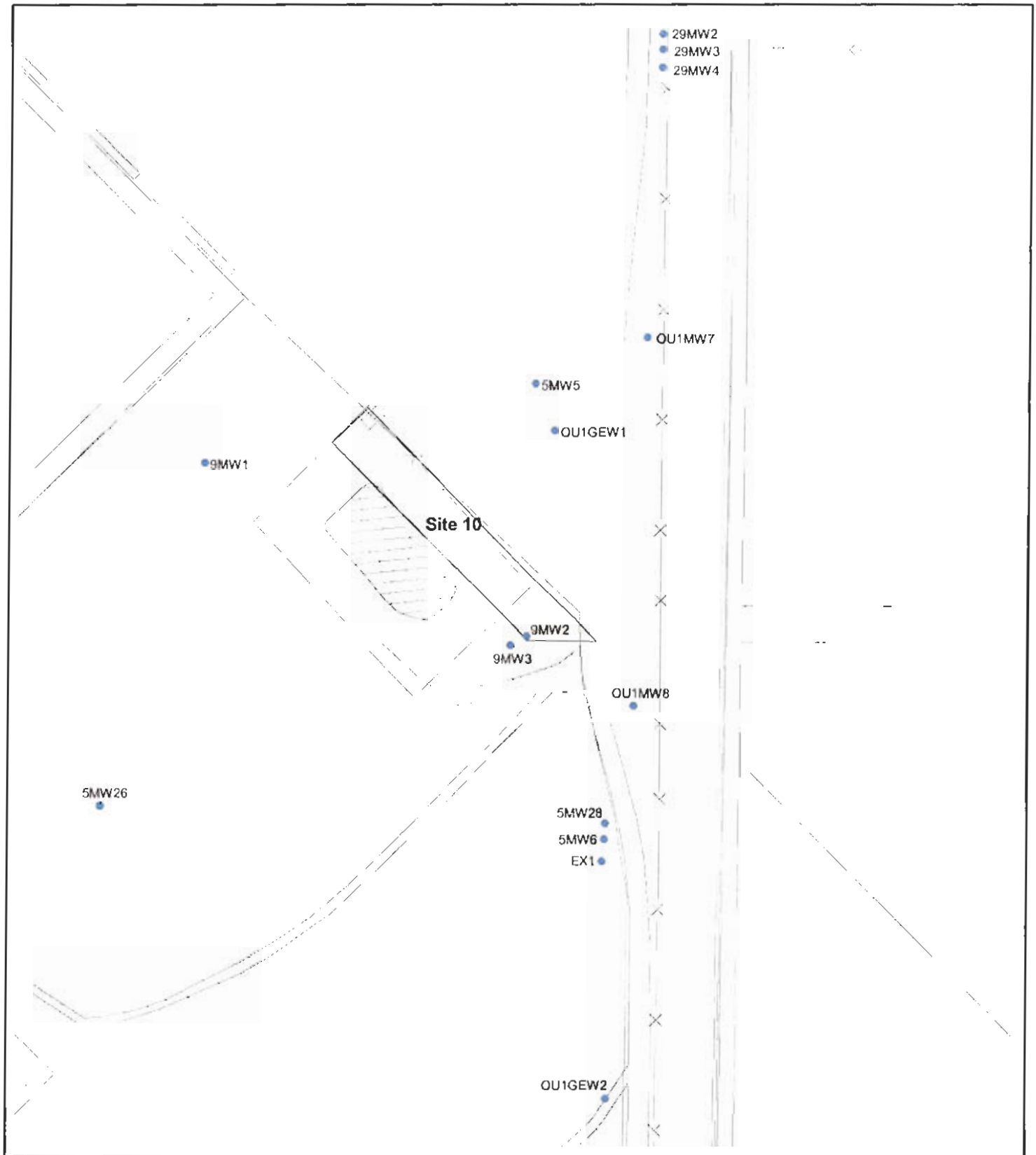
Site 10 remains Air Force property and it will remain Air Force property for the indefinite future. Site 10 is situated along the southeast end of the flightline apron and is secured from the general public by the base fence. Currently Site 10 is behind a security fence maintained by the AFRC and is not being used for residential, commercial, or municipal activities. There are no current users of groundwater at the site.

4.4.1 Remedial Actions

This section describes the remedy selection, implementation, system operations, and cleanup process for Site 10.

4.4.1.1 Remedy Selection.

The remedial action identified in the OU1 ROD for Site 10 was excavation and treatment of the contaminated sediments using low-temperature thermal desorption. Excavation removes the contaminated sediments from the site and low-temperature thermal desorption destroys the COCs, thereby protecting human health and the environment. The selected remedy addresses the principal threat posed by Site 10 by removing PAHs using a proven treatment technology. Since the remedy eliminates the residual contamination at the site, periodic inspections and long-term monitoring would not be required.



LEGEND

- Wells
- Structures/ Roads

N

150 0 150 Feet

DEPARTMENT OF THE AIR FORCE
HO AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 10
Operable Unit 1 5-Year Review
March Air Force Base

EARTH TECH
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Project No. 39663
Date: 09-03

Figure 4.4-1

The remedy selected in the OU1 ROD was altered slightly prior to the onset of remedial actions at Site 15. Low-temperature thermal desorption was selected in the OU1 ROD based on the outcome of an evaluation which rated the abilities and cost effectiveness of potential remedies in treating PAH-contaminated sediment. Since remediation of Site 10 was conducted at the same time as Site 15, another investigation of site contaminants identified petroleum soil contamination was present in addition to the PAH contamination described in the OU1 ROD. The remediation contractor responded to this new condition by performing additional analysis. The additional analysis resulted in the selection of bioremediation as the treatment method for sediment and soils at both Sites 10 and 15. It was determined that bioremediation would render the same outcome as was anticipated under the original remedy selected.

4.4.1.2 Remedy Implementation.

Remedial actions (excavation) at Site 10 were conducted on July 19, 1995 as part of the combined removal action at Sites 15 and 10. As part of the removal action, all contaminated sediment was removed from the cement-lined drainage ditch. The fuel and TPH-contaminated soil from Site 15 and PAH-contaminated sediment from Site 10 was transported to Candelaria Environmental for bioremediation.

4.4.1.3 System Operations/Operations and Maintenance.

There are no O&M activities required at the site since the approved removal action at Site 10 removed the sediment from the concrete-lined channel and left no residual contamination present on the site.

4.4.1.4 Progress since the Last 5-Year Review.

This is the first 5-year review for all sites at March AFB/ARB.

4.4.2 Site 10 5-Year Review Process.

The March AFB/ARB 5-year review at Site 10 was directed by Mr. Phillip Mook, AFRPA/DD March ROL. The following team member performed the review at Site 10:

- Mr. William Muir, Earth Tech.

The Site 10 5-year review consisted of the following activities: a review of related documents and interviews with the local AFRC Environmental Management office. No site inspection was conducted since the site had been remediated by OHM Remediation Services by removing all sediment from the concrete-lined drainage channel.

4.4.3 Site 10 5-Year Review Findings

This section describes findings of the 5-year review for Site 10.

4.4.3.1 Interviews.

The following individuals were contacted by Earth Tech as part of the 5-year review process:

- Mr. Phillip Mook, AFRPA, was contacted on September 11, 2003.
- Mr. Eric Lehto, March ARB Environmental Management Office was contacted on August 26, 2003.

Mr. Lehto stated that the AFRC has direct control over Site 10 and that no trespassing of the general public is allowed. Mr. Lehto stated that the site is secure from the general public because the site is situated on base, immediately adjacent to the flight line and no unauthorized access can be made without Air Force consent. Air Force security units patrol the perimeter of the site 24 hours a day, 7 days a week, 365 days a year because the site sits adjacent to the flightline parking apron.

4.4.3.2 Site Inspection.

No site inspection was performed because OHM removed all sediment from the concrete-lined drainage channel during the removal action in July 1995.

4.4.3.3 Risk Information Review.

Since all contaminated soil was removed from the site, no review of the previous risk data was necessary. The contaminated soil was completely removed during the remedial action conducted at the site in July 1995.

4.4.3.4 Data Review.

Site 10 was completely remediated in July 1995 and no contaminated sediment remains at the site. No further review was necessary.

4.4.4 Site 10 Assessment

The following conclusions support the determination that the actions performed at Site 10 are protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision document?

HASP/Contingency Plan: Site 10 has been completely remediated and there is no need to have an HASP or Contingency Plan for this site.

Implementation of Institutional Controls and Other Measures: Contaminated sediment from the site was completely removed during the removal action in July 1995. No further action is warranted.

Remedial Action Performance: The remedial action performed at the site was successful at removing all contaminated sediment from the site and remediation of the sediment off site was accomplished. No performance evaluation was necessary for this 5-Year Review.

System Operations/O&M: There are no O&M procedures at Site 10 since all contaminated sediment was removed from the site and bioremediated. Since 1974, the main oil/water separator pre-treats the discharge before it is released to the Site 10 drainage channel.

Opportunities for Optimization: There are no opportunities for optimization because there is no active remediation ongoing at the site. Contaminated soil was removed from the concrete-lined drainage channel in 1995 and bioremediated off site.

Early Indicators of Potential Remedy Failure: There are no indicators of remedy failure. All remedial actions have been successfully completed at Site 10 and the contaminated soil was removed and bioremediated off site.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in "Standards" and "To Be Considered": This 5-Year Review did not identify any "standards" or "to be considered" that would require a different remedy.

Changes in Exposure Pathway: No changes in site conditions that affect exposure pathways were identified in the course of the 5-year review.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in risk assessment methodologies since the OU1 ROD was signed.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy. Contaminated soil was completely removed from Site 10 during the 1995 removal action process and the main oil/water separator currently pre-treats flightline discharges before they enter the Site 10 drainage channel.

4.4.5 Site 10 Issues

No outstanding major deficiencies were noted during the 5-year review. The AFRC ensures the proper operation of the main oil/water separator in pre-treating discharges to the Site 10 drainage channel.

4.4.6 Site 10 Assessment

Site 10 was completely and successfully remediated as a result of the removal action that was conducted at the site in 1995. The site poses no threat to human health or the environment.

4.4.7 Site 10 Recommendations and Follow-Up Actions

Site 10 has been completely and successfully remediated as a result of the removal action completed in 1995. Therefore, Site 10 should not be included in future 5-year reviews.

4.4.8 Site 10 Protectiveness Statement

The remedial actions that have been implemented at Site 10 are protective of human health and the environment. Site 10 should be removed from any future 5-year review requirement.

4.4.9 Next Review

This is a statutory review of Site 10. This site was included in the 5-Year Review because the proposed remedial action identified in the OU1 ROD was different than the completed remedy. Since Site 10 was remediated to unrestricted remediation goals, Site 10 does not require future 5-year reviews. The completion date for this site is the date shown on the signature cover attached to the front cover of this report.

4.5 SITE 15 – FIRE PROTECTION AREA NO. 3

Site 15 is situated within the current cantonment area and is controlled by the AFRC. Site 15 is situated between Sites 5 and 7 at the southeast end of runway 12-30 (Figure 4.5-1). Site 15 was developed in 1978 as a fire protection training area. The site was reportedly constructed by placing an under-drain system and gravel over a clay liner. The drainage system transported firefighting water, solutions of aqueous film-forming foam (AFFF), and residual fuel used during training exercises to a formerly unlined water holding pond situated adjacent to Site 15. From 1978 until temporary closure in 1993, approximately 6,000 gallons of contaminated JP-4 jet fuel were burned at the site every year as part of the training exercises.

Site 15 was identified as a potentially contaminated site during the Phase I IRP, which began in March 1983. Groundwater and soil samples from boreholes, surface locations, and hand auger boreholes were collected from Site 15 during the OU1 RI to determine the extent of the contamination. The results of the sample analyses revealed that Site 15 surface soil was contaminated with beryllium, dioxins, and various PAHs. These contaminants were detected at concentrations greater than the December 1991 U.S. EPA Region IX residential PRGs.

In response to the level of the contaminants present at the site, a risk assessment was conducted for Site 15. The results of the risk assessment indicated that neither the beryllium nor the dioxins required remediation at this site. Beryllium was found to be naturally occurring. Although dioxin concentrations exceeded the U.S. EPA Region IX PRGs for unrestricted land use, cancer risk from dioxins was within the acceptable range for cancer risk (10^{-4} to 10^{-6} cancer risk) and did not require remediation. The PAHs, however, did require remediation.

Site 15 is within the OU1 groundwater plume. Information relating to the groundwater contaminants at Site 15 can be found in the OU1 Groundwater Plume review (see Section 4.10 of this document).

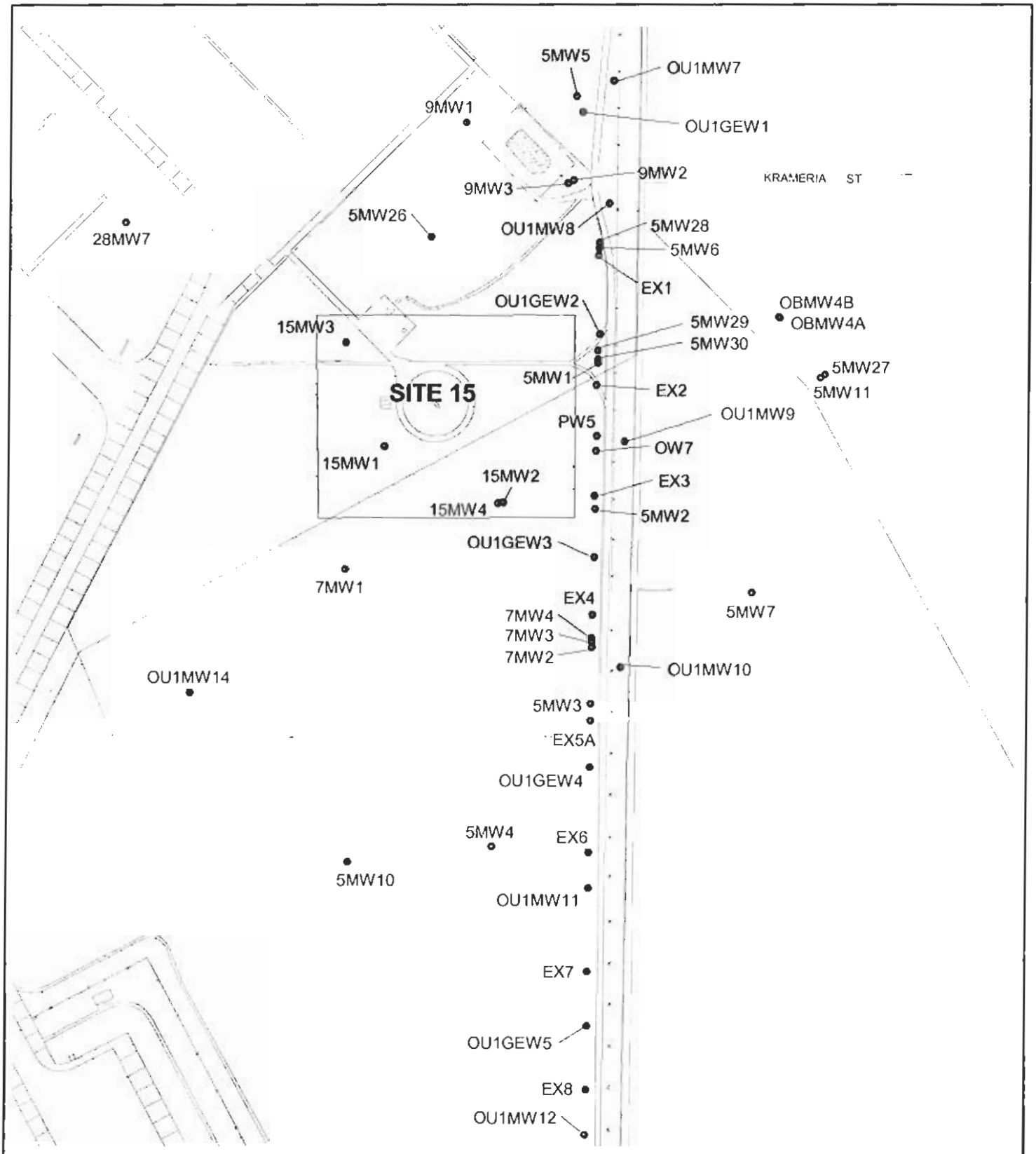
4.5.1 Remedial Actions

This section describes the remedial actions conducted at Site 15.

4.5.1.1 Remedy Selection.

The OU1 ROD determined that the contaminated soil at Site 15 would be excavated and remediated using low-temperature thermal desorption. The excavated area would then be backfilled with clean soil. Excavating removes the contaminated soil from the site and low-temperature thermal desorption destroys the COCs, thereby protecting human health and the environment. The selected remedy addresses the principal threat posed by Site 15 by removing PAHs using a proven treatment technology. In addition, since the remedy eliminates the residual contamination at the site, periodic inspections and long-term monitoring would not be required.

The remedy selected in the OU1 ROD was altered slightly prior to the onset of remedial actions at Site 15. Low-temperature thermal desorption was selected in the OU1 ROD based on the outcome of an evaluation that rated the abilities and cost effectiveness of potential remedies in treating PAH-contaminated soil. However, upon further investigation of the site, total petroleum hydrocarbon (TPH) contaminated soil was found in addition to the PAH contamination described in the OU1 ROD. The remediation contractor responded to this new condition by performing additional analysis. The additional



LEGEND

- Wells
- Structures/ Roads

N

450 0 450 Feet

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 15
Operable Unit 1 5-Year Review
March Air Force Base

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Project No. 39863
Date 09-03

Figure 4.5-1

analysis resulted in the selection of bioremediation as the preferred treatment method. Bioremediation would render the same outcome as that anticipated under the original remedy.

4.5.1.2 Remedy Implementation.

Remedial actions (excavation) at Site 15 began on June 26, 1995 and were completed on July 11, 1995. Approximately 2,525 cubic yards of soil were removed from the former fire training area and the adjacent evaporation pond. This amount of excavation greatly exceeded the amount estimated in the OU 1 ROD.

OHM Remediation Services Corporation excavated the PAH-contaminated soil from those areas identified in the OU1 ROD as requiring remediation at Site 15. Additional excavation was deemed necessary due to the identification of TPH-contaminated soil at levels that required remediation. In order to remediate the TPH contamination, soil was excavated from the fire training area to depths of between 1 and 6 feet below grade and was guided by visual observations of heavily stained soils and diesel/jet fuel odor. The final limits of the excavation were determined based on the results of confirmation samples, which noted levels of contamination at or below cleanup criteria established in the OU1 ROD for benzene, naphthalene, 2-methyl naphthalene, and phenanthrene (the specific COCs identified for Site 15). In addition to excavating the soil within the fire training area, contaminated soil was also excavated from the adjacent evaporation pond. The total depth of excavation at the evaporation pond was 23 feet bgs. Since dioxins were only found in one surface soil sample located just south of the evaporation pond, the depth and width of the excavations ensured removal of the dioxin-contaminated soil. All excavated soil was transported off site for bioremediation treatment and the excavated areas were backfilled with clean soil. Site 15 remedial actions were completed on September 14, 1995. The final closure report was submitted in March 1996.

4.5.1.3 System Operations.

Site 15 was completely remediated upon completion of the excavation procedures; therefore, no system operations and/or O&M Plans are required.

4.5.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review of all sites at March AFB/ARB.

4.5.2 Site 15 5-Year Review Process

Mr. Michael Zabaneh, AFBCA/DD March ROL, directed the 5-year review at site 15. The following team members performed the review for Site 15:

- Mr. Manish Joshi, Earth Tech
- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The 5-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a site inspection, where warranted. The public was informed regarding the review during the RAB meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet

compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.5.3 Site 15 5-Year Review Findings

This section describes the 5-year review findings for Site 15.

4.5.3.1 Interviews.

The following individuals were contacted by Earth Tech as part of the 5-year review:

- Mr. Larry Sievers, Booz Allen & Hamilton (telephone interview on 4/6/00)
- Mr. Eric Lehto, 452 SPTG/CEV, March ARB (8/23/00).

Mr. Sievers stated that the only changes relating to Site 15 since the OU1 ROD was signed was that the ESD changed the remedy selection. Mr. Lehto concurred with Mr. Sievers' assessment of the Site 15 remedy.

4.5.3.2 Site Inspection.

Although there is an ongoing Air Force presence at the site and the risks were eliminated upon remediation, Ms. Pearson and Mr. Tucker conducted a site inspection on August 23, 2000. The site of the former fire training area has been redeveloped into a new fire training area that uses propane piped into the site to simulate an aircraft fire. No liquid fuel is used and, therefore, no releases of hazardous chemicals to the ground are conducted at the site. No evidence of trespassing or vandalism, erosion, staining, unusual odors, or distressed vegetation was noted during a thorough walkthrough in and around the site.

4.5.3.3 Risk Information Review.

December 1991 U.S. EPA Region IX PRG standards were identified as ARARs in the OU1 ROD and were reviewed for changes that could affect protectiveness.

Concentrations of analytes detected in the surface soil (0- to 2- foot interval) were compared to December 1991 U.S. EPA Region IX residential PRGs. These PRGs have changed since the OU1 ROD was signed. The new PRGs (October 2002) have become less stringent, as shown in Table 4.5-1; therefore, these changes do not affect protectiveness.

Site 15 remedial actions were performed in compliance with all action-specific ARARs. These action-specific ARARs were not reviewed for change because the remedial actions that were applicable or relevant to these standards were completed before the OU1 ROD was signed in June 1996. Therefore, any change in these standards would not be applicable. Location-specific ARARs had not been identified for this site.

Cleanup levels for surface soil contaminants were developed using a risk assessment that predicted future risk to human health. The risk assessment examined all of the possible exposure pathways through which each contaminant could be ingested. The assessment also examined the possible threats that various levels of ingestion would cause. Site-specific cleanup levels were determined as a result of

Table 4.5-1. Site 15 Changes in PRGs*

Contaminant	Media	Previous* Residential PRG (mg/kg) (Dec 1991)	Current Residential PRG (mg/kg) (Oct 2002)
Benzo(a)pyrene	Soil	0.061	0.062
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	Soil	0.0000038(1)	0.0000039(1)
Heptachlorinated dibenzo-p-dioxins, total	Soil	0.0000038(1)	0.0000039(1)
Beryllium	Soil	0.14	150
Naphthalene	Soil	19[2]	56
2-Methyl Naphthalene	Soil	19[2]	56[3]
Phenanthrene	Soil	19[2]	56[3]

Notes: [1] 2, 3, 7, 8-TCDD is the only dioxin for which Region IX has calculated PRGs (the PRG was previously 3.8E-06 and is currently 3.9E-06). These PRGs have, therefore, been adjusted using TEF. The TEF for 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin is 0.01 mg/kg, and the TEF for heptachlorinated dibenzo-p-dioxins, total is 0.01 (TEFs were obtained from "*Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities,*" Cal EPA, Department of Toxic Substances Control (DTSC), Office of the Science Advisor [July 1992]). Although the PRGs have changed since the OU1 ROD was signed, the TEFs remain the same.

[2] A PRG was not available for this PAH. The December 1991 PRG for anthracene, which was the most conservative PRG for noncarcinogenic PAHs, was used as a surrogate.

[3] A PRG was not available for this PAH. The October 2002 PRG for naphthalene, which is now the most conservative PRG for noncarcinogenic PAHs, was used as a surrogate.

*Values presented in the OU1 ROD, 1996.

mg/kg = milligram per kilogram

PRG = Preliminary Remediation Goal

these examinations. There have been no changes in exposure pathways or toxicity factors that could negatively affect the protectiveness of the remedy since these cleanup levels were set.

No changes in exposure pathways or toxicity factors warranting risk recalculations have been identified.

4.5.3.4 Data Review.

A review of the Site 15 final closure report indicates that the site has been successfully remediated. The results of analyses performed for the initial site characterizing samples defined the COCs and the levels at which they occurred at the site. The results of the confirmation samples indicate that the site has been remediated to acceptable levels (OHM Corp., 1996).

The primary contaminants of concern were benzene, naphthalene, 2-methyl naphthalene, and phenanthrene. Table 4.5-2 lists these soil contaminants and provides the cleanup goals for each contaminant as they were determined under the OU1 risk assessments. The results of the confirmation samples were all at or below these cleanup levels.

Table 4.5-2. Site 15 Surface Soil Contaminants

Contaminant of Concern	Cleanup Goal[1]
Benzene	6.8 mg/kg
Naphthalene	1.5 mg/kg
2-Methyl Naphthalene	1.5 mg/kg
Phenanthrene	1.5 mg/kg

Note: [1] Values taken from OHM Final Sampling and Analysis Plan, 1996.
mg/kg = milligrams per kilogram

4.5.4 Site 15 Assessment

The following conclusions support the determination that the remedy at Site 15 is expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: The site currently presents no unacceptable risks to human health and the environment. Contamination has been removed to acceptable levels. The HASP for this site is incorporated in the Basewide RI/FS HASP, which is in place and properly implemented.

Implementation of Institutional Controls and Other Measures: There are no current or planned land use changes. The site will remain within AFRC control. ICs are in place to ensure the public does not have access to the site.

Remedial Action Performance: The excavation was successful in remediating the site. The contaminated soils were removed from the site, thereby eliminating the threat to human health and the environment.

System Operations/O&M: No system operations and/or O&M Plans were performed or planned.

Opportunities for Optimizations: The remedy has been completed; therefore, there are no optimization opportunities.

Early Indicators of Potential Remedy Failure: The remedy has been completed; therefore, there is no potential for remedy failure.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and to be Considered: This 5-year review identifies U.S. EPA Region IX PRGs that have changed since the OU1 ROD was signed. These changes are not significant enough to change the protectiveness of the remedy.

Changes in Exposure Pathways: No changes in site conditions affecting exposure pathways were identified as part of the 5-year review. There are no current or planned land use changes; no new contaminants, sources, or routes of exposure were identified.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

4.5.5 Site 15 Issues

The remedial actions at Site 15 have been completed and no deficiencies/issues were noted.

4.5.6 Site 15 Assessment

The remedial action conducted at Site 15 remediated the site to below cleanup criteria established in the OU1 ROD. The OU1 ROD selected low-temperature thermal desorption over ex-situ bioremediation because it was less expensive and more easily implemented. However, prior to remediation, another evaluation was done that identified petroleum contamination in the subsurface soils. The remediation contractor performed another cost analysis in which the equally protective remedy of bioremediation was preferred over low-temperature thermal desorption. An Explanation of Significant Difference (ESD) was prepared that described the preferred alternative as bioremediation and the regulatory agencies concurred with this remedy change. The site was excavated and the contaminated soil was taken off site for bioremediation. Confirmation sampling showed that the remaining soil contamination was at levels lower than the cleanup standards established in the OU1 ROD and the site was backfilled with clean soil and closed. Currently, a state-of-the art fire training facility is situated on the former Site 15. This new facility uses propane as the flammable material, which negates the need to spill fuels and solvents on the ground.

4.5.7 Site 15 Recommendations and Follow-up Actions

There are no recommendations or follow-up actions for Site 15 since the site has been remediated to cleanup levels established in the OU1 ROD.

4.5.8 Site 15 Protectiveness Statements

The remedy at Site 15 is protective of human health and the environment. The excavation was effective in permanently removing the threats posed by contamination at the site.

4.5.9 Next Review

This is a statutory review of Site 15. This site was included in the 5-Year Review because the proposed remedial action identified in the OU1 ROD was different than the completed remedy. Since Site 15 was remediated to unrestricted remediation goals, Site 15 does not require future 5-year reviews. The completion date for this site is the date shown on the signature cover attached to the front cover of this report.

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4.6 SITE 18 - ENGINE TEST CELL

Site 18 is situated between the active runway to the west, the aircraft parking apron to the east, Taxiway No. 1 to the south, and Taxiway No. 2 to the north (Figure 4.6-1). The site is situated within the current cantonment and is controlled by the AFRC. An engine test cell historically operated within the area of Site 18. The test cell was constructed in 1957 for the purpose of testing aircraft engines; it has been inactive for several years. An oil/water separator was installed at the test cell in 1976. Water from the separator was discharged to a leach field. Oil was collected by a base contractor for off-base disposal. Prior to 1976, spills of oil, fuels, or solvents were drained to a nearby ditch.

Soil and groundwater contamination at Site 18 primarily consists of petroleum fuel products. One potential source of the fuel contamination was overflow of portable fuel tanks that were placed at the site to store fuels for use at the engine test cell. Another potential source was overflow of fuel tanks on aircraft that were parked on the "hot cargo pad" situated between the engine test cell and Taxiway No. 2 in the past. From the late 1950s to the early 1980s, the "hot cargo pad" north of the Engine Test Cell was used extensively by B-52s on alert status, the potential for a release of JP-4 to the ground was high. During OU1 RI/FS investigations, up to 10 feet of floating product was identified in one of the wells at the site, and more recently, in February 2000, 11 feet of floating free product were measured in a Site 18 well.

During the OU1 RI/FS, soil samples from boreholes and surface locations, as well as groundwater samples, were collected from Site 18. The surface soil sampling detected beryllium at concentrations greater than the U.S. EPA Region IX residential PRG. Subsurface soil contaminants detected included volatile jet fuel components, oil and grease, and semivolatiles (naphthalene, bis 2-ethylhexyl phthalate, and di-n-butyl phthalate). BTEX, methylene chloride, and phenols were detected in the groundwater at Site 18.

During the OU1 RI/FS, a human health and environmental risk assessment was conducted for Site 18 in accordance with U.S. EPA Region IX and California EPA guidance. The risk assessment produced estimates of the potential risks to human health and the environment from the aforementioned contaminants detected at Site 18. Based on the results of the surface soil risk assessment, beryllium did not require remediation. It was determined that the groundwater would require remediation. Since the jet fuel had migrated to the water table and impacted groundwater with concentrations of contaminants above the MCLs, the California Regional Water Quality Control Board, Santa Ana Region required subsurface soil remediation.

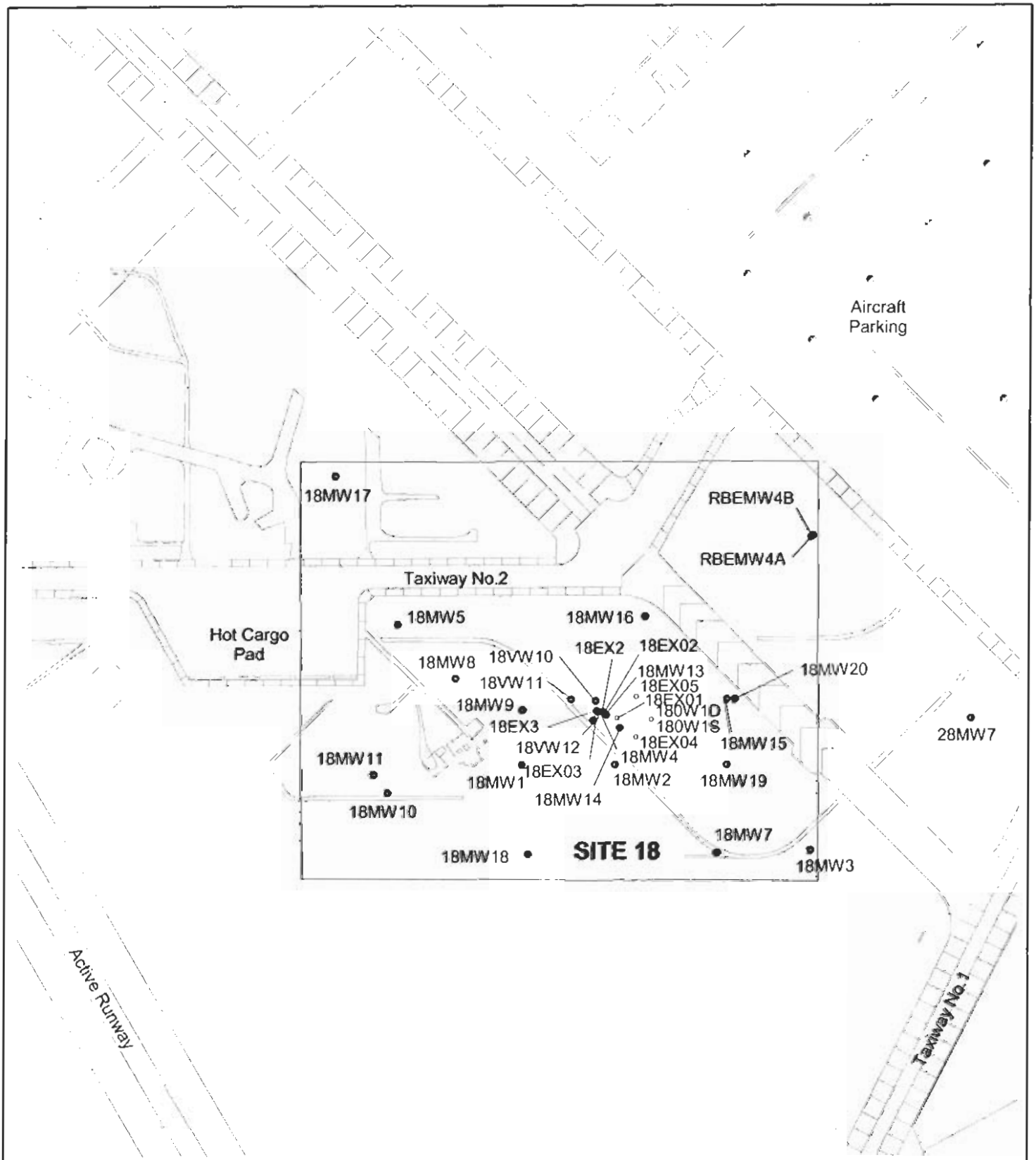
4.6.1 Remedial Actions

This section describes the remedy selection, implementation, systems operations, and cleanup process for Site 18.

4.6.1.1 Remedy Selection.

The Site 18 remedial action objectives as stated in the OU1 ROD are as follows:

- Prevent ingestion of or direct contact with contaminated groundwater and soils
- Eliminate contaminant loading to the groundwater
- Prevent contaminants from migrating off base
- Recover and treat the contaminated groundwater and discharge the treated water.



LEGEND

- Wells
- Structures/ Roads

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450 0 450 Feet

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 18
Operable Unit 1 5-Year Review
March Air Force Base

EARTH TECH
tyco INTERNATIONAL LTD. COMPANY

Project No. 28863
Date: 09-03

Figure 4.6-1

The remedial actions selected to achieve theses objectives were:

- Soil vapor extraction (SVE) with treatment by thermal oxidation
- Groundwater extraction, treatment, and reinjection.

The OU1 ROD states that the preferred method of cleanup for the subsurface soil is SVE with treatment via the Purus PADRE™ system. It was later decided by the Air Force, in concurrence with the regulatory agencies, that a more effective treatment of soil vapors would be catalytic/thermal oxidation. SVE mechanically removes volatile contaminants from unsaturated soils. The contaminated vapors are then treated by catalytic or thermal oxidation. This remedy reduces soil contaminant concentrations and prevents further degradation of groundwater quality through contaminant migration.

The remedy selected for the contaminated groundwater at Site 18 was extraction and treatment with liquid-phase GAC. The remedy incorporated oil/water separation to remove free product from the extracted groundwater. The selected remedy provides protection to human health and the environment through recovery of contaminated groundwater and subsequent removal of the contaminants. The selected remedies address the principal threats present at Site 18 by removing the contamination using proven treatment technologies.

4.6.1.2 Remedy Implementation.

Initial remedial actions (conducted in 1996 and 1997) consisted of additional investigations of the site and a pilot test. Several alternative cleanup remedies (air sparging, high vacuum extraction, and free-product removal) were also investigated, but were not shown to be an improvement over the selected OU1 ROD remedy. Based on the additional investigations, the conceptual site model was refined. The primary source of the contamination was determined to be a floor drain in the jet engine test cell. Prior to the oil/water separator installation in 1976, the floor drain led to a dry well. The fuel drained into the dry well subsequently migrating away from the well horizontally through sandy soil layers and percolation downward. Over the years, these contaminated sandy soil layers have been submerged by a continually rising water table.

Subsequent investigations at Site 18 consisted of performing long-term aquifer pump tests, SVE tests, and the construction of a well system (three dual phase extraction wells [DPEWs]) with associated piping and vapor treatment facilities. System construction, functional testing, and checkout were completed in February 1999. The proposed treatment approach involved groundwater extraction and treatment, free product removal, and dewatering of the site to allow removal of contaminants in the smear zone via SVE.

The Site 18 treatment system consists of several subsystems. These include three multiphase extraction wells, monitoring and piezometer wells, SVE and treatment facilities, a free product and phase-separation groundwater pretreatment system, and a water transfer (pumping and pipeline) system. The extracted soil vapors were treated at Site 18 via a thermal/catalytic oxidation system, while the groundwater was transferred to the OU1 EGETS treatment plant for final treatment by GAC adsorption.

The principal methods applied in the Site 18 soil remediation design included soil vapor extraction from the dewatered soils. Coupled with SVE, soil venting by air injection in the primary treatment area was part of the soil remediation technology, thus facilitating vapor flow through the soils of variable permeability and supplying extra oxygen for the in-situ hydrocarbon degradation processes. A self-contained electrically driven vapor extraction and propane-fueled treatment unit (catalytic/thermal oxidation), rated for up to 500 cubic feet per minute flow rate and vacuum (12 - 14 inches mercury [Hg])

was installed to handle the SVE/treatment requirements for Site 18. The Site 18 remedial system did not incorporate the Purus PADRE™ system as was described in the OU1 ROD. In 2000, the Air Force discontinued operation of the catalytic/thermal oxidizer unit at Site 18 and tried another approach using high vacuum extraction technology. This system used existing extraction wells connected to a pilot scale high vacuum extraction blower system. The nature of the subsurface soils prohibited effective use of the high vacuum extraction system. The Air Force is currently evaluating free-product removal technology.

4.6.1.3 System Operations.

The three-well groundwater/SVE system began operating in March 1999. Groundwater modeling predicted that the three wells would need to run for a year to draw down the water table enough to allow the SVE to be effective. SVE was attempted during the year of groundwater extraction, and was proven to be ineffective. After the first year, the groundwater drawdown was evaluated, and it was determined that the drawdown had not reached the contaminated soil layers. The water level initially dropped rapidly, but little decrease in the water level was observed during the last 6 months of operation.

All groundwater/SVE systems have been shut down while the technology is re-evaluated, although groundwater monitoring is ongoing. The groundwater plume is stable and does not threaten downgradient drinking water wells situated south of the base. The EGETS, situated at the base boundary, also acts as a groundwater interdiction system and provides additional protection (see Section 4.10 of this document). O&M documents reviewed during this 5-year review are listed in Appendix C.

4.6.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review of all sites at March AFB/ARB.

4.6.2 Site 18 5-Year Review Process

Mr. Michael Zabaneh, AFBCA/DD March ROL, directed the 5-year review for Site 18. The following team members performed the review at Site 18:

- Mr. Manish Joshi, Earth Tech
- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The 5-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a site inspection, where warranted. The public was informed regarding the review during the RAB meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.6.3 Site 18 5-Year Review Findings

This section describes the findings of the 5-year review for Site 18.

4.6.3.1 Interviews.

The following individuals were contacted by Earth Tech as part of the 5-year review:

- Mr. Ivan Vargas, Montgomery Watson (phone interview on July 10, 2000)
- Mr. Eric Lehto, 452 SPTG/CEV, March ARB (August 23, 2000).

Mr. Vargas stated that soil vapor and groundwater extraction had been halted at Site 18. He said that the groundwater extraction operations were put offline on March 21, 2000. He said that current operations at Site 18 include monitoring water levels at the site and removing free product as it collects in the wells. Mr. Lehto concurred with the information provided by Mr. Vargas, and stated that the status of the treatment is currently under review by the Air Force and regulatory agencies. Mr. Lehto also indicated that the Air Force will be submitting an OU1 ROD modification in the near future to remove Site 18 from the CERCLA process and the site will be managed as a fuel-contaminated site, which will be regulated by the California Regional Water Quality Control Board, Santa Ana Region.

4.6.3.2 Site Inspection.

Ms. Pearson and Mr. Tucker conducted a site inspection on August 22, 2000. Because Site 18 is situated in the airfield area of the base, east of the active runway, west of the aircraft parking apron, and between Taxiway 1 to the south and Taxiway 2 to the north, Mr. Lehto accompanied the site inspection team. No evidence of trespassing or vandalism, erosion, staining, unusual odors, or distressed vegetation was noted during a thorough walkthrough at and in the vicinity of the site. On-site wells and equipment were in good condition.

4.6.3.3 Risk Information Review.

The following standards were identified as ARARs in the OU1 ROD. They were reviewed for changes that could affect protectiveness:

- MCLs for Primary Drinking Water (Title 22, CCR, Division 4, Chapter 15, Article 5.5, Section 64444.5)

- National Primary Drinking Water Regulations (40 CFR 141.61 MCLs for Organic Contaminants).

Although there are no current users of groundwater in the immediate vicinity of March AFB/ARB, the State of California considers groundwater beneath the base to be a source of drinking water. Therefore, federal and state MCLs, which are chemical-specific ARARs and drinking water standards, are used as cleanup standards. Where the federal and the state MCLs for a contaminant are not the same, the more stringent of the two is used as a cleanup standard. Since the signing of the OU1 ROD there have been no changes to these standards. Therefore, the established groundwater cleanup levels for Site 18 are still expected to be protective of human health and the environment.

Site 18 subsurface soil contaminants primarily consist of BTEX. Due to existing groundwater contamination at the site and the potential for subsurface soil contaminants to provide a continuing source of groundwater contaminants, the California Regional Water Quality Control Board requested that subsurface soil remediation strategies be included at Site 18. Cleanup criteria for subsurface soils were developed such that soil contaminants would not be expected to leach into groundwater at concentrations greater than applicable groundwater standards (federal and state MCLs).

Modeling the entire soil column from the ground surface to the groundwater assessed impacts of contaminant migration from soil to groundwater. Two models were used: VLEACH, a vadose zone contaminant transport model, and MIXCELL, a mixing cell model that calculates groundwater contaminant concentrations from contaminant fluxes supplied by VLEACH. There have been no changes at Site 18 that would alter the outcome of the VLEACH and MIXCELL models. No differing characteristics in the soil column have been discovered since the signing of the OU1 ROD and the federal and state drinking water MCLs that serve as endpoints for the model have not changed. Therefore, the soil remedial actions at Site 18 are still expected to be protective.

No changes in exposure pathways or toxicity factors warranting risk recalculations have been identified. In summary, there have been no changes in the conditions at Site 18 that affect protectiveness.

4.6.3.4 Data Review.

From October 1997 until March 1998, approximately 4.9 million gallons of groundwater were extracted from Site 18. The extracted groundwater was sampled periodically and analyzed for TPH and BTEX compounds. Based on the analytical results and the extraction flow rates, groundwater extraction at Site 18 resulted in the removal of approximately 38 pounds of BTEX and 112 pounds of TPH. Additionally, approximately 115 gallons (~670 pounds) of free product (weathered JP-4) were recovered during the pilot test program. In March 1999, Site 18 was tied into the OU1 treatment facility, as groundwater pumped from three wells at Site 18 began to be transferred to the treatment system. Until March 1999, approximately 42.3 million gallons of water had been extracted from Site 18 and treated at the OU1 treatment facility.

A review of sampling data indicates that BTEX and TPH concentrations were reduced during the limited remedial action that had been implemented at the site. The contaminant concentrations, however, remain above cleanup standards. In March 2000, TPH concentrations were found to range from 500 μg/l to 6,100 μg/l and benzene concentrations ranged from 38μg/l to 1,100 μg/l. Finally, floating free product continues to accumulate in a few of the Site 18 wells.

4.6.4 Site 18 Assessment

Remedial actions at Site 18 are currently being re-evaluated by the Air Force. In the interim, the Air Force has taken steps to ensure protection of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: The HASP for Site 18 is in place and properly implemented. Since Site 18 is situated between the active runway, the aircraft parking apron, and Taxiway 1 to the south and Taxiway 2 to the north, there is no way that the public would have uncontrolled access to the site. In addition, any proposed excavation or construction-related activities at Site 18 would require a Base Digging Permit to be processed. These steps assure that no one will excavate or dig within the Site 18 area unless approval is received from both the Base Environmental Office and the regulatory agencies. Should AFRC propose any construction projects or excavation within Site 18, the Regional Water Quality Control Board, Santa Region would be notified and consulted.

Implementation of Institutional Controls and Other Measures: Site 18 is in an area to be retained by the Air Force. Since the OU1 ROD's signature, the Air Force and regulatory agencies have recognized that the ICs are an important part of any remedy where waste is left in place above regulatory levels. Site

18 is currently part of March ARB and will not be transferred by deed in the indefinite future. The AFRC, will identify the site as an IRP site in the BCP and all intrusive work anywhere on base requires that the Base Environmental Office approve the project through the Base Digging Permit process. Therefore, any work to be conducted on or around Site 18 requires approval from the Base Environmental Office prior to the work being conducted. These steps assure that no one will excavate or dig within the Site 18 area unless approval is received from both the Base Environmental Office and the regulatory agencies. AFRC will continue to monitor groundwater downgradient of the site as part of the Basewide Groundwater Monitoring Program and EGETS O&M. Due to the location of Site 18, ICs are in place to ensure that the public does not have access to the site.

Remedial Action Performance: The remedial alternative is currently undergoing re-evaluation. In addition, the Air Force will be submitting an OU1 ROD modification to remove Site 18 from the CERCLA process in the near future. When Site 18 is removed from the CERCLA process, regulatory oversight would then be done by the Regional Water Quality Control Board, Santa Ana Region.

System Operations/O&M: Current O&M activities at Site 18 include groundwater monitoring and limited free-product removal. Once a remedy is selected and implemented, O&M activities will reflect the required O&M of the particular treatment system selected.

Opportunities for Optimizations: Remedial actions for Site 18 are currently being re-evaluated.

Early Indicators of Potential Remedy Failure: Remedial alternatives are currently being re-evaluated for Site 18. The selected remedy identified in the OU1 ROD will also be re-evaluated in the near future as well as other alternatives to determine the best approach for effectively remediating the site.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and to be Considered: This 5-year review did not note any changes in standards or other issues to be considered that have occurred since the OU1 ROD was signed.

Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified as part of the 5-year review. There are no current or planned changes in land use and no new contaminants, sources, or routes of exposure identified.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed that call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

4.6.5 Site 18 Issues

Remedial action alternatives are currently being re-evaluated. Since Site 18 is a fuel spill site, the Air Force will issue an OU1 ROD modification in the near future that will remove Site 18 from the CERCLA process and put Site 18 into the State of California Corrective Action Program for fuel sites, which is administered through the California Regional Water Quality Control Board.

4.6.6 Site 18 Assessment

Remedial action alternatives are currently being re-evaluated for Site 18. Site 18 is situated between the active runway to the west, the parking apron to the east, Taxiway 1 to the south, and Taxiway 2 to the north. Site 18 is currently not being used for residential purposes and will not be used for residential purposes in the near future because of its close proximity to the active runway and the active taxiways that immediately surround the site. There are no users of groundwater beneath the site; therefore, there is no immediate threat from the consumption of groundwater resources from the site. Downgradient of Site 18, the base boundary pump-and-treat system (EGETS) collects and treats contaminated groundwater that is migrating that direction, which includes groundwater from Site 18. The Air Force will be submitting a modification to the OU1 ROD that will remove Site 18 from the CERCLA process and the Regional Water Quality Control Board, Santa Ana Region, will then be responsible for regulatory oversight.

4.6.7 Site 18 Recommendations and Follow-up Actions

Strategies for implementation of final remedial actions at Site 18 are currently under review by the Air Force and the regulatory agencies. There are currently no other recommendations or follow-up actions proposed.

4.6.8 Site 18 Protectiveness Statements

Final remedial actions have not been implemented at Site 18 and protectiveness is uncertain pending resolution of the final remedial actions currently under review by the Air Force and Regional Water Quality Control Board. Site 18 will continue to be under AFRC control for the indefinite future and the site is not being used for residential purposes. Based on the location of Site 18, there is very little likelihood of public access to the site. Site 18 remains Air Force property and land use controls are in-place to protect human health and the environment. Through the Air Force Digging Permit process, excavation and other construction activities require approval from the Base Environmental Office before any work can be done at the site. Although there are no current users of groundwater in the immediate vicinity of Site 18, the State of California considers the groundwater beneath Site 18 to be a potential source of drinking water. The AFRC prohibits the use of groundwater under the base.

4.6.9 Next Review

This is a statutory review of Site 18 that would normally require ongoing 5-year reviews. However, if the OU1 ROD modification is approved to remove Site 18 from the CERCLA process, this site would become a State of California regulated site and would not be included in the next 5-year review process. If the site is not removed from the CERCLA process, the next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

4.7 SITE 29 – FIRE PROTECTION TRAINING AREA NO. 15

Site 29 is situated along the eastern part of the base, north of Site 9 (Figure 4.7-1). The site is situated within the current cantonment and is controlled by the AFRC. The area was used as a fire protection training pit prior to 1951. A review of aerial photographs taken in 1959 showed the site covered an area of approximately 1 acre (42,000 square feet). The sources of soil contamination at Site 29 were burn pits situated throughout the southern portion of the site. While information about Site 29 was limited, large quantities of aviation gas, oils, jet fuels, and solvents were reported to have been used during training exercises for the base fire department.

Initial field investigations at Site 29 took place during the months of April 1992 throughout September 1992, and again from December 1992 to January 1993. An additional site characterization study was conducted in November 1993. Soil samples from boreholes and surface locations as well as groundwater samples were collected from Site 29.

The COCs in the soil at Site 29 were beryllium, lead, manganese, and dioxins. These contaminants were detected at concentrations greater than the December 1991 U.S. EPA Region IX residential PRGs, but lower than the industrial PRGs. Based on the 1991 PRGs, no contaminants at this site require remediation. The OU1 ROD selected no further action for Site 29. Site 29 remains Air Force property and it will remain Air Force property for the indefinite future. Site 29 is situated along the southeast end of the flightline apron and is secured from the general public by the base fence. Currently Site 29 is behind a security fence maintained by the AFRC and the site is not being used for residential, commercial, or municipal activities.

Site 29 is within the OU1 groundwater plume; information relating to the groundwater contaminants at Site 29 can be found in the OU1 Groundwater Plume review (see Section 4.10 of this document). There are no current users of groundwater at the site.

4.7.1 Site 29 Remedial Actions

The following sections describe the remedial action conducted at Site 29.

4.7.1.1 Remedy Selection.

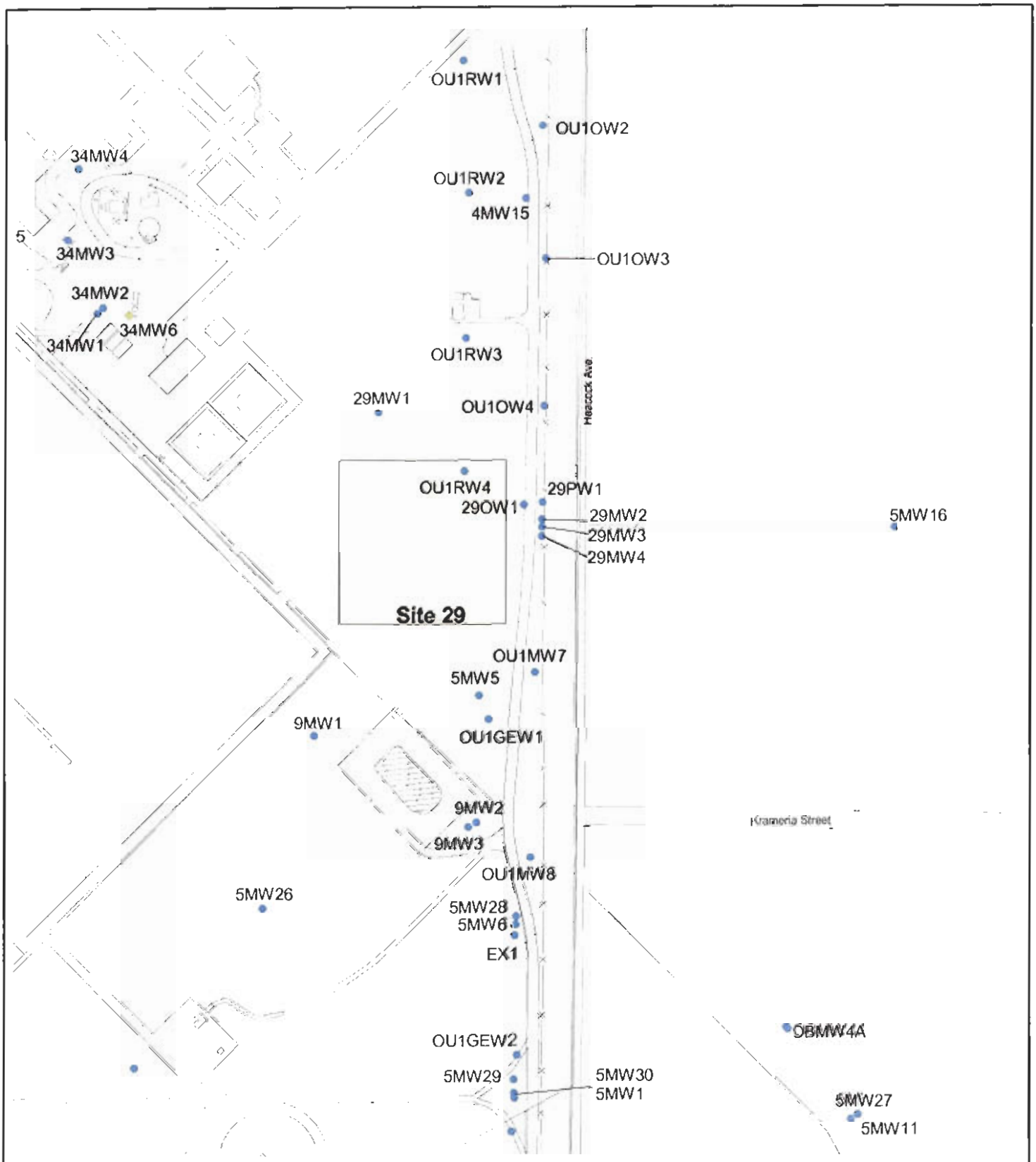
The OU1 ROD identified that no further remedial action was required for Site 29, based on the results of the risk assessment performed under the OU1 RI. Implementation of ICs were proposed for the site.

4.7.1.2 Remedy Implementation.

Since the OU1 ROD determined that no further action was required for Site 29, ICs are to be enforced to ensure that the public will not access the area.

4.7.1.3 System Operations.

Systems operations and/or O&M Plans do not exist for sites with no further action.



LEGEND

- Wells
- Structures/ Roads

N

300 0 300 Feet

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 29
Operable Unit 1 5-Year Review
March Air Force Base

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Project No. 38363
Date: 09-03

Figure 4.7-1

4.7.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review of all sites at March AFB/ARB.

4.7.2 Site 29 5-Year Review Process

Mr. Michael Zabaneh, AFBCA/DD March ROL, directed the 5-year review for Site 29. The following team members performed the review for Site 29:

- Mr. Manish Joshi, Earth Tech
- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The 5-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a site inspection, where warranted. The public was informed regarding the review during the RAB meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.7.3 5-Year Review Findings

The following paragraphs describe the review findings at Site 29.

4.7.3.1 Interviews.

The following individual was contacted by Earth Tech as part of the 5-year review:

- Mr. Eric Lehto, 452 SPTG/CEV, March ARB (telephone interview on April 11, 2000 and in-person interview on August 23, 2000).

Mr. Lehto stated that the conditions at Site 29 have not changed since the OU1 ROD was signed and there are no planned changes in land use.

4.7.3.2 Site Inspection.

Although the ongoing Air Force presence at the site prohibits public access, Ms. Pearson and Mr. Tucker conducted a site inspection on August 23, 2000. No evidence of trespassing or vandalism, erosion, staining, unusual odors, or distressed vegetation was noted during a thorough walkthrough at and in the vicinity of the site.

4.7.3.3 Risk Information Review.

The December 1991 U.S. EPA Region IX PRG standards were identified as chemical-specific ARARs in the OU1 ROD and were reviewed for changes that could affect protectiveness. The U.S. EPA Region IX PRGs have changed since the OU1 ROD was signed. The October 2002 PRGs for some of the COCs

have become less stringent; therefore, the change does not affect protectiveness. The changes are noted in Table 4.7-1.

Table 4.7-1. Site 29 Changes in PRGs

Contaminant	Media	Concentration (mg/kg)	Residential PRG (mg/kg)		Industrial PRG (mg/kg)	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	Soil	ND-0.00079	Previous (Dec 1991)	0.0000038[1]	Previous	0.000024[1]
			New (Oct 2002)	0.0000039[1]	New	0.000016[1]
Heptachlorinated dibenzo-p-dioxins, total	Soil	ND-0.0014	Previous (Dec 1991)	0.0000038[1]	Previous	0.000024[1]
			New (Oct 2002)	0.0000039[1]	New	0.000016[1]
Beryllium	Soil	0.27-0.66	Previous (Dec 1991)	0.14	Previous	1.1
			New (Oct 2002)	150	New	1900
Manganese	Soil	250.0-554.0	Previous (Dec 1991)	380	Previous	7800
			New (Oct 2002)	1800	New	19000
Lead	Soil	5.3-246.0	Previous (Dec 1991)	130[2]	Previous	1000
			New (Oct 2002)	400[3]	New	750

Notes: [1] 2, 3, 7, 8-TCDD is the only dioxin for which Region IX has calculated PRGs (the PRG was previously 3.8E-06 and is currently 3.9E-06). These PRGs have, therefore, been adjusted using TEF. The TEF for 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin is 0.01, and the TEF for heptachlorinated dibenzo-p-dioxins, total is 0.01 (TEFs were obtained from "*Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities,*" CAL EPA, DTSC, Office of the Science Advisor [July 1992]). Although the PRGs have changed since the OU1 ROD was signed, the TEFs remain the same.

[2] The CAL EPA PRG was used for this chemical because it is more restrictive than the Region IX PRG.

Current PRG for lead not based on CAL EPA; most stringent is the Region IX PRG (Oct 2003).

mg/kg = milligram per kilogram
PRG = Preliminary Remediation Goal

No changes in exposure pathways or toxicity factors warranting risk recalculations have been identified. In summary, there have been no changes in the conditions at Site 29 that affect protectiveness. To ensure that the Air Force has a safe guard against accidental exposure to base personnel, the Air Force will identify Site 29 as an IRP site with contamination above unrestricted cleanup levels on the BCP and before any activity at the base can be conducted at the site, the Base Environmental Office and the regulators must be made aware of any proposed activities. According to Air Force protocol, any excavation of any kind, anywhere on base requires that the individuals conducting the work get approval from all facility groups before work can begin (Base Digging Permit).

4.7.3.4 Data Review.

The major COCs are summarized in Table 4.7-1. The table shows that at the time of the RI/FS investigations, 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin; heptachlorinated dibenzo-p-dioxins, total; beryllium; lead; and manganese occurred at concentrations that exceeded the December 1991 U.S. EPA Region IX residential PRGs; however, they were lower than the industrial PRGs. Based on the risk assessments conducted during the OU1 RI and the fact that Site 29 is adjacent to the flightline parking apron and will remain industrial land use for the foreseeable future, ICs are an appropriate remedy for Site 29.

4.7.4 Site 29 Assessment

The following conclusions support the determination that the remedy at Site 29 is expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: Based on the site being industrial land use, the site currently presents no unacceptable risks to human health and the environment. No HASP/Contingency Plans exist. The Base Digging Permit Process requires that any excavating or digging on base requires review and approval by the Base Environmental Office before any work can be done. This ensures that the site is managed in a safe manner and that any work proposed in the area must be approved before work can be done. Should the AFRC propose any construction or excavation within Site 29, the regulatory agencies would be notified as well.

Implementation of Institutional Controls and Other Measures: The OU1 ROD did not contain ICs as part of the remedy at Site 29. Since the OU1 ROD's signature, the Air Force and regulatory agencies have recognized that the ICs are an important part of any remedy where contaminants are left in place above regulatory levels. Site 29 is currently part of March ARB and will not be transferred by deed in the indefinite future. The AFRC will identify the site as an IRP site with residual contamination above unrestricted levels in the BCP. All intrusive work anywhere on base requires that the Base Environmental Office approve the project through the Base Digging Permit process. Therefore, any work to be conducted on or around Site 29 requires approval from the Base Environmental Office prior to the work being conducted. These steps assure that no one will conduct intrusive activities within Site 29 unless approval is received from both the Base Environmental Office and the regulatory agencies.

Remedial Action Performance: The OU1 ROD required no further action at Site 29. Therefore, there are no remedial action performance criteria to evaluate. The AFRC will identify the site as an IRP site in the BCP. AFRC will continue to monitor groundwater downgradient of the site as part of the Basewide Groundwater Monitoring Program and EGETS O&M.

System Operations/O&M: There have been no opportunities for optimization because there is no active remediation ongoing at the site.

Opportunities for Optimizations: There are no O&M procedures at Site 29 since the site was approved for no further action in the OU1 ROD. The base ensures that no excavation occurs at the site without proper approval (Base Digging Permit).

Early Indicators of Potential Remedy Failure: The OU1 ROD required no further action at the site. As part of the BCP, the AFRC will identify the area encompassing Site 29 as a former fire training area and will review any proposed development of the site before work can be started. Any excavation proposed by the Air Force anywhere on base requires that the Base Environmental Office approve the work before work can be conducted. In addition, because the site is an IRP site with contaminants present on site above unrestricted levels, the regulatory agencies would also require review and approval of proposed construction activities at Site 29.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and to be Considered: This 5-year review identifies U.S. EPA Region IX PRGs that have changed since the OU1 ROD was signed. These changes did not affect the protectiveness of the remedy.

Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified in the course of the 5-year review. There are no current or planned land use changes; no new contaminants, new sources of contamination, or routes of exposure identified.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed that call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy. The Base Digging Permit Process requires that the Base Environmental Office review and approve any proposed work at Site 29. Thus, the Base Digging Permit process provides a measure of safety that no one will excavate in the former fire training area without the Air Force Base Environmental Office providing approval and guidance. In addition, the AFRC will identify the area comprising Site 29 in the BCP as an IRP site with contamination above unrestricted cleanup levels, which requires Base Environmental and regulatory approval before any intrusive work can be conducted on the site.

4.7.5 Site 29 Issues

No outstanding major deficiencies were noted during the 5-year review. The AFRC, Base Environmental Office will ensure that no intrusive work will occur on Site 29 without a thorough review and approval from the Base Environmental Coordinator and the regulatory agencies prior to any proposed work. The area comprising Site 29 should be noted on the BCP as soon as possible.

4.7.6 Site Assessment

Site 29 remains Air Force property and land use and ICs are in place to protect human health and the environment. Through the Air Force Digging Permit process, excavation and other construction activities require approval from the Base Environmental Office before any work can be done at the site. The BCP will also identify this area as an IRP site with contamination above unrestricted cleanup levels and will require a thorough review and approval by the Base Environmental Office and regulatory agencies prior to any intrusive activities at the site.

4.7.7 Site 29 Recommendations and Follow-up Actions

The following recommendations are made:

- Update the BCP to identify the area containing Site 29 as a former fire training area
- Once the IC dispute is resolved, submit an OU1 ROD modification establishing ICs for Site 29.

4.7.8 Site 29 Protectiveness Statements

No remedial actions have been implemented at the site. The Air Force will update the BCP to identify the site as an IRP site with contamination above unrestricted levels. Should the Air Force conduct any intrusive work on the site, the Base Environmental Office and regulatory agencies would be involved in setting requirements. As part of the base construction process, any excavation proposed at the site requires the review and approval by the Base Environmental office. Because Site 29 is an IRP site, the regulatory agencies would also review and approve work to be completed at the site. Given the current land use restrictions, Site 29 does not pose a threat to human health or the environment.

4.7.9 Next Review

This is a statutory review of Site 29 that requires ongoing 5-year reviews. The next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

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4.8 SITE 31 – SOLVENT SPILL

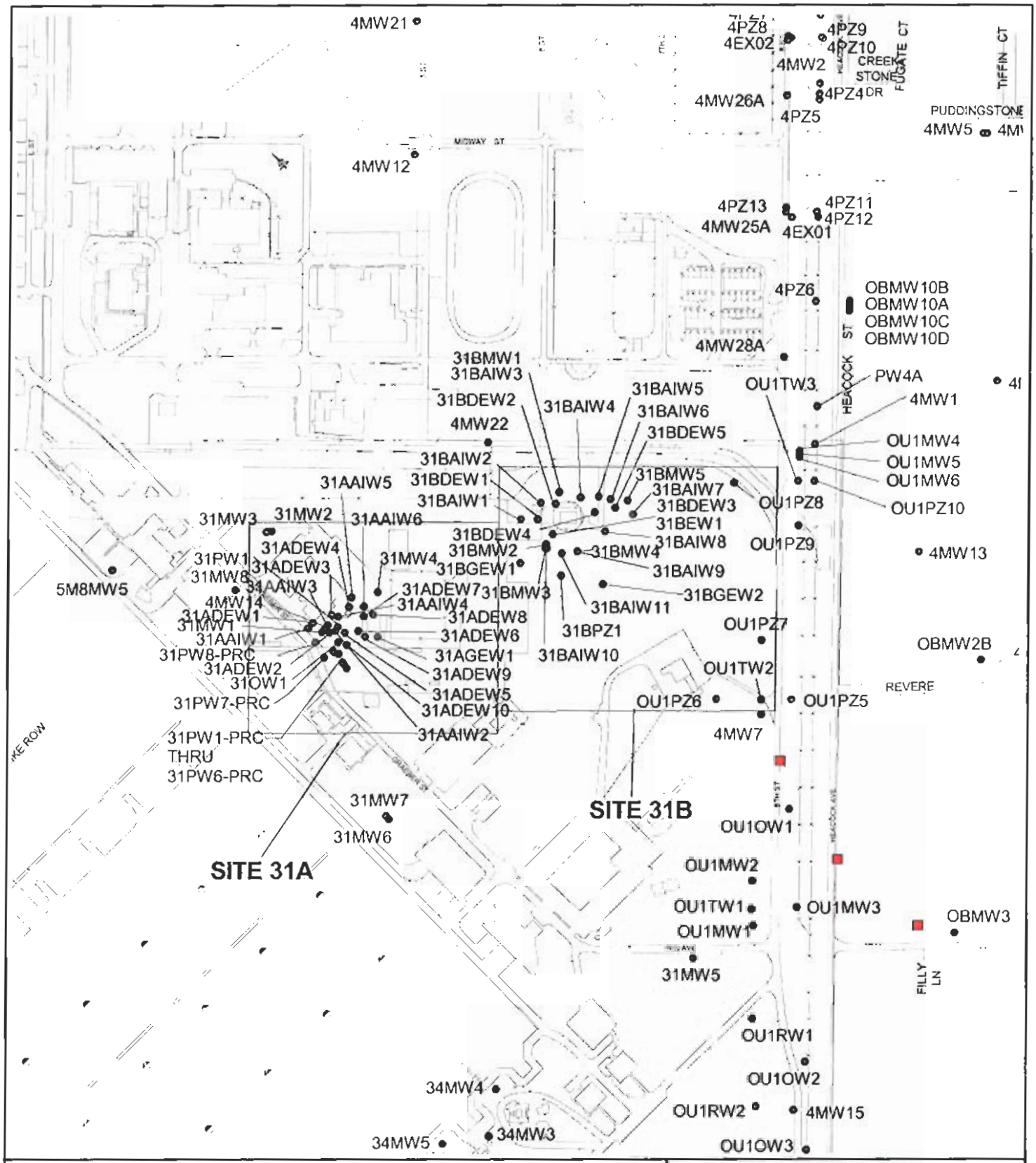
Site 31 is situated in the east-central portion of the Base, to the south of the main cantonment area and to the east of the aircraft parking apron. The site is situated within the current cantonment and is controlled by the AFRC. The site, described as an area of unconfirmed solvent disposal, is within the OU1 groundwater plume and is considered to be the source area for much of the TCE contamination in the plume. Site 31 is comprised of two source areas of contamination: Site 31A and 31B (Figure 4.8-1).

Site 31A is situated to the south of Building 1211, which was constructed in 1957. A 1980 operational data sheet indicates that Building 1211 contained a Weapons Cleaning Shop, where B-52 tailguns were disassembled and routine cleaning, maintenance, and repairs of the guns were performed. Gun parts were placed in wire baskets supported by an overhead chain hoist and lowered into solutions of bore cleaners, vapor degreasers, and hot gun oil. The fluids were allowed to drain onto the floor and through floor drains to an oil/water separator outside the building. This oil/water separator is currently inactive. The floor drains and oil/water separator, along with surface discharge, are the possible sources of TCE identified at Site 31A. Building 1211 currently supports the Tanker Maintenance Branch. Tanker maintenance personnel are responsible for pre- and post-flight inspections, fueling, liquid oxygen (LOX) servicing, and minor maintenance of aircraft. Tools, supplies for maintenance functions, and other equipment, which are all performed on the flight line, are stored at Building 1211.

Site 31B includes the area around the LOX Facility (Building 1254) and a concrete pad with trench drains east of the LOX Facility. Currently there is only LOX storage at Building 1254; however, it has been confirmed that in the past the facility made LOX and during the time TCE was used and stored at the facility. A review of 1960 aerial photography indicated a rather large facility east of the LOX Facility. A site inspection revealed a large partitioned concrete slab structure with sloped floor surfaces and floor drains draining to the concrete slab. This facility appeared to be a parts or aircraft cleaning facility that was active for approximately 6 to 8 years during the 1960s. No records exist for the facility and interviews with several March AFB personnel did not reveal its past usage. However, TCE was detected in groundwater samples collected in the vicinity of this abandoned facility during the OU1 RI/FS.

During the OU1 RI/FS, soil gas, surface and subsurface soil, and groundwater samples were collected at Site 31 to characterize the extent of soil and groundwater contamination. The results of surface soil sampling at Site 31 indicated concentrations of beryllium, lead, manganese, and several PAHs, at levels exceeding U.S. EPA Region IX PRGs. Subsurface soil investigations revealed TCE as a contaminant of concern. In addition, TCE and other solvent-related contaminants were detected in the groundwater at Site 31 at concentrations exceeding the established ARARs.

A human health and environmental risk assessment was conducted for Site 31 following U.S. EPA Region IX and California EPA guidance. The risk assessment produced estimates of the potential risks to human health and the environment from the aforementioned contaminants detected at Site 31. Based on the results of the surface soil risk assessment, manganese did not require remediation; however, the PAHs were found to present a potential human health risk and required remediation. For lead, the method developed by DTSC was used to estimate blood-lead concentrations. Results indicated that lead did not require remediation. In addition, concentrations of beryllium at the site were determined to be naturally occurring and did not require remediation. It was determined that the subsurface soil contamination required remediation in order to prevent further degradation of the groundwater through migration of contaminants from soil to groundwater. Finally, it was determined that the groundwater would require remediation.



LEGEND

- Wells
- Proposed Wells
- Structures/ Roads

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450 0 450 Feet

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

SITE 31
Operable Unit 1 5-Year Review
March Air Force Base

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Project No. 39863
Date: 09-03

Figure 4.8-1

4.8.1 Remedial Actions

This section describes the remedy selection, implementation, systems operations, and cleanup process for Site 31.

4.8.1.1 Remedy Selection.

The Site 31 remedial action objectives stated in the OU1 ROD are to:

- Prevent ingestion of or direct contact with contaminated groundwater and soils
- Eliminate contaminant loading to the groundwater
- Prevent contaminants from migrating off base
- Recover and treat the contaminated groundwater and discharge the treated water.

The remedial actions selected in the OU1 ROD to achieve theses objectives were:

- Excavation and treatment of contaminated surface soils
- SVE with carbon adsorption treatment for subsurface contamination
- Groundwater extraction, treatment, and reinjection.

The preferred method of cleanup for the contaminated surface soils at Site 31 was excavation and low-temperature thermal desorption. For the subsurface soil, the selected remedy was SVE with carbon adsorption. SVE mechanically removes volatile contaminants from unsaturated soils and the contaminated vapors are treated by carbon adsorption. This remedy reduces soil contaminant concentrations and, thus prevents further degradation of groundwater through contaminant migration. The remedy selected for the contaminated groundwater at Site 31 was extraction and treatment with liquid-phase GAC. The selected remedy provides protection to human health and the environment through recovery of contaminated groundwater and subsequent removal of the contaminants. The selected remedies address the principal threats present at Site 31 by removing the contamination using proven treatment technologies.

4.8.1.2 Remedy Implementation.

A pilot scale groundwater SVE treatment system was installed in March 1995 at Site 31A to determine the effectiveness of this remediation technology on contaminant removal from the soils and groundwater. The pilot system was in operation until March 1996. Based on the results of the groundwater SVE treatability study and site characterization data, this remediation technology was demonstrated to be an efficient and cost-effective method for reducing contamination levels in the treatment zones.

Remedial design for the full scale groundwater SVE treatment system was completed in March 1996, and construction began in April 1996. Six DPEWs, one groundwater extraction well (GWEW), and ten air injection wells (AIWs) were installed at Site 31A. Five DPEWs, 2 GWEWs, 11 AIWs, 1 piezometer, and 1 SVE well were installed at Site 31B. Vadose zone SVE wells were installed in the same boreholes as the DPEWs. A treated water reinjection system at the base boundary was installed as part of the treatment system. The reinjection system consists of five treated water reinjection wells and seven observation/monitoring wells along the eastern base boundary to the south of Site 4. The groundwater SVE treatment system installation was completed in August/September 1996. The system began pumping and treating groundwater in September 1996. SVE from the vadose zone began on October 17, 1996, and SVE from the DPEWs (deeper zones) was initiated on December 5, 1996. In the summer of

1999 an additional vadose zone SVE well, outside of Site 31A and 31B, was added to the Site 31 treatment system.

The groundwater treatment system was designed to extract 800 gallons per minute (gpm), with treatment by GAC. Although originally constructed to produce 800 gpm, the system has been modified to produce 500 to 600 gpm at higher pressures than previously achieved. A portion of the treated water is reinjected into the aquifer along the eastern base boundary through the reinjection wells. Aquifer reinjection assists the remedial actions by providing hydraulic control along the base boundary. Excess water not needed for reinjection is recycled for irrigation purposes, and/or discharged to the Heacock Storm Drain, as required for operational control and flexibility. The treated water is discharged under a National Pollutant Discharge Elimination System (NPDES) permit.

The SVE system was designed to extract and treat approximately 900 standard cubic feet per minute (scfm) of soil vapors, with treatment by GAC. The treated vapors discharged from the treatment system maintain contaminant concentrations far below any applicable air emission standards.

4.8.1.3 System Operations.

Groundwater extraction at Site 31A and 31B was started during the second week of September 1996. System operations were conducted in accordance with the approved O&M plan (Earth Tech, 1998). System operations as they were described in the O&M plan are as follows:

- Daily monitoring of treatment plant operations, flow meter readings, and routine maintenance
- Daily monitoring of reinjection wells, operation, and reinjection well totalizer readings
- Daily monitoring of system effluent totalizer
- Weekly monitoring of extraction wells and totalizer readings
- Weekly analysis of influent and effluent contaminant concentrations (TCE)
- GAC change-outs
- Weekly monitoring of SVE wells, vacuum, and flow readings
- Weekly analysis of influent soil vapors
- Monthly water level readings of extraction and reinjection wells
- Monthly, quarterly, and annually compliance sampling of groundwater, per NPDES permit requirements
- Monthly compliance sampling of treated soil vapors
- Preparation and submittal of operations summary reports.

Currently Site 31 operations are relatively consistent with those described above with a few exceptions. The SVE system has been shutdown since January 2000 so SVE operations have ceased. Additional O&M procedures that have been implemented at Site 31 include groundwater and SVE rebound testing.

These rebound testing procedures were approved by the regulatory agencies, and were implemented since the contaminant concentrations at the site have been reduced considerably. O&M documents reviewed during this 5-year review are listed in Appendix C.

4.8.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review of all sites at March AFB/ARB.

4.8.2 Site 31 5-Year Review Process

Mr. Michael Zabaneh, AFBCA/DD March ROL, directed the 5-year review for Site 31. The following team members performed the review for Site 31:

- Mr. Manish Joshi, Earth Tech
- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The 5-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a site inspection, where warranted. The public was informed regarding the review during the RAB meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.8.3 Site 31 5-Year Review Findings

4.8.3.1 Interviews.

The following individuals were contacted by Earth Tech as part of the 5-year review:

- Mr. Eric Lehto, 452 SPTG/CEV, March ARB (telephone interview on June 15, 2000 and personally on August 23, 2000)

- Mr. Ivan Vargas, Montgomery Watson OU1 treatment system onsite (telephone on June 15, 2000 and personally on August 23, 2000).

Mr. Vargas stated that all soil vapor operations were halted in January 2000. On June 15, 2000, all Site 31 wells, with the exception of 31B-GEW2, were undergoing rebound testing. Mr. Lehto stated that the AFRC will be preparing a modification to the OU1 ROD that will change the selected remedy for the PAH-contaminated surface soil from excavation and treatment using low-temperature thermal desorption to ICs. This OU1 ROD modification will be prepared once the IC dispute is resolved.

4.8.3.2 Site Inspection.

Ms. Pearson and Mr. Tucker conducted a site inspection on August 23, 2000. No evidence of public trespassing or vandalism, erosion, staining, unusual odors, or distressed vegetation was noted during a thorough walkthrough at and in the vicinity of the site.

4.8.3.3 Risk Information Review.

The following standards were identified as ARARs in the OU1 ROD and were reviewed for changes that could affect protectiveness:

- U.S. EPA Region IX PRGs
- California EPA PRGs
- MCLs for Primary Drinking Water (Title 22, CCR, Division 4, Chapter 15, Article 5.5., Section 64444.5)
- National Primary Drinking Water Regulations (40 CFR 141.61 MCLs for Organic Contaminants).

Concentrations of analytes detected in the surface soils at Site 31 during the OU1 RI/FS were compared to December 1991 U.S. EPA Region IX PRGs. Some of these PRGs have changed since the OU1 ROD was signed. The new PRGs (October 2002) have become less stringent, as shown in Table 4.8-1; these changes do not affect the protectiveness of the selected remedy.

Table 4.8-1. Site 31 Changes to PRGs

Contaminant	Media	Previous Residential PRG (mg/kg) (December 1991)	Current Residential PRG (mg/kg) (October 2002)
Benzo(a)anthracene	Soil	0.61	0.62
Benzo(a)pyrene	Soil	0.061	0.062
Benzo(b)fluoranthene	Soil	0.61	0.62
Indeno(1,2,3-c,d) pyrene	Soil	0.61	0.62
Beryllium	Soil	0.14	150
Lead	Soil	130[1]	150[1]
Manganese	Soil	380	1,800

Notes: [1] The California EPA PRG was used for this chemical because it is more restrictive than the Region IX PRG.
mg/kg = milligram per kilogram
PRG = Preliminary Remediation Goal

There were no PRGs for subsurface contaminants when the OU1 ROD was signed. The California Regional Water Quality Control Board, Santa Ana Region requested that the Air Force develop and propose cleanup criteria for soils that would be protective of the groundwater. Cleanup criteria for subsurface soils were developed such that soil contaminants would not be expected to leach into groundwater at concentrations greater than applicable groundwater standards (federal and state MCLs).

Modeling the entire soil column from the ground surface to the groundwater assessed the impacts of contaminant migration from soil to groundwater. Two models were used: VLEACH, a vadose zone contaminant transport model, and MIXCELL, a mixing cell model that calculates groundwater contaminant concentrations from contaminant fluxes supplied by VLEACH.

Site 31 subsurface soil contaminants consisted primarily of TCE. Due to existing groundwater contamination at the site and the potential for subsurface soil contaminants to provide a continuing source of groundwater contaminants, the California Regional Water Quality Control Board requested that Site 31 be included in subsurface soil remediation strategies. There still are no standards that directly regulate subsurface contaminant levels; therefore, the VLEACH/MIXCELL methodology continues to be an effective risk assessing technique. In addition, since the OU1 ROD was signed, there have been no changes at Site 31 that would alter the outcome of the VLEACH/MIXCELL model. No differing characteristics in the soil column have been discovered since the OU1 ROD was signed and the federal and state Drinking Water MCLs that serve as endpoints for the model have not changed.

No changes in exposure pathways or toxicity factors warranting risk recalculations have been identified. In summary, there have been no changes in the conditions at Site 31 that affect protectiveness.

4.8.3.4 Data Review.

The pilot treatability system was installed and placed in operation at Site 31A prior to startup of the full-scale dual phase extraction and treatment system. The treatability system extracted and treated groundwater and soil vapors from three wells (31A-DEW1, 2, and 3). In approximately 1 year of the pilot system operation, 97 pounds of total VOCs contaminants (groundwater SVE) were removed. A review of the Site 31 monitoring reports for the full-scale treatment system from September 1996 through December 1998 indicates the following: approximately 100 million gallons of water have been treated, approximately 44 pounds of VOC contaminants have been removed from the water, and approximately 420 pounds of VOC contaminants have been removed from the soil vapors.

The rebound test program was developed to optimize cleanup actions. The objectives of the program are to reduce O&M costs of source area treatment by phase-out of GWESs meeting certain pre-determined rebound test criteria and clean-up targets. The following criteria and targets were established for the rebound tests (Earth Tech 1997):

- Requirement of DPEWs (31A or 31B) to be considered for rebound testing:
  - No measurable contaminants in the vapor phase

- Requirement of groundwater extraction wells (31A or 31B) to be considered for rebound testing:
  - Asymptotic cleanup profile
  - Contaminant concentration $\leq$ 50 μg/l TCE

- Average target for source locations (31A or 31B) after rebound testing:
  - Contaminant concentrations $\leq$ 50 μg/l TCE

- Maximum allowable concentration for shut-down of individual wells after rebound testing:
  - Site 31A wells - $\leq$ 85 μg/l TCE
  - Site 31B wells - $\leq$ 43 μg/l TCE.

Site 31 rebound testing has been implemented in three phases as wells have met pre-determined criteria. A well can be phased-out once rebound testing indicates that it has met its criteria and targets. Remedial progress at Site 31A is documented in *Active Remediation Complete Report, March ARB IRP Site 31A, Subsurface Soil and Groundwater* (Air Force Reserves, 2002). Active remediation at Site 31A has been terminated and the site has been approved for no further action with the exception of continued groundwater monitoring (Air Force Reserves, 2002). GWESs at Site 31B are in rebound. Two GWESs were operating at Site 31B at the time of the 2002 annual monitoring round. Another extraction well

(31BGEW3) was installed in June 2002 and became operational in August 2002 to extract and treat a "hot spot" south of the Site 31B source area. All wells continue to be monitored to confirm successful remediation. All groundwater monitoring results are reported quarterly as required, and reviewed to identify any trends. The most recent results are included in the *Draft, 2001-2002 Annual Monitoring Report, AFRC Long-Term Groundwater Monitoring Program/AFBCA Groundwater Monitoring Program* (Montgomery Watson, 2003).

4.8.4 Site 31 Assessment

The following conclusions support the determination that the remedy at Site 31 is expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: The HASP for Site 31 is in place and properly implemented.

Implementation of Institutional Controls and Other Measures: Site 31 is in an area to be retained by the Air Force. ICs are in place to ensure that the public does not have access to the site. Since the OU1 ROD's signature, the Air Force and regulatory agencies have recognized that the ICs are an important part of any remedy where contamination is left in place above regulatory levels. Site 31 is currently part of March ARB and will not be transferred by deed in the indefinite future. The AFRC, however, will identify the site as an IRP site with surface soil contamination above unrestricted cleanup levels in the BCP and all intrusive work anywhere on base requires that the Base Environmental Office approve the project through the Base Digging Permit process. Therefore, any work to be conducted on or around Site 31 requires approval from the Base Environmental Office prior to the work being conducted. These steps assure that no one will excavate contaminated soil within the Site 31 area unless approval is received from the Base Environmental Office first, and in consultation/approval with the regulatory agencies.

Remedial Action Performance: Rebound testing results have indicated that the remedial actions at Site 31 are effectively remediating the subsurface soil and groundwater contamination at the site. Mr. Lehto has indicated that the AFRC will be submitting an OU1 ROD modification to change the selected remedy for the PAH-contaminated surface soils from excavation and treatment using low temperature thermal desorption to ICs.

System Operations/O&M: Site 31 operations consist of groundwater monitoring in order to confirm the effectiveness of the remedial actions. In addition, groundwater extraction and treatment operations will continue until the site is determined to be remediated.

Opportunities for Optimizations: This 5-year review did not identify any additional need for optimization at this time. Continued groundwater monitoring of the site will identify issues, if they arise, and the Air Force and regulatory agencies will work together to resolve these issues and opportunities for optimization.

Early Indicators of Potential Remedy Failure: No early indicators of potential remedy failure were noted during the review.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and To Be Considered: This 5-year review identified U.S. EPA PRGs that have changed since the OU1 ROD was signed. These changes are not significant enough to change the protectiveness of the remedy.

Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified as part of the 5-year review. There are no current or planned changes in land use, and no new contaminants, sources, or routes of exposure identified.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed that call into question the protectiveness of the remedy

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

4.8.5 Site 31 Issues

No deficiencies at Site 31 were noted during this 5-year review.

4.8.6 Site 31 Assessment

The groundwater and subsurface soil remedy was implemented per the OU1 ROD. The remedy has been effective in reducing the level of subsurface soil and groundwater contamination at the site and the remedy has been protective of human health and the environment.

PAH-contaminated surface soil remains at the site above unrestricted cleanup levels. Site 31 remains Air Force property and land use and institutional controls are in place to protect human health and the environment. Through the Air Force Digging Permit process, excavation and other construction activities require approval from the Base Environmental Office before any work can be done at the site. The BCP will also identify this area as an IRP site with contamination above unrestricted levels and will require a thorough review and approval by the Base Environmental Office and regulatory agencies prior to any intrusive activities at the site.

4.8.7 Site 31 Recommendations and Follow-up Actions

The following recommendations are made:

- Update the BCP to identify the area containing Site 31 as an IRP site.
- Once the IC dispute is resolved, submit an OU1 ROD modification establishing ICs for Site 31.
- Continue to monitor the groundwater at the site to ensure the successful remediation of the site.

4.8.8 Site 31 Protectiveness Statements

The selected remedies for the groundwater at the Site 31 plume and the subsurface soils at Site 31 are protective of human health and the environment and comply with federal and state requirements that are legally applicable or relevant and appropriate to the remedial actions, and are cost effective. For surface soil contamination, the OU1 ROD modification will identify ICs that will be implemented at Site 31 that will restrict the site from becoming residential land use. In addition, as part of the base construction process, any excavation proposed at the site requires review and approval by the Base Environmental Office. Because Site 31 is an IRP site, the regulatory agencies would also review and approve any intrusive work to be completed at the site. Given the current land use restrictions, Site 31 does not pose a threat to human health or the environment.

4.8.9 Next Review

This is a statutory review of Site 31 that requires ongoing 5-year reviews. The next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

4.9 SITE 34 - PRITCHARD REFUELING SYSTEM

Site 34 encompasses the former Pritchard Refueling System. This site is situated next to Building 1245, at the southeast end of Taxiway No. 1 and the southeast end of the aircraft parking apron (Figure 4.9-1). Six 50,000-gallon tanks were moved from the Panero Fueling System to Site 34 in 1962 to provide JP-4 for KC-10 and KC-135 aircraft. The tanks were discovered to be leaking during a geologic investigation for a construction project just south of the site in July 1988. Use of this system was discontinued in 1990 and most of the piping system and tanks were removed in 1991. An additional 550-gallon tank was situated at the site and removed in 1999.

During the OU1 RI/FS, soil samples from boreholes and surface locations as well as groundwater samples were collected from Site 34 in order to determine the extent of the contamination caused by the leaking storage tanks. Sampling results indicated that several PAHs were present in the surface soil (0 - 2 feet bgs) at concentrations exceeding December 1991 U.S. EPA Region IX PRGs. Subsurface soil (from the ground surface to groundwater level) contamination was also detected. The subsurface soil contaminants detected were benzene, ethylbenzene, and xylenes. In addition to the soil contaminants, groundwater contamination was discovered. Benzene was detected in the groundwater at Site 34 at concentrations exceeding the established ARARs.

A human health risk assessment was conducted for Site 34 following U.S. EPA Region IX and California EPA guidance. The risk assessment produced estimates of the potential risks to public health from the aforementioned contaminants detected at Site 34. Beryllium did not require remediation based on the results of the surface soil risk assessment; however, the PAHs were found to present a potential human health risk and required remediation. It was determined that the subsurface soil contaminants required remediation in order to prevent further degradation of the groundwater through migration of contaminants from soil to groundwater.

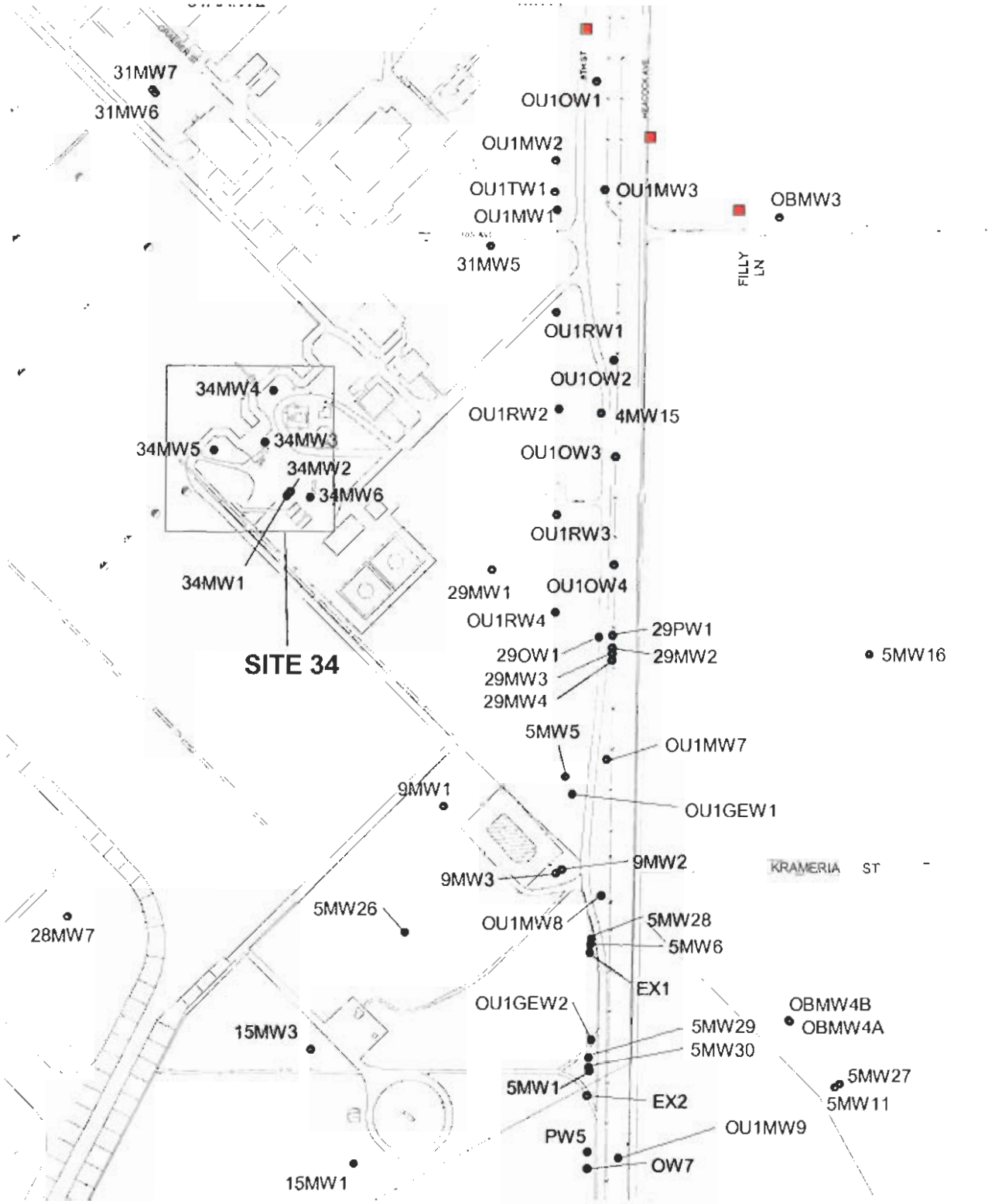
Site 34 is within the OU1 groundwater plume. Therefore, more specific information relating to the groundwater contaminants at Site 34 can be found in the discussion of the OU1 groundwater plume (see Section 4.10).

4.9.1 Remedial Actions

This section describes the remedy selection, implementation, systems operations, and cleanup process for Site 34.

4.9.1.1 Remedy Selection.

The OU1 ROD identified excavation and low-temperature thermal desorption as the preferred method of cleanup for the contaminated surface soils at Site 34. Excavation removes the contaminated surface soil from the site and low-temperature thermal desorption destroys the contaminants of concern, thereby protecting human health and the environment. The OU1 ROD also selected bioventing as the subsurface soil contamination remedy. Bioventing is a remedial technique that consists of injecting oxygen into the soil to stimulate the growth of hydrocarbon degrading microbes. These microbes use the hydrocarbons as an energy source and break them down into nonhazardous compounds. The selected remedies address the principal threats present at Site 34 by removing the contamination using proven treatment technologies.



LEGEND

- Wells
- Proposed Wells
- Structures/ Roads

N

450 0 450 Feet

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HQ AIR FORCE RESERVE COMMAND
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Figure 4.9-1

4.9.1.2 Remedy Implementation.

Subsurface soil remediation began in 1994 and was completed in 1995. Earth Tech installed a bioventing system at Site 34 to remediate soils in the former underground storage tank (UST) area in March 1994. The system was shutdown in December 1995 after investigations indicated that the subsurface soil had been remediated.

The Air Force will be submitting an OU1 ROD modification that will change the OU1 ROD selected surface soil remedy from excavation and treatment of PAH contaminated soil using low temperature thermal desorption to implementation of ICs.

4.9.1.3 System Operations.

Presently the system operations at Site 34 consist of groundwater monitoring. Three monitoring wells, 34MW2, 34MW4, 34MW5, are sampled on an annual basis and 34MW1 is sampled quarterly. Appendix C includes a complete list of O&M documents reviewed during the 5-year review.

While subsurface remedial actions were taking place, system operations consisted of monthly system checks, completion of operation/maintenance/repair manuals and respiration tests every 6 months of operation. In addition, oxygen, carbon dioxide, and hydrocarbon concentrations from vapor monitoring wells were monitored on a monthly basis. Data collected from the monthly monitoring was evaluated and used as the basis for adjusting the airflow into the subsurface. The system was shutdown in December 1995 when the monitoring and confirmation sampling indicated that the subsurface soil had been remediated.

Additional site operations consisted of the removal of a UST and an 8-inch-diameter condensate pipe in June 1999. The tank was used to collect condensed fuel storage vapors from a tank farm formerly situated to the west of the UST. The 550-gallon UST was situated approximately 50 feet west of groundwater monitoring wells 34MW1 and 34MW2 on the east-central portion of the site. Soil samples were collected upon removal of the tank and pipe and analyzed for total extractable fuel hydrocarbons, total volatile fuel hydrocarbons, and VOCs.

4.9.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review of all sites at March AFB/ARB.

4.9.2 Site 34 5-Year Review Progress

Mr. Michael Zabaneh, AFBCA/DD March ROL, directed the 5-year review at Site 34. The following team members performed the review for Site 34:

- Mr. Manish Joshi, Earth Tech
- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The 5-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a

site inspection, where warranted. The public was informed regarding the review during the RAB meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.9.3 Site 34 5-Year Review Findings

This section describes the findings of the 5-year review conducted for Site 34.

4.9.3.1 Interviews.

The following individual was contacted by Earth Tech as part of the 5-year review:

- Mr. Eric Lehto, 452 SPTG/CEV, March ARB (telephone interview on June 2, 2000 and personally August 22, 2000).

Mr. Lehto stated that the conditions at Site 34 have not changed since the bioventing system was shut down. Additional investigation of subsurface soil and groundwater contamination was conducted in 2002 to determine the extent of contamination remaining from a recently removed vapor recovery tank previously situated at the site. Results of the subsurface soil and groundwater investigation concluded that the former UST does not pose a threat to groundwater. In addition, benzene concentrations in groundwater continues to decline (historical high of 1,500 µg/l in 1997 to a concentration of 2.2 µg/l in October 2001). During the same time, additional characterization of PAH-contaminated surface soils showed minimal risk to industrial workers at the site. The investigation recommended that residential land use be prohibited at the site and that risk-based closure would require an amendment to the OU1 ROD. Mr. Lehto indicated that an OU1 ROD modification would be prepared changing the selected remedy for surface soil contamination (PAHs) from excavation and off-site treatment using low-temperature thermal desorption to ICs.

4.9.3.2 Site Inspection.

Accompanied by Mr. Lehto, Ms. Pearson and Mr. Tucker conducted a site inspection on August 20, 2000. No evidence of trespassing or vandalism, erosion, staining, unusual odors, or distressed vegetation was noted during a thorough walkthrough at the site. The area is fenced within the fuel yard.

4.9.3.3 Risk Information Review.

The following standards were identified as ARARs in the OU1 ROD and were reviewed for changes that could effect protectiveness:

- U.S. EPA Region IX PRGs
- MCLs for Primary Drinking Water (Title 22, CCR, Division 4, Chapter 15, Article 5.5, Section 64444.5)
- National Primary Drinking Water Regulations (40 CFR 141.61 MCLs for Organic Contaminants).

Concentrations of analytes detected in the surface soils at Site 34 were compared to December 1991 U.S. EPA Region IX PRGs. These PRGs have changed since the OU1 ROD was signed. The new

PRGs (October 2002) have become less stringent, as shown in Table 4.9-1; therefore, these changes do not affect protectiveness of the selected remedy.

Table 4.9-1. Site 34 Changes in PRGs

Contaminant	Media	Previous Residential PRG (mg/kg) (December 1991)	Current Residential PRG (mg/kg) (October 2002)
Benzo(a)anthracene	Soil	0.61	0.62
Benzo(a)pyrene	Soil	0.061	0.062
Benzo(b)fluoranthene	Soil	0.61	0.62
Indeno(1,2,3-c,d)pyrene	Soil	0.61	0.62

mg/kg = milligram per kilogram
PRG = Preliminary Remediation Goal

There were no PRGs for subsurface contaminants when the OU1 ROD was signed. The California Regional Water Quality Control Board, Santa Ana Region requested that the Air Force develop and propose cleanup criteria for soils that would be protective of the groundwater. Cleanup criteria for subsurface soils were developed such that soil contaminants would not be expected to leach into groundwater at concentrations greater than applicable groundwater standards (federal and state MCLs).

Impacts of contaminant migration from soil to groundwater were assessed by modeling the entire soil column from the ground surface to the groundwater. Two models were used: VLEACH, a vadose zone contaminant transport model, and MIXCELL, a mixing cell model that calculates groundwater contaminant concentrations from contaminant fluxes supplied by VLEACH.

Site 34 subsurface soil contaminants consisted primarily of benzene, ethylbenzene, and xylenes. Based on the modeling results, Site 34 subsurface soil contaminants were found to not exceed allowable limits and thus, would not be expected to leach into groundwater at concentrations that exceed MCLs. However, due to existing groundwater contamination at the site and the potential for subsurface soil contaminants to provide a continuing source of groundwater contaminants, the California Regional Water Quality Control Board requested that Site 34 be included in subsurface soil remediation strategies.

There still are no standards that directly regulate subsurface contaminant levels; therefore, the VLEACH/MIXCELL methodology continues to be an adequate risk assessing technique. In addition, since the OU1 ROD was signed, there have been no changes at Site 34 that would alter the outcome of the VLEACH/MIXCELL model.

The modeled subsurface soil cleanup criteria are based on controlling impacts to groundwater exposure pathways. Therefore, federal and state drinking water MCLs are used as indirect endpoints for estimating the likelihood that existing soil contaminant concentrations will result in an unacceptable groundwater impact. The MCLs for benzene and xylenes have stayed the same and the MCL for ethylbenzene has changed since the OU1 ROD was signed. The new MCL for ethylbenzene has become less stringent. The previous MCL (December 1991) for ethylbenzene was 680 μg/l and the new MCL (October 2002) is 700 μg/l; therefore, this change does not affect protectiveness.

No changes in exposure pathways or toxicity factors warranting risk recalculations have been identified since these risk assessments were completed. In summary, there have been no changes in the conditions at Site 34 that affect protectiveness.

4.9.3.4 Data Review.

Based on the confirmation sampling results presented in the Final Site 34 Confirmation Soil and Groundwater Sampling Report (dated May 1997), the State of California and the Santa Ana Regional Water Quality Control Board concurred that the subsurface soils at Site 34 had been remediated. Prior to treatment, subsurface soil contaminants consisted primarily of BTEX. Because BTEX compounds were not detected in subsurface soils during either soil gas surveys or the confirmation soil sampling effort, any modeling efforts would predict no potential for BTEX contaminants to migrate into the water table. Two monitoring wells at Site 34, however, continue to contain elevated levels of contamination.

4.9.4 Site 34 Assessment

The following conclusions support the determination that the Site 34 remedy is expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: The HASP for Site 34 is incorporated in the Basewide RI/FS HASP, which is in place and properly implemented.

Implementation of Institutional Controls and Other Measures: Site 34 is in an area to be retained by the Air Force. ICs are in place to ensure that the public does not have access to the site. Since the OU1 ROD's signature, the Air Force and regulatory agencies have recognized that the ICs are an important part of any remedy where contamination is left in place above unrestricted use levels. Site 34 is currently part of March ARB and will not be transferred by deed in the indefinite future. The AFRC will identify the site as an IRP site with residual contamination above unrestricted levels in the BCP. All intrusive work on base requires that the Base Environmental Office approve the project through the Base Digging Permit process. Therefore, any intrusive work to be conducted on or around Site 34 requires approval from the Base Environmental Office prior to the work being conducted. These steps assure that no one will excavate contaminated soil within the Site 34 area unless approval is received from the Base Environmental Office first, and in consultation/approval with the regulatory agencies.

Remedial Action Performance: The bioventing system effectively remediated the subsurface soil contamination. Mr. Lehto has indicated that the AFRC will be submitting an OU1 ROD modification to change the selected remedy for the PAH-contaminated surface soils from excavation and treatment using low temperature thermal desorption to ICs.

System Operations/O&M: Site 34 operations consist of groundwater monitoring in order to confirm the effectiveness of the remedial actions.

Opportunities for Optimizations: This 5-year review did not identify any additional need for optimization at this time. Continued groundwater monitoring of the site will identify issues, if they arise, and the Air Force and regulatory agencies will work together to resolve these issues and opportunities for optimization.

Early Indicators of Potential Remedy Failure: No early indicators of potential remedy failure were noted during the review.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and To Be Considered: This 5-year review identified U.S. EPA PRGs and a State Drinking Water Standard that have changed since the OU1 ROD was signed. These changes are not significant enough to change the protectiveness of the remedy.

Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified as part of the 5-year review. There are no current or planned changes in land use, and no new contaminants, sources, or routes of exposure identified.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed that call into question the protectiveness of the remedy

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

4.9.5 Site 34 Issues

No deficiencies were discovered at Site 34 during the 5-year review.

4.9.6 Site 34 Assessment

Site 34 remains Air Force property and land use and institutional controls are in place to protect human health and the environment. Through the Air Force Digging Permit process, excavation and other construction activities require approval from the Base Environmental Office before any work can be done at the site. The BCP will also identify this area as an IRP site with contamination above unrestricted cleanup levels and will require a thorough review and approval by the Base Environmental Office and regulatory agencies prior to any intrusive activities at the site.

4.9.7 Site 34 Recommendations and Follow-Up Actions

The following recommendations are made:

- Update the BCP to identify the area containing Site 34 as an IRP site.
- Once the IC dispute is resolved, submit an OU1 ROD modification establishing ICs for Site 34.
- Continue to monitor the groundwater at the site to ensure the successful remediation of the site.

4.9.8 Site 34 Protectiveness Statements

The remedial actions that have been implemented thus far are protective of human health and the environment. The subsurface soil contamination has been effectively remediated. The OU1 ROD modification will identify ICs that will be implemented at Site 34 that will restrict the site from becoming residential land use. In addition, as part of the base construction process, any excavation proposed at the site requires review and approval by the Base Environmental Office. Because Site 34 is an IRP site, the regulatory agencies would also review and approve any intrusive work to be completed at the site. Given the current land use restrictions, Site 34 does not pose a threat to human health or the environment.

4.9.9 Next Review

This is a statutory review of Site 34 that requires ongoing 5-year reviews. The next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

4.10 OPERABLE UNIT 1 GROUNDWATER PLUME

At March AFB/ARB, the occurrence of groundwater contaminants is discussed within the context of "plumes" of contaminants that share a common source area, geographic distribution, and composition. These plumes cross site boundaries, so site specific discussions are not practical. Any remedial response actions undertaken are applied to each plume as an entity, without consideration for site boundaries. The OU1 groundwater plume is one of four plumes that have been identified at March ARB within the OU1 area. This OU1 groundwater plume is the most widespread of the four plumes, extending from Site 31 south and east through Sites 34, 29, 9, 14, 16, 10, 9, 5, 15, and 7. The OU1 plume has been divided into the on-base OU1 groundwater plume and the off-base OU1 groundwater plume. The off-base OU1 groundwater plume extends to a maximum of approximately 1,300 feet to the east of the eastern base boundary and 1,500 feet south of Site 5 (Figure 4.10-1).

At March AFB/ARB, aircraft maintenance, fuel storage operations, fire training exercises, and base operations have generated a variety of hazardous wastes. Past waste disposal practices have resulted in contamination of soil and groundwater at several areas on base, including the OU1 groundwater plume. The source of the contamination found in the OU1 plume cannot be identified, but it is believed that a majority of the contamination migrated into the groundwater as a result of solvent spills at Site 31.

Groundwater sampling results from the OU1 plume detected several organic contaminants that exceeded applicable standards. The most widespread contaminant detected was TCE. The following contaminants were also detected above cleanup standards: bis(2-ethylhexyl)phthalate; benzene; carbon tetrachloride; 1,1-dichloroethene; 1,2-dichloroethane; cis-1,2-dichloroethene; methylene chloride; tetrachloroethene; and total phenols.

Throughout the area of the OU1 groundwater plume, there are no current users of groundwater; therefore, no receptors are currently exposed to groundwater contaminants. Since the State of California considers all groundwater as potential drinking water, a risk assessment was conducted. The risk assessment was implemented under U.S. EPA Region IX and California EPA guidance. It produced estimates of the potential risks to a hypothetical receptor from site contaminants as if no cleanup would occur. Based on the results of the risk assessment it was decided that the on-base portion of the groundwater plume would require remediation.

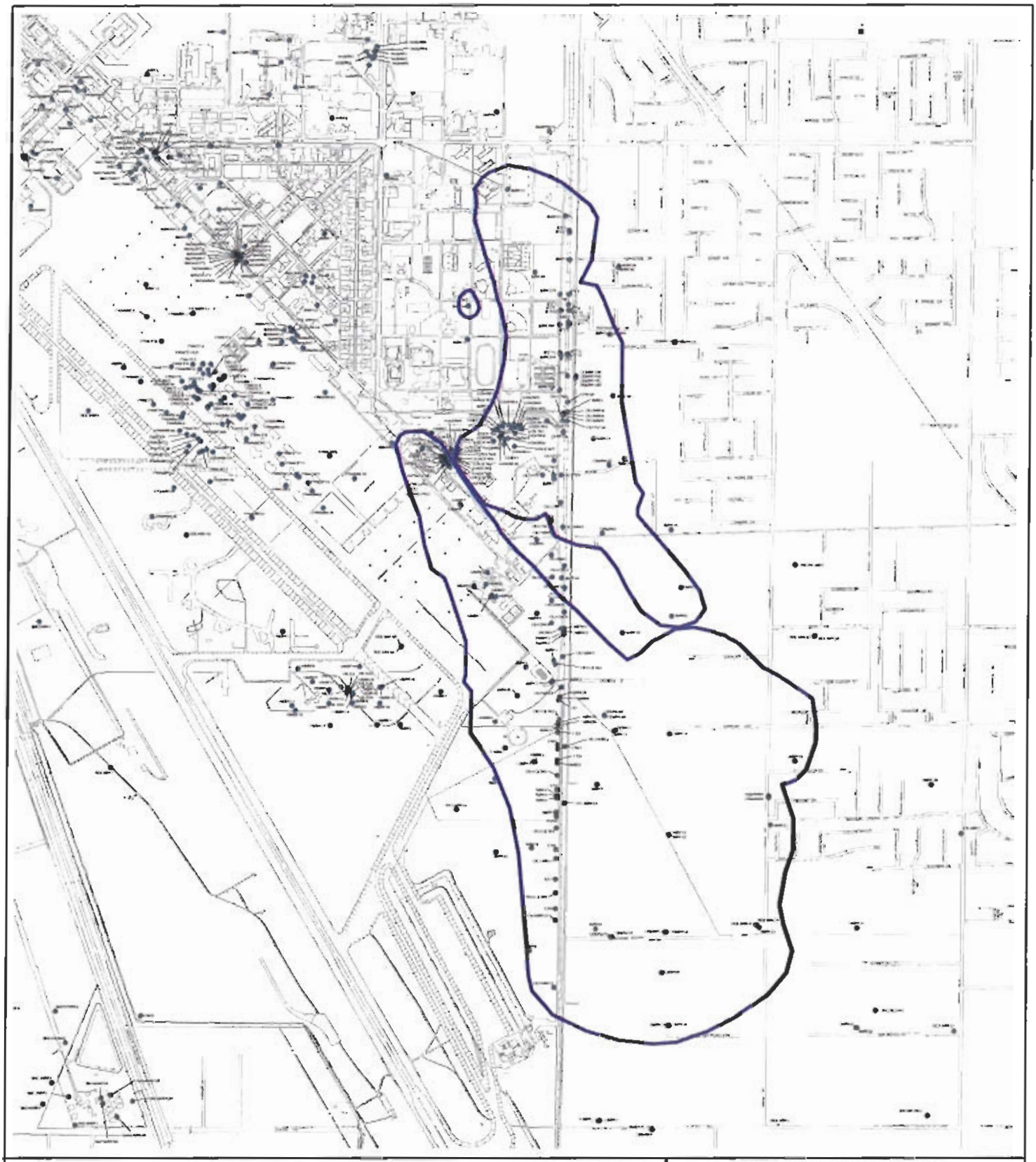
4.10.1 Remedial Actions

The following paragraphs describe the remedial actions for the OU1 plume.

4.10.1.1 Remedy Selection.

The OU1 ROD was signed on June 20, 1996 and identified the following objectives for the remedial actions of the OU1 Groundwater Plume:

- Prevent ingestion of or direct contact with contaminated groundwater
- Prevent contaminants from migrating off base
- Recover and treat on-base contaminated groundwater
- Ensure that contaminant levels in the offbase portion of the plume continues to decrease
- Ensure that the off-base portion of the plume does not threaten off-base water supplies.



LEGEND

- Wells
- Structures/ Roads
- Consolidated OU-1 Plume

N

900 0 900 1800 Feet

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE RESERVE COMMAND
ROBINS AFB, GEORGIA

MARCH AIR RESERVE BASE CALIFORNIA

OU-1 Plume
Operable Unit 1 5-Year Review
March Air Force Base

EARTH TECH
A tyco international LTD company

Prc,ect No. 39863

Date 09-03

Figure 4.10-1

The remedy selected to achieve these objectives was groundwater extraction and treatment with liquid-phase GAC at the base boundary. The selected remedy provides protection to human health and the environment through recovery of contaminated groundwater and subsequent removal of the contaminants. Injecting treated water into the aquifer along the eastern base boundary creates a hydraulic barrier, which will assist in preventing contaminants from migrating off base. Groundwater monitoring will be conducted to ensure that migration of the plume off base has stopped, that off-base water supplies are not threatened, and that the concentration of contaminants in off-base portions of the plume are decreasing. If contaminant concentrations in off-base portions of the plume do not decrease or migration has not stopped, the Air Force will take action to cleanup these portions of the plume, including installation of off-base extraction wells as necessary. Groundwater monitoring will be conducted to ensure that the on-base portion of the plume does not migrate off base, to ensure that the maximum concentrations of off-base contaminants continues to fall, and to ensure that the off-base plume does not threaten off-base water supplies. The selected remedies address the principal threats present by removing the contamination using proven treatment technologies.

4.10.1.2 Remedy Implementation.

Currently the on-base OU1 groundwater plume is being remediated via pump-and-treat technology. Seventeen groundwater extraction wells and five groundwater reinjection wells are in operation along the eastern base boundary. In addition to the remediation of the on-base portion of the groundwater plume, further investigations are underway to better characterize the off-base OU1 plume.

The onset of remedial actions at the OU1 groundwater plume occurred in 1991/1992 with the installation of the OU1 GETS. The OU1 GETS was installed as an interim measure for plume control along the eastern base boundary. Originally, groundwater from the GETS wells was pumped over to the GETS treatment facility for carbon adsorption treatment. Then in 1996/1997 the GETS was expanded with the installation of additional groundwater extraction wells, reinjection wells and system monitoring wells. With the addition of the new wells the former GETS became known as the EGETS. In the last week of April 1997 the GETS treatment facility was taken out of use and the groundwater extracted from the EGETS was transferred to the OU1 treatment facility for treatment. The OU1 treatment facility was constructed in 1996 at Site 31.

The OU1 groundwater treatment system was designed to extract 800 gpm (subsequently reduced to 500 to 600 gpm), with treatment by GAC. Such a treatment capacity enables the treatment facility to treat groundwater from all four of the plumes identified within the OU1 area (OU1 Plume, OU1/Site 4 Plume, Site 18 Plume, and Site 31 Plume). A portion of the treated water is reinjected into the aquifer along the eastern base boundary through the reinjection wells. Aquifer reinjection assists the remedial actions by providing hydraulic control along the eastern base boundary. Excess water that is not needed for reinjection is recycled through the base sewer system for irrigation purposes, and/or discharged to the Heacock Storm Drain, as required for operational control and flexibility. The treated water is discharged under an NPDES permit.

The EGETS was designed to interdict the Site 4 and OU1 plumes at the base boundary to stop the migration of the on-base plume off base and to treat the contaminated groundwater in the existing plume. The OU1 ROD states that the downgradient portion of the plume would be allowed to dissipate. That decision was based on the following criteria:

- The estimation that with the removal of the source of the downgradient plume naturally occurring processes, including dilution, volatilization, adsorption, and/or partitioning to the solid phase, in conjunction with biological degradation, would result in dissipation

- The maximum concentrations of PCE and TCE in the off-base portion of the plume (19 µg/l and 42 µg/l, respectively in 1995) were considered minimal with previous experiences indicating that the associated incremental cost for capture and treatment were not warranted.

The OU1 ROD also states that through continued monitoring of the downgradient plume it will be possible to determine whether additional measures are necessary to assure that there are no threats to human health and the environment during this period of dissipation of the downgradient plume (MWH, 2003).

4.10.1.3 System Operations.

Current EGETS system operations are conducted in accordance with the approved O&M plan. System operations as they were described in the O&M plan are as follows:

- Daily monitoring of treatment plant operations, flow meter readings, and routine maintenance

- Daily monitoring of reinjection wells to assure proper operation and note amount of reinjected water

- Daily monitoring of system effluent totalizer

- Weekly monitoring of extraction wells to note flow amounts and maintain proper operation

- Weekly analysis of influent and effluent contaminant concentrations (TCE, PCE)

- GAC change-outs

- Monthly water level readings of extraction and reinjection wells

- Monthly, quarterly, and annual compliance sampling of groundwater, per NPDES permit requirements

- Preparation and submittal of summary reports.

The current OU1 plume remediation operations are relatively consistent with those described above. In addition, as part of the Basewide groundwater monitoring plan, the OU1 off-base plume monitoring wells are sampled in order to further characterize the level of contamination off base. O&M documents reviewed during this 5-year review are listed in Appendix C.

4.10.1.4 Progress Since the Last 5-Year Review.

This is the first 5-year review of all sites at March AFB/ARB.

4.10.2 OU1 Plume 5-Year Review Process

Mr. Michael Zabaneh, AFBCA/DD March ROL, directed the 5-year review for the OU1 Plume. The following team members performed the review for the OU1 plume:

- Mr. Manish Joshi, Earth Tech

- Dr. Olav Johanneson, Earth Tech
- Mr. Ryan Harkness, Earth Tech
- Ms. Mary Pearson, Earth Tech
- Mr. Thomas Tucker, Earth Tech.

The 5-year review consisted of the following activities: a review of related documents, interviews with local government officials and representatives of the construction and the operations contractors, and a site inspection, where warranted. The public was informed regarding the review during the RAB meeting held in April 2000. In addition, a notice regarding the forthcoming review was placed in the fact sheet compiled from the RAB meeting. In accordance with U.S. EPA guidance, a fact sheet detailing the 5-year review process was sent to the RAB members in December 2000.

4.10.3 OU1 Plume 5-Year Review Findings

The following paragraphs describe the finding of the 5-year review for the OU1 Plume.

4.10.3.1 Interviews.

The following individuals were contacted by Earth Tech as part of the 5-year review:

- Mr. Eric Lehto, 452 SPTG/CEV, March ARB (phone interview on July 18, 2000 and personally August 22, 2000)

- Mr. Ivan Vargas, Montgomery Watson OU1 treatment system on-site representative (phone interview on July 15, 2000 and in-person interview on August 22, 2000).

Mr. Lehto stated that the OU1 treatment system is currently pumping and treating water from all of the EGETS extraction wells. He further stated that all of the reinjection wells are in use. Mr. Lehto indicated that the regulators are concerned that the extraction and injection rates in the area of OU1OW1 are low and suggest that additional monitoring wells should be installed upgradient and downgradient of OU1OW1 to ensure that the on-base portion of the OU1/Site 4 plume is adequately characterized and in fact, the EGETS system is working as expected to prevent the off-base migration of contaminants in the groundwater. Mr. Vargas stated that the HASP is in place and it is properly implemented.

4.10.3.2 Site Inspection.

Accompanied by Mr. Vargas, Ms. Pearson and Mr. Tucker conducted a treatment system site inspection on August 22, 2000. The system was operating properly and no concerns were noted.

4.10.3.3 Risk Information Review.

The following standards were identified as ARARs in the OU1 ROD. They were reviewed for changes that could affect protectiveness:

- MCLs for Primary Drinking Water (Title 22, CCR, Division 4, Chapter 15, Article 5.5, Section 64444.5)

- National Primary Drinking Water Regulations (40 CFR 141.61 MCLs for Organic Contaminants).

Although there are no current users of groundwater in the immediate vicinity of March AFB/ARB, the State of California considers groundwater beneath the base to be a source of drinking water. Therefore,

federal and state MCLs, which are chemical-specific ARARs and drinking water standards, are used as cleanup standards. Where the federal and the state MCLs for a contaminant are not the same, the more stringent of the two is used as the cleanup standard. There have been no changes with these standards since the OU1 ROD was signed; therefore, the established groundwater cleanup levels for the OU1 plume are still expected to be protective of human health and the environment.

4.10.3.4 Data Review.

Remediation of the on-base portion of the OU1 groundwater plume began in 1991/1992 with the GETS. The GETS was in operation for approximately 5 years, during which an estimated 100,000 gallons per day of groundwater were treated. A review of monitoring reports since the EGETS has been in operation indicates that approximately 139 million gallons of water have been treated by the OU1 treatment facility, removing about 25.55 pounds of TCE and approximately 7.43 pounds of PCE.

In August 1998, EGETS operations were evaluated to validate that the system was "operating properly and successfully" in accordance with the criteria set fourth under CERCLA Section 120 (h)(3). A 15-month operating database was reviewed in September 1998. The review depicted a decrease in the flow-weighted average TCE concentration from approximately 56 μg/l to about 15 μg/l, while the flow-weighted average PCE concentration decreased from 30 μg/l to approximately 5 μg/l.

A review of the First Quarter 2000 Process Monitoring Report for the OU1 sites indicated that in March 2000 the EGETS wells were sampled. TCE was detected in all samples at concentrations ranging from 0.43 μg/l in well OU1GEW1 to 46 μg/l in well OU1GEW4. PCE was detected in all but two wells (OU1GEW1 and OU1GEW4), at concentrations ranging from 0.39 μg/l in well OU1GEW5 to 31 μg/l in well 4MW1.

The latest OPS evaluation concluded that the EGETS was operating properly and that it was meeting the design criteria (MWH, 2003). Based on the most recent capture analysis using particle tracking on water level contours, the EGETS is achieving capture for all onbase plume areas. The concern from the regulators is that the extraction and injection rates near OU1OW1 are low, and may not be providing the capture that is portrayed. The Air Force has agreed to install additional monitoring wells in the vicinity of OU1OW1 to fill this data gap.

4.10.4 OU1 Plume Assessment

The following conclusions support the determination that the OU1 groundwater plume remedial actions are expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

HASP/Contingency Plan: The HASP for work done in relation to the OU1 plume is in place and properly implemented.

Implementation of Institutional Controls and Other Measures: In accordance with the California Health and Safety Code Section 25230, deed restrictions will be implemented as an IC. The deed restrictions will prohibit the installation of wells within the OU1 plume in order to restrict groundwater use in on-base contaminated areas. Deed restrictions will be in effect until groundwater cleanup standards have been achieved in on-base contaminated areas. In addition, Riverside County officials have been

notified of the properties offbase that are impacted by the OU1 Plume and have been advised to deny the installation of wells and to restrict the use of groundwater in the area impacted by that portion of the OU1 Plume.

Remedial Action Performance: Results of groundwater sampling have indicated that the OU1 remedial actions are effectively remediating the groundwater contamination at the site. As part of the OPS evaluation, MWH concluded that the EGETS is extracting, treating, and discharging treated water in accordance with the EGETS design objectives. Regulatory agencies have raised concerns that a data gap exists in the area of OU1OW1 and are requesting additional monitoring wells upgradient and downgradient of OU1OW1 to collect data to ensure that the onbase portion of the OU1 Plume is being captured. The Air Force has agreed to install these additional wells in late 2003 to fill the data gaps.

System Operations/O&M: OU1 plume operations are mostly consistent with those described in the OU1 O&M Manual. Operating procedures are implemented as expected to maintain the effectiveness of the remedial actions.

Opportunities for Optimizations: This 5-year review did not identify a need for optimization at this time.

Early Indicators of Potential Remedy Failure: No early indicators of potential remedy failure were noted during the review.

Question B: Are the assumptions used at the time of the remedy selection still valid?

Changes in Standards and To Be Considered: This 5-year review identified no changes in standards.

Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified as part of the 5-year review.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in toxicity or other contaminant characteristics that would affect the protectiveness of the remedy.

Changes in Risk Assessment Methodologies: There have been no changes in risk assessment methodologies since the OU1 ROD was signed that call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy. The Air Force has agreed to install additional groundwater monitoring wells in both the upgradient and downgradient direction of OU1OW1 to fill the perceived data gap in this area.

4.10.5 OU1 Plume Issues

No deficiencies were noted during this 5-year review. Additional groundwater monitoring wells will be installed in late 2003 to fill the data gaps identified in the area of OU1OW1.

4.10.6 Site Assessment

The EGETS is operating as designed. The on-base portion of the OU1 groundwater plume appears to be halted at the base boundary. Additional groundwater monitoring wells in the vicinity of OU1OW1 will be installed to fill the data gap identified by the regulatory agencies. Continued groundwater monitoring in the on-base and off-base portion of the OU1 Plume will allow the Air Force to monitor the progress of the remedial action and compliance with the OU1 ROD. Any modifications to the EGETS system based on groundwater monitoring will be coordinated with the regulators.

4.10.7 OU1 Plume Recommendations and Follow-up Actions

The following recommendations are made:

- Install additional groundwater monitoring wells in the vicinity of OU1OW1 to fill the data gaps identified by the regulatory agencies
- Continue to operate the EGETS
- Continue to monitor both on-base and off-base groundwater monitoring wells to ensure protection of human health and the environment.

4.10.8 OU1 Protectiveness Statements

The selected remedy for the groundwater at the OU1 plume is protective of human health and the environment. The remedial actions comply with federal and state requirements that are legally applicable or relevant and appropriate to the remedial actions, and are cost effective. The remedy utilizes permanent solutions that reduce toxicity, mobility or volume of contaminants. Groundwater remedial actions (operation of the EGETS and long-term groundwater monitoring) will continue until OU1 ROD standards are met (both onbase and offbase). At that time it is expected that active groundwater cleanup will stop. Groundwater monitoring will continue until the OU1 Groundwater Plume reaches site closure.

4.10.9 Next Review

This is a statutory review of the OU1 Plume that requires ongoing 5-year reviews. The next review should be conducted within 5 years of the completion of this 5-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of the report.

5.0 REFERENCES/BIBLIOGRAPHY

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for chromium.

Applied P & Ch Laboratory. 2000. *APCL Analytical Report*. July.

Bradford, et al., 1996. *Background Concentrations of Trace and Major Elements in California Soils*, Kearney Foundation Special Report, UC-Riverside and CAL-EPA DTSC, March.

CH2M Hill, 1984. *Installation Restoration Program Records Search.* April.

Chow, V.T., 1964. *Handbook of Applied Hydrology*, McGraw-Hill Book Company, New York, New York.

Dudley, P.H., 1935 *Geology of a Portion of the Perris Block, Southern California*, California Journal Mines and Geology, Volume 31, pp. 487-506.

E.G. and G. Idaho, Inc., 1994. *Remedial Investigation Report*. August.

Earth Tech, 1997. *IRP Site 31 Aquifer and Soil Remediation, Soil Vapor and Groundwater Cleanup Targets and Rebound Test Program, Informal Technical Review*. September

Earth Tech. 2000. *Draft Final Site 42 Treatability Study Report.* June.

Earth Tech. 2000. *Draft Final Site 42 Treatability Study Report.* June.

Earth Tech. 2000b. *Final Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Final Status Survey Report for the Weapon Storage Area (WSA).* October.

Earth Tech. 2000c. *Draft MARSSIM Historical Site Assessment of the March AFB Hospital, Building 2990.* October.

Earth Tech. 2000d. *Draft MARSSIM Historical Site Assessment of the Former Bioenvironmental Engineering Services, Building 500.* October.

Earth Tech. 2001. *Draft Basewide Remedial Investigation & Feasibility Study, March Air Force Base, California.* May.

Earth Tech. 1996. *Record of Decision, Operable Unit #1, March Air Force Base*. June.

Earth Tech. 1991. *Stage 4, Site Characterization Summary.* April.

Earth Tech. 1992a. *Installation Restoration Program, Remedial Investigation/Feasibility Study, Final Basewide Work Plan.* January.

Earth Tech. 1992b. *Expanded Source Investigation/RCRA Facility Assessment Report.* October.

Earth Tech. 1993. *Expanded Source Investigation/RCRA Facility Assessment.* May.

Earth Tech. 1994. *Remedial Investigation/Feasibility Study Report for Operable Unit #1, Volume 1*. July.

Engineering Science. 1986. *Installation Restoration Program Phase II – Confirmation/Quantification Stage 1, Volume I.* August.

Engineering Science. 1987. *Installation Restoration Program Phase II – Confirmation/Quantification Stage 1, Volume I.*

Engineering Science. 1988. *Installation Restoration Program Phase II – Confirmation/Quantification Stage 2, Volume I.* June.

Engineering Science. 1989. *Installation Restoration Program Stage 3 – Draft Remedial Investigation/Preliminary Feasibility Study Area No. 5, Volume I.* September.

Environmental Protection Agency. 1990. *Preliminary Remediation Goals (PRG)*.

Gibbons, R.D. 1994. *Statistical Methods for Groundwater Monitoring*. John Wiley & Sons, Inc. New York.

Gilbert, R.O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold, New York, NY.

Gilbert, R.O., 1993. Letter report from Richard O. Gilbert (Battelle) to Beverly Ramsay of Systematic Management Services, Inc. July.

I.T. Corp. 1997. *Final Report Mercury Spill Clean Up at Site No. 44, Water Tower No. 407 and Soil Excavation at Site No. 8, Area 17 March AFB.*

Integrated Risk Information System. 1999.

IT Corporation. 1996. *Removal of Wastes at Site 3 OU-2, March Air Force Base Closure Report, Volumes I and II*. March.

Maximum Contaminant Levels. 1999.

Montgomery Watson Harza, 2003. *Draft, 2001-2002 Annual Monitoring Report, AFRC and AFBCA Groundwater Monitoring Program, March Air Force Base*. January.

Montgomery Watson Harza, 2003. *Operating Properly and Successfully Report, OU1 Plume Remedy, Former March Air Force Base, California*. January.

Munz, P.A., 1968. *A California Flora*, University of California Press, Berkeley. (OU1)

OHM Remediation Services Corp. 1996. *Final Closure Report, Site 10 and 15, March Air Force Base, Riverside, California*. March.

OHM Remediation Services Corp. 1996. *Final Sampling and Analysis Report, Site 10 and 15, March Air Force Base, Riverside, California*. March.

Public Affairs, 1991. March AFB, June.

Riverside County Flood Control and Water Conservation District (RCFCWCD), 1978. *Riverside County Flood Control and Water Conservation District Hydrology Manual*, April. (OU1)

Ruffner, J.A., 1978. *Climate of the States*, Third Edition, Gale Research Company, Book Tower, Detroit, Michigan, Volume 1, pp. 83-138.

Tetra Tech, Inc. 1996. *Draft United States Air Force RFA, EBS, and AOC Site Investigation Report for March AFB Operable Unit No. 2.* March.

Tetra Tech, Inc. 1998. *Draft Final March AFB. Operable Unit No. 2, Record of Decision.* November.

Tetra Tech, Inc. 1998. *Well Destruction Report for 23 Wells at West March Air Reserve Base, California*. July.

Tetra Tech, Inc. 2000. *Draft Installation Restoration Program Stage 5, March Air Reserve Base, California, March ARB Landfill Baseline Water Quality Monitoring, Winter 1998-Fall 1999, Analytical Data Informal Technical Information Report*. June. (OU2)

Tetra Tech, Inc. 2000. *Draft Letter Work Plan for Confirmation Sampling at IRP Site 43, March ARB*.

Tetra Tech, Inc. 2001. *Draft Well Destruction Report*. April.

Tetra Tech, Inc. 2001. *Work Plan for Mitigation of Site 43, March Air Reserve Base, California*. August.

Tetra Tech, Inc. 2002. *Preliminary Draft Report, Mitigation of Site 43, March Air Reserve Base, California*. January

Tetra Tech, Inc. 1996. *Draft Final RI/FS Report for Operable Unit No. 2, Volume 14,* March Air Force Base, prepared for Headquarters Strategic Air Command Deputy Chief of Staff for Engineering and Services (HQ SAC/DE) Environmental Compliance Division Offutt Air Force Base, Nebraska, 68113-5001. November.

Tetra Tech, Inc. 1996. *Site Investigation Summary Report for March Air Force Base Operable Unit 2, Sites Recommended for No Further Investigation*. June. (OU2)

Tetra Tech, Inc. 1997. *Draft Final RI/FS Report for OU2, Vol. 1*, March Air Force Base, prepared for Headquarters Strategic Air Command Deputy Chief of Staff for Engineering and Services (HQ SAC/DE) Environmental Compliance Division Offutt Air Force Base, Nebraska, 68113-5001. July.

Tetra Tech, Inc. 1998. *Final Proposed Monitoring Strategy for March AFB Landfill Sites 3, 5, 20/26, 25, 30 and 40.* February.

Tetra Tech, Inc. 1998. *Final Proposed Monitoring Strategy for March AFB Landfill Sites 4, 6 and 24y/24.* April.

Tetra Tech, Inc. 2000. *Installation Restoration Program Remedial Groundwater Program, Site 4 Supplemental Groundwater Characterization and Proposed Corrective Action Report*. May.

Tetra Tech, Inc. 2000. *Status of Conditions at Building 373 – Former Washrack Site, March Air Reserve Base, California.* December.

Tetra Tech, Inc. 2001. *Draft Workplan For Demonstration of Remedial Actions Operating Properly and Successfully, Expanded Groundwater Extraction and Treatment System*. September.

Tetra Tech, Inc. 2001. *Pilot Study Work Plan, Former Oil/Water Separator, Building 2307, Site 8, Area 15, March Air Reserve Base, California.* April.

Tetra Tech, Inc. 1993. *Ecological Baseline Survey, Operable Unit No. 2, West March AFB section.* Prepared for Air Force Center for Environmental Excellence, Brooks AFB, Texas.

Tetra Tech, Inc. 1997. *1996 Annual Groundwater Report*, September.

U.S. Air Force. 2000. *March AFB RPM Meeting Minutes*. January.

U.S. Air Force. 1993. *Handbook to Support the Installation Restoration Program (IRP) Statements of Work for Remedial Investigation/Feasibility Studies (RI/FS), Air Force Occupational and Environmental Health Laboratory.*

U.S. Fish and Wildlife Service, 1989. *Survey of Stephen's Kangaroo Rats on March Air Force Base, Riverside County, California*. Prepared for the U.S. Air Force and Army Corps of Engineers.

U.S. Air Force, 1991. *Final Environmental Impact Statement, Realignment of March Air Force Base, California*. Prepared by Department of the Air Force Headquarters, Strategic Air Command, Offutt AFB, NE.

U.S. Air Force. 2000. *March Air Force Base, California, Operable Unit 2, Air Force Base Conversion Agency, Record of Decision.* Prepared by Air Force Base Conversion Agency, March Regional Operating Location. October.

U.S. Army Corps of Engineers, Jurisdictional Delineation of Wetlands within the Heacock and Cactus Flood Control Channels on March Air Force Base. Prepared for David McPhee, Deputy Base Civil Engineer, March Air Force Base, California, 1992.

U.S. Environmental Protection Agency (EPA). 1985. *Verification of PCB Spill Cleanup by Sampling and Analysis.*

U.S. Geological Survey, Perris, California, Photo Revised 1979, AMS 2551 I SW-Series V895, Scale 1:24,000, U.S. Geological Survey, 1967a.

U.S. Geological Survey, Riverside East, California, Photo Revised 1990, CMA 2551 IV NE-Series V895, Scale 1:24,000, U.S. Geological Survey, 1967b.

U.S. Geological Survey, Steele Peake, California, Photo Revised 1973, Photo Inspected 1978, DMA 2551 IV SE-Series V895, Scale 1:24,000, U.S. Geological Survey, 1967c.

U.S. Geological Survey, Sunnymead, California, Photo Revised 1980, DMA 2551 IV NW-Series V895, Scale 1:24,000, U.S. Geological Survey, 1967d.

Woodford, A.O., Shelton, J.S, Doehring, D.O., and Morton, R.K., 1971. *Pliocene-Pleistocene History of the Perris Block, Southern California*, Geological Society of American Bulletin, Volume 82, pp. 3421-3448.

Guidance Documents

—— 2000b. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance.* Office of Emergency and Remedial Response, Washington, D.C.

—— 2000a. *Integrated Risk Information System (IRIS).* On-line at http://www.epa.gov/iris/subst/index.html

—— 1999. *Region 9 Preliminary Remediation Goals (PRGs)*. EPA Region IX, San Francisco, California. October.

—— 1998. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part D) Interim: Standardized Planning, Reporting, and Review of Superfund Risk Assessments. EPA/540-R-97-033. Office of Emergency and Remedial Response. Washington, D.C.

—— 1997b. *Exposure Factors Handbook.* EPA 600/P-95/002Fa. August.

—— 1997a. *Health Effects Assessment Summary Tables (HEAST) FY 1997 Update*. Office of Research and Development. U.S. Environmental Protection Agency. Washington, D.C. July.

—— 1996b. *Soil Screening Guidance: Technical Background Document.* Office of Solid Waste and Emergency Response, EPA/540/R-95/128. May.

—— 1996a. *Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil Technical Review Workgroup for Lead.* December.

—— 1993. Relative Potency Factors. Offices of Solid Waste and Emergency Response. Washington, D.C.

—— 1992. *Supplemental Guidance to RAGS: Calculating the Concentration Term.* Publication 9285.7-081. Office of Solid Waste and Emergency Response. Washington DC, May.

—— 1991b. Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors. Washington, D.C.: Office of Emergency and Remedial Response.

—— 1991a. Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals. OSWER Directive 9285.7-01B. December.

—— 1989. *Risk Assessment Guidance for Superfund, Volume 1, Human Health Manual*. Office of Emergency and Remedial Response, Washington, D.C.

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APPENDIX A

SITE INSPECTION FORMS

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the five-year review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: 7 - FPT AREA #2	Date of inspection: 8-22-00
Location and Region: MARCH ARB	EPA ID: N/A OU1
Agency, office, or company leading the five-year review: ET	Weather/temperature: Sunny, 75°F

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Other_____

Attachments: G Inspection team roster attached G Site map attached NA

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** NA _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. O&M staff _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

extraction well #6 fenced & locked
no vandalism

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ NA _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

NA

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	G O&M manual	G Readily available	G Up to date	G N/A
	G As-built drawings	G Readily available	G Up to date	G N/A
	G Maintenance logs	G Readily available	G Up to date	G N/A
	Remarks N/A			
2.	**Site-Specific Health and Safety Plan**	G Readily available	G Up to date	G N/A
	G Contingency plan/emergency response plan	G Readily available	G Up to date	G N/A
	Remarks			
3.	O&M and OSHA Training Records	G Readily available	G Up to date	G N/A
	Remarks			
4.	Permits and Service Agreements			
	G Air discharge permit	G Readily available	G Up to date	G N/A
	G Effluent discharge	G Readily available	G Up to date	G N/A
	G Waste disposal, POTW	G Readily available	G Up to date	G N/A
	G Other permits	G Readily available	G Up to date	G N/A
	Remarks N/A			
5.	**Gas Generation Records**	G Readily available	G Up to date	G N/A
	Remarks			
6.	**Settlement Monument Records**	G Readily available	G Up to date	G N/A
	Remarks			
7.	**Groundwater Monitoring Records**	G Readily available	G Up to date	G N/A
	Remarks			
8.	**Leachate Extraction Records**	G Readily available	G Up to date	G N/A
	Remarks			
9.	**Discharge Compliance Records**			
	G Air	G Readily available	G Up to date	G N/A
	G Water (effluent)	G Readily available	G Up to date	G N/A
	Remarks			
10.	Daily Access/Security Logs	G Readily available	G Up to date	G N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**
   G State in-house G Contractor for State
   G PRP in-house G Contractor for PRP
   G Other N/A

2. **O&M Cost Records**
   G Readily available G Up to date N/A
   G Funding mechanism/agreement in place
   Original O&M cost estimate_____ G Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period** N/A
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map (G Gates secured) (G N/A)
   Remarks fencing around well OK.

Part on base part off

Phillips warehouse off-base constructed w/ in past year

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map (G N/A)
   Remarks _____

C. Institutional Controls

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented — G Yes G No (G N/A)
   Site conditions imply ICs not being fully enforced — G Yes G No (G N/A)

   Type of monitoring (e.g., self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)

   Reporting is up-to-date — (G Yes) G No G N/A
   Reports are verified by the lead agency — (G Yes) G No G N/A

   Specific requirements in deed or decision documents have been met — (G Yes) G No G N/A
   Violations have been reported — G Yes (G No) G N/A
   Other problems or suggestions: G Report attached

2. **Adequacy** (G ICs are adequate) G ICs are inadequate G N/A
   Remarks _____

D. General

1. **Vandalism/trespassing** G Location shown on site map (G No vandalism evident)
   Remarks _____

2. Land use changes onsite (G N/A) volume 5 remains
   Remarks _____

3. **Land use changes offsite** G N/A
   Remarks Phillips warehouse constructed

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
   Remarks_____

B. Other Site Conditions

Remarks_____
and Concrete drainage ditch

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. Vegetative Cover G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. Alternative Cover (armored rock, concrete, etc.) G N/A
   Remarks_____

7.	**Bulges**	G Location shown on site map	G Bulges not evident
	Areal extent_____	Height_____	
	Remarks_____		
8.	**Wet Areas/Water Damage**	G Wet areas/water damage not evident	
	G Wet areas	G Location shown on site map	Areal extent_____
	G Ponding	G Location shown on site map	Areal extent_____
	G Seeps	G Location shown on site map	Areal extent_____
	G Soft subgrade	G Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** G Slides	G Location shown on site map	G No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B.	**Benches** G Applicable	G N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	G Location shown on site map	G N/A or okay
	Remarks_____		
2.	**Bench Breached**	G Location shown on site map	G N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	G Location shown on site map	G N/A or okay
	Remarks_____		
C.	**Letdown Channels** G Applicable	G N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	G Location shown on site map	G No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	G Location shown on site map	G No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

4. Leachate Extraction Wells
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

5. Settlement Monuments G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
G Flaring G Thermal destruction G Collection for reuse
G Good condition G Needs O&M
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
G Good condition G Needs O&M
Remarks_____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
G Good condition G Needs O&M G N/A
Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. Outlet Pipes Inspected G Functioning G N/A
Remarks_____

2. Outlet Rock Inspected G Functioning G N/A
Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
G Siltation not evident
Remarks_____

2. Erosion Areal extent_____ Depth_____
G Erosion not evident
Remarks_____

3. Outlet Works G Functioning G N/A
Remarks_____

4. Dam G Functioning G N/A
Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable G N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable (G N/A)			
A. Groundwater Extraction Wells, Pumps, and Pipelines		G Applicable	G N/A
1.	**Pumps, Wellhead Plumbing, and Electrical** G Good condition G All required wells located G Needs O&M G N/A Remarks_____		
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs O&M Remarks_____		
3.	Spare Parts and Equipment G Readily available G Good condition G Requires upgrade G Needs to be provided Remarks_____		
B. Surface Water Collection Structures, Pumps, and Pipelines		G Applicable	G N/A
1.	**Collection Structures, Pumps, and Electrical** G Good condition G Needs O&M Remarks_____		
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs O&M Remarks_____		

3. **Spare Parts and Equipment**
G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
G Metals removal G Oil/water separation G Bioremediation
G Air stripping G Carbon adsorbers
G Filters_____
G Additive (e.g., chelation agent, flocculent)_____
G Others_____
G Good condition G Needs O&M
G Sampling ports properly marked and functional
G Sampling/maintenance log displayed and up to date
G Equipment properly identified
G Quantity of groundwater treated annually_____
G Quantity of surface water treated annually_____
Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
G N/A G Good condition G Needs O&M
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
G N/A G Good condition G Proper secondary containment G Needs O&M
Remarks_____

4. **Discharge Structure and Appurtenances**
G N/A G Good condition G Needs O&M
Remarks_____

5. **Treatment Building(s)**
G N/A G Good condition (esp. roof and doorways) G Needs repair
G Chemicals and equipment properly stored
Remarks_____

6. Monitoring Wells (pump and treatment remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs O&M G N/A
Remarks_____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs O&M G N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

adequate - industrial use only

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

NA

C.	**Early Indicators of Potential Remedy Failure**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. NA
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. NA

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the five-year review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: 15 – FT area #3	**Date of inspection:** 8-23-00
Location and Region: March ARB, 9	**EPA ID:** OU1
Agency, office, or company leading the five-year review: Earth Tech	**Weather/temperature:** Sunny 80°
Remedy Includes: (Check all that apply) G Landfill cover/containment G Access controls G Institutional controls G Groundwater pump and treatment G Surface water collection and treatment G Other_____	groundwater treatment discussed in OU1 GW Plume reports + Checklist
Attachments: G Inspection team roster attached	G Site map attached
II. INTERVIEWS (Check all that apply)	
1. O&M site manager _____ (Name) NA (Title) _____ (Date) Interviewed G at site G at office G by phone Phone no. _____ Problems, suggestions; G Report attached _____	
2. O&M staff _____ (Name) _____ (Title) _____ (Date) Interviewed G at site G at office G by phone Phone no. _____ Problems, suggestions; G Report attached _____	

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency 452 SPTG / CEV March ARB
Contact M. Eric Lehto — Engineer — 8-2300 — _____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached _____
N/A

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply) N/A			
1. O&M Documents			
G O&M manual	G Readily available	G Up to date	G N/A
G As-built drawings	G Readily available	G Up to date	G N/A
G Maintenance logs	G Readily available	G Up to date	G N/A
Remarks			
2. **Site-Specific Health and Safety Plan**	G Readily available	G Up to date	G N/A
G Contingency plan/emergency response plan	G Readily available	G Up to date	G N/A
Remarks			
3. O&M and OSHA Training Records	G Readily available	G Up to date	G N/A
Remarks			
4. Permits and Service Agreements			
G Air discharge permit	G Readily available	G Up to date	G N/A
G Effluent discharge	G Readily available	G Up to date	G N/A
G Waste disposal, POTW	G Readily available	G Up to date	G N/A
G Other permits	G Readily available	G Up to date	G N/A
Remarks			
5. Gas Generation Records	G Readily available	G Up to date	G N/A
Remarks			
6. **Settlement Monument Records**	G Readily available	G Up to date	G N/A
Remarks			
7. **Groundwater Monitoring Records**	G Readily available	G Up to date	G N/A
Remarks			
8. **Leachate Extraction Records**	G Readily available	G Up to date	G N/A
Remarks			
9. Discharge Compliance Records			
G Air	G Readily available	G Up to date	G N/A
G Water (effluent)	G Readily available	G Up to date	G N/A
Remarks			
10. Daily Access/Security Logs	G Readily available	G Up to date	G N/A
Remarks			

IV. O&M COSTS

1. **O&M Organization**
   G State in-house G Contractor for State N A
   G PRP in-house G Contractor for PRP
   G Other_____

2. **O&M Cost Records**
   G Readily available G Up to date N A
   G Funding mechanism/agreement in place
   Original O&M cost estimate_____ G Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period** N A
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
   Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
   Remarks_____

C. Institutional Controls

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented G Yes G No G N/A
   Site conditions imply ICs not being fully enforced G Yes G No G N/A

   Type of monitoring (e.g., self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.

   Reporting is up-to-date G Yes G No G N/A
   Reports are verified by the lead agency G Yes G No G N/A

   Specific requirements in deed or decision documents have been met G Yes G No G N/A
   Violations have been reported G Yes G No G N/A
   Other problems or suggestions: G Report attached

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident
   Remarks_____

2. Land use changes onsite G N/A
   Remarks_____

3. **Land use changes offsite** G N/A
   Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
   Remarks_____

B. Other Site Conditions

Remarks OK

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. Vegetative Cover G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. Alternative Cover (armored rock, concrete, etc.) G N/A
   Remarks_____

7.	**Bulges**	G Location shown on site map	G Bulges not evident
	Areal extent_____	Height_____	
	Remarks_____		
8.	**Wet Areas/Water Damage**	G Wet areas/water damage not evident	
	G Wet areas	G Location shown on site map	Areal extent_____
	G Ponding	G Location shown on site map	Areal extent_____
	G Seeps	G Location shown on site map	Areal extent_____
	G Soft subgrade	G Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** G Slides	G Location shown on site map	G No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	G Applicable	G N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	G Location shown on site map	G N/A or okay
	Remarks_____		
2.	**Bench Breached**	G Location shown on site map	G N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	G Location shown on site map	G N/A or okay
	Remarks_____		
C. Letdown Channels	G Applicable	G N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement	G Location shown on site map	G No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	G Location shown on site map	G No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

5.	**Settlement Monuments** G Located G Routinely surveyed G N/A Remarks_____	
E. Gas Collection and Treatment	G Applicable	G N/A
1.	**Gas Treatment Facilities** G Flaring G Thermal destruction G Collection for reuse G Good condition G Needs O&M Remarks_____	
2.	**Gas Collection Wells, Manifolds and Piping** G Good condition G Needs O&M Remarks_____	
3.	**Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings) G Good condition G Needs O&M G N/A Remarks_____	
F. Cover Drainage Layer	G Applicable	G N/A
1.	**Outlet Pipes Inspected** G Functioning G N/A Remarks_____	
2.	**Outlet Rock Inspected** G Functioning G N/A Remarks_____	
G. Detention/Sedimentation Ponds	G Applicable	G N/A
1.	**Siltation** Areal extent_____ Depth_____ G N/A G Siltation not evident Remarks_____	
2.	Erosion Areal extent_____ Depth_____ G Erosion not evident Remarks_____	
3.	Outlet Works G Functioning G N/A Remarks_____	
4.	Dam G Functioning G N/A Remarks_____	

H. Retaining Walls	G Applicable	G N/A
1. **Deformations**	G Location shown on site map	G Deformation not evident
Horizontal displacement_____ Vertical displacement_____		
Rotational displacement_____		
Remarks_____		
2. **Degradation**	G Location shown on site map	G Degradation not evident
Remarks_____		
I. Perimeter Ditches/Off-Site Discharge	G Applicable	G N/A
1. **Siltation**	G Location shown on site map	G Siltation not evident
Areal extent_____ Depth_____		
Remarks_____		
2. **Vegetative Growth**	G Location shown on site map	G N/A
G Vegetation does not impede flow		
Areal extent_____ Type_____		
Remarks_____		
3. **Erosion**	G Location shown on site map	G Erosion not evident
Areal extent_____ Depth_____		
Remarks_____		
4. **Discharge Structure**	G Functioning	G N/A
Remarks_____		
VIII. VERTICAL BARRIER WALLS	G Applicable	G N/A
1. **Settlement**	G Location shown on site map	G Settlement not evident
Areal extent_____ Depth_____		
Remarks_____		
2. **Performance Monitoring**	Type of monitoring_____	
G Performance not monitored		
Frequency_____	G Evidence of breaching	
Head differential_____		
Remarks_____		

IX. GROUNDWATER/SURFACE WATER REMEDIES	G Applicable	G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells located G Needs O&M G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs O&M
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable G N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs O&M
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs O&M
   Remarks_____

3. **Spare Parts and Equipment**
G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
G Metals removal G Oil/water separation G Bioremediation
G Air stripping G Carbon adsorbers
G Filters_____
G Additive (e.g., chelation agent, flocculent)_____
G Others_____
G Good condition G Needs O&M
G Sampling ports properly marked and functional
G Sampling/maintenance log displayed and up to date
G Equipment properly identified
G Quantity of groundwater treated annually_____
G Quantity of surface water treated annually_____
Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
G N/A G Good condition G Needs O&M
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
G N/A G Good condition G Proper secondary containment G Needs O&M
Remarks_____

4. **Discharge Structure and Appurtenances**
G N/A G Good condition G Needs O&M
Remarks_____

5. **Treatment Building(s)**
G N/A G Good condition (esp. roof and doorways) G Needs repair
G Chemicals and equipment properly stored
Remarks_____

6. Monitoring Wells (pump and treatment remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs O&M G N/A
Remarks_____

D. Monitored Natural Attenuation NA

1. **Monitoring Wells** (natural attenuation remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs O&M G N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

remediation complete

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

NA

C.	**Early Indicators of Potential Remedy Failure**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the five-year review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: 18 - Jet Engine Test Cell	**Date of inspection:** 22-8-00
Location and Region: Mavern ARB, 9	**EPA ID:** OU1
Agency, office, or company leading the five-year review: Earth Tech	**Weather/temperature:** 90° SUNNY

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Other_____

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____
   Mr. Ivan Vargas, Onsite manager
   Montgomery Watson

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency March ARB CE
Contact M. Encheinto — Environmental Engineer — 22-8-00
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached
Waiting review w/ CME EPA

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

NA

III.. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	G O&M manual	G Readily available	G Up to date	G N/A
	G As-built drawings	G Readily available	G Up to date	G N/A
	G Maintenance logs	G Readily available	G Up to date	G N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	G Readily available	G Up to date	G N/A
	G Contingency plan/emergency response plan	G Readily available	G Up to date	G N/A
	Remarks			
3.	**O&M and OSHA Training Records**	G Readily available	G Up to date	G N/A
	Remarks			
4.	**Permits and Service Agreements**			
	G Air discharge permit	G Readily available	G Up to date	G N/A
	G Effluent discharge	G Readily available	G Up to date	G N/A
	G Waste disposal, POTW	G Readily available	G Up to date	G N/A
	G Other permits	G Readily available	G Up to date	G N/A
	Remarks			
5.	**Gas Generation Records**	G Readily available	G Up to date	G N/A
	Remarks			
6.	**Settlement Monument Records**	G Readily available	G Up to date	G N/A
	Remarks			
7.	**Groundwater Monitoring Records**	G Readily available	G Up to date	G N/A
	Remarks			
8.	**Leachate Extraction Records**	G Readily available	G Up to date	G N/A
	Remarks			
9.	**Discharge Compliance Records**			
	G Air	G Readily available	G Up to date	G N/A
	G Water (effluent)	G Readily available	G Up to date	G N/A
	Remarks			
10.	Daily Access/Security Logs	G Readily available	G Up to date	G N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**
   G State in-house G Contractor for State N/A
   G PRP in-house G Contractor for PRP
   G Other_____

2. **O&M Cost Records**
   G Readily available G Up to date N/A
   G Funding mechanism/agreement in place
   Original O&M cost estimate_____ G Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____
   N/A

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. Fencing damaged G Location shown on site map G Gates secured G N/A
   Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
   Remarks On base location - flightline area restricted

C. Institutional Controls

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented G Yes G No G N/A
   Site conditions imply ICs not being fully enforced G Yes G No G N/A

   Type of monitoring (e.g., self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.

   Reporting is up-to-date G Yes G No G N/A
   Reports are verified by the lead agency G Yes G No G N/A

   Specific requirements in deed or decision documents have been met G Yes G No G N/A
   Violations have been reported G Yes G No G N/A
   Other problems or suggestions: G Report attached

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A
   Remarks _____

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident
   Remarks _____

2. **Land use changes onsite** G N/A
   Remarks _____

3. **Land use changes offsite** G N/A
   Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
   Remarks_____

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. Vegetative Cover G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. Alternative Cover (armored rock, concrete, etc.) G N/A
   Remarks_____

7.	**Bulges** Areal extent_____ Remarks_____	G Location shown on site map Height_____	G Bulges not evident
8.	**Wet Areas/Water Damage** G Wet areas G Ponding G Seeps G Soft subgrade Remarks_____	G Wet areas/water damage not evident G Location shown on site map G Location shown on site map G Location shown on site map G Location shown on site map	Areal extent_____ Areal extent_____ Areal extent_____ Areal extent_____
9.	**Slope Instability** Areal extent_____ Remarks_____	G Slides G Location shown on site map	G No evidence of slope instability
B. Benches	G Applicable G N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench** Remarks_____	G Location shown on site map	G N/A or okay
2.	**Bench Breached** Remarks_____	G Location shown on site map	G N/A or okay
3.	**Bench Overtopped** Remarks_____	G Location shown on site map	G N/A or okay
C. Letdown Channels	G Applicable G N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement** Areal extent_____ Remarks_____	G Location shown on site map Depth_____	G No evidence of settlement
2.	**Material Degradation** Material type_____ Remarks_____	G Location shown on site map Areal extent_____	G No evidence of degradation

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

4. Leachate Extraction Wells
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

5.	**Settlement Monuments**	G Located	G Routinely surveyed	G N/A
	Remarks_____			
	_____			
E. Gas Collection and Treatment		G Applicable	G N/A	
1.	**Gas Treatment Facilities**			
	G Flaring	G Thermal destruction	G Collection for reuse	
	G Good condition	G Needs O&M		
	Remarks_____			
	_____			
2.	**Gas Collection Wells, Manifolds and Piping**			
	G Good condition	G Needs O&M		
	Remarks_____			
	_____			
3.	**Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)			
	G Good condition	G Needs O&M	G N/A	
	Remarks_____			
	_____			
F. Cover Drainage Layer		G Applicable	G N/A	
1.	**Outlet Pipes Inspected**	G Functioning	G N/A	
	Remarks_____			
	_____			
2.	**Outlet Rock Inspected**	G Functioning	G N/A	
	Remarks_____			
	_____			
G. Detention/Sedimentation Ponds		G Applicable	G N/A	
1.	**Siltation**	Areal extent_____	Depth_____	G N/A
	G Siltation not evident			
	Remarks_____			
	_____			
2.	**Erosion**	Areal extent_____	Depth_____	
	G Erosion not evident			
	Remarks_____			
	_____			
3.	Outlet Works	G Functioning	G N/A	
	Remarks_____			
	_____			
4.	Dam	G Functioning	G N/A	
	Remarks_____			
	_____			

H. Retaining Walls	G Applicable	G N/A
1.	**Deformations**	G Location shown on site map G Deformation not evident Horizontal displacement_____ Vertical displacement_____ Rotational displacement_____ Remarks_____
2.	**Degradation**	G Location shown on site map G Degradation not evident Remarks_____
I. Perimeter Ditches/Off-Site Discharge	G Applicable	G N/A system currently off-line
1.	**Siltation**	G Location shown on site map G Siltation not evident Areal extent_____ Depth_____ Remarks_____
2.	**Vegetative Growth**	G Location shown on site map G N/A G Vegetation does not impede flow Areal extent_____ Type_____ Remarks_____
3.	**Erosion**	G Location shown on site map G Erosion not evident Areal extent_____ Depth_____ Remarks_____
4.	**Discharge Structure**	G Functioning G N/A Remarks_____
VIII. VERTICAL BARRIER WALLS	G Applicable	G N/A
1.	**Settlement**	G Location shown on site map G Settlement not evident Areal extent_____ Depth_____ Remarks_____
2.	**Performance Monitoring**	Type of monitoring_____ G Performance not monitored Frequency_____ G Evidence of breaching Head differential_____ Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A			
A. Groundwater Extraction Wells, Pumps, and Pipelines		G Applicable	G N/A
1.	**Pumps, Wellhead Plumbing, and Electrical** G Good condition G All required wells located G Needs O&M G N/A Remarks		
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs O&M Remarks		
3.	**Spare Parts and Equipment** G Readily available G Good condition G Requires upgrade G Needs to be provided Remarks		
B. Surface Water Collection Structures, Pumps, and Pipelines		G Applicable	G N/A
1.	**Collection Structures, Pumps, and Electrical** G Good condition G Needs O&M Remarks		
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs O&M Remarks		

3. **Spare Parts and Equipment**
G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
G Metals removal G Oil/water separation G Bioremediation
G Air stripping G Carbon adsorbers
G Filters_____
G Additive (e.g., chelation agent, flocculent)_____
G Others_____
G Good condition G Needs O&M
G Sampling ports properly marked and functional
G Sampling/maintenance log displayed and up to date
G Equipment properly identified
G Quantity of groundwater treated annually_____ offline now
G Quantity of surface water treated annually_____
Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
G N/A G Good condition G Needs O&M
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
G N/A G Good condition G Proper secondary containment G Needs O&M
Remarks_____

4. **Discharge Structure and Appurtenances**
G N/A G Good condition G Needs O&M
Remarks_____

5. **Treatment Building(s)**
G N/A G Good condition (esp. roof and doorways) G Needs repair
G Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs O&M G N/A
Remarks_____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs O&M G N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Awaiting commencement of EPA & state regulations

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

NA

C.	**Early Indicators of Potential Remedy Failure**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the five-year review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: 29 – Fire Training	Date of inspection: 8-23-00
Location and Region: Mann AFB, 9	EPA ID: OU1
Agency, office, or company leading the five-year review: EarthTech	Weather/temperature: Sunny 82°

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- (G) Access controls
- (G) Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other_____

gw addressed in OU1 Groundwater Plume

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** ~~NA~~ _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. O&M staff _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency 452 SPTG/CEV March ARB
Contact Eric Lehto Engineer 8-23-00
Name Title Date Phone no.
Problems; suggestions; G Report attached No

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; G Report attached

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; G Report attached

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; G Report attached

4. **Other interviews** (optional) G Report attached.

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	G O&M manual	G Readily available	G Up to date	G N/A
	G As-built drawings	G Readily available	G Up to date	G N/A
	G Maintenance logs	G Readily available	G Up to date	G N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	G Readily available	G Up to date	G N/A
	G Contingency plan/emergency response plan	G Readily available	G Up to date	G N/A
	Remarks			
3.	**O&M and OSHA Training Records**	G Readily available	G Up to date	G N/A
	Remarks			
4.	**Permits and Service Agreements**			
	G Air discharge permit	G Readily available	G Up to date	G N/A
	G Effluent discharge	G Readily available	G Up to date	G N/A
	G Waste disposal, POTW	G Readily available	G Up to date	G N/A
	G Other permits	G Readily available	G Up to date	G N/A
	Remarks			
5.	**Gas Generation Records**	G Readily available	G Up to date	G N/A
	Remarks			
6.	**Settlement Monument Records**	G Readily available	G Up to date	G N/A
	Remarks			
7.	**Groundwater Monitoring Records**	G Readily available	G Up to date	G N/A
	Remarks			
8.	**Leachate Extraction Records**	G Readily available	G Up to date	G N/A
	Remarks			
9.	**Discharge Compliance Records**			
	G Air	G Readily available	G Up to date	G N/A
	G Water (effluent)	G Readily available	G Up to date	G N/A
	Remarks			
10.	Daily Access/Security Logs	G Readily available	G Up to date	G N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**
   G State in-house G Contractor for State
   G PRP in-house G Contractor for PRP
   G Other_____

2. **O&M Cost Records**
   G Readily available G Up to date
   G Funding mechanism/agreement in place
   Original O&M cost estimate_____ G Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
   Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A
   Remarks on-base location

C. Institutional Controls

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented G Yes G No G N/A
   Site conditions imply ICs not being fully enforced G Yes G No G N/A

   Type of monitoring (e.g., self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.

   Reporting is up-to-date G Yes G No G N/A
   Reports are verified by the lead agency G Yes G No G N/A

   Specific requirements in deed or decision documents have been met G Yes G No G N/A
   Violations have been reported G Yes G No G N/A
   Other problems or suggestions: G Report attached

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A
   Remarks _____

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident
   Remarks _____

2. **Land use changes onsite** G N/A
   Remarks _____

3. **Land use changes offsite** G N/A
   Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
   Remarks_____

B. Other Site Conditions

Remarks OK

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. Alternative Cover (armored rock, concrete, etc.) G N/A
   Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable G N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable G N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. **Cover Penetrations** G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

5.	**Settlement Monuments**	G Located	G Routinely surveyed G N/A
	Remarks_____		
E. Gas Collection and Treatment		G Applicable	G N/A
1.	**Gas Treatment Facilities**		
	G Flaring	G Thermal destruction	G Collection for reuse
	G Good condition	G Needs O&M	
	Remarks_____		
2.	**Gas Collection Wells, Manifolds and Piping**		
	G Good condition	G Needs O&M	
	Remarks_____		
3.	**Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)		
	G Good condition	G Needs O&M	G N/A
	Remarks_____		
F. Cover Drainage Layer		G Applicable	G N/A
1.	**Outlet Pipes Inspected**	G Functioning	G N/A
	Remarks_____		
2.	**Outlet Rock Inspected**	G Functioning	G N/A
	Remarks_____		
G. Detention/Sedimentation Ponds		G Applicable	G N/A
1.	**Siltation** Areal extent_____	Depth_____	G N/A
	G Siltation not evident		
	Remarks_____		
2.	Erosion Areal extent_____	Depth_____	
	G Erosion not evident		
	Remarks_____		
3.	Outlet Works	G Functioning	G N/A
	Remarks_____		
4.	Dam	G Functioning	G N/A
	Remarks_____		

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable G N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	G Applicable	G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells located G Needs O&M G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs O&M
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable G N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs O&M
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs O&M
   Remarks_____

3. **Spare Parts and Equipment**
G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
G Metals removal G Oil/water separation G Bioremediation
G Air stripping G Carbon adsorbers
G Filters_____
G Additive (e.g., chelation agent, flocculent)_____
G Others_____
G Good condition G Needs O&M
G Sampling ports properly marked and functional
G Sampling/maintenance log displayed and up to date
G Equipment properly identified
G Quantity of groundwater treated annually_____
G Quantity of surface water treated annually_____
Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
G N/A G Good condition G Needs O&M
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
G N/A G Good condition G Proper secondary containment G Needs O&M
Remarks_____

4. **Discharge Structure and Appurtenances**
G N/A G Good condition G Needs O&M
Remarks_____

5. **Treatment Building(s)**
G N/A G Good condition (esp. roof and doorways) G Needs repair
G Chemicals and equipment properly stored
Remarks_____

6. Monitoring Wells (pump and treatment remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs O&M G N/A
Remarks_____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs O&M G N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

OK

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	**Early Indicators of Potential Remedy Failure**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. NONE
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. NONE

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the five-year review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: 31-Solvent Spill	**Date of inspection:** 8-23-00
Location and Region: March AFB	**EPA ID:** CA1
Agency, office, or company leading the five-year review: EarthTech	**Weather/temperature:** Sunny 80°

Remedy Includes: (Check all that apply)
- G Landfill cover/containment
- G Access controls
- G Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other on-base location

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** see report - Juan Vargas
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. O&M staff _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3: **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency 452 SPTG/CEV March AFB
Contact Encinetto _____ 8-23-00 _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

Duan Vongsa

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	G O&M manual	G Readily available	G Up to date	G N/A
	G As-built drawings	G Readily available	G Up to date	G N/A
	G Maintenance logs	G Readily available	G Up to date	G N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	G Readily available	G Up to date	G N/A
	G Contingency plan/emergency response plan	G Readily available	G Up to date	G N/A
	Remarks			
3.	**O&M and OSHA Training Records**	G Readily available	G Up to date	G N/A
	Remarks			
4.	**Permits and Service Agreements**			
	G Air discharge permit	G Readily available	G Up to date	G N/A
	G Effluent discharge	G Readily available	G Up to date	G N/A
	G Waste disposal, POTW	G Readily available	G Up to date	G N/A
	G Other permits	G Readily available	G Up to date	G N/A
	Remarks			
5.	**Gas Generation Records**	G Readily available	G Up to date	G N/A
	Remarks			
6.	**Settlement Monument Records**	G Readily available	G Up to date	G N/A
	Remarks			
7.	**Groundwater Monitoring Records**	G Readily available	G Up to date	G N/A
	Remarks			
8.	**Leachate Extraction Records**	G Readily available	G Up to date	G N/A
	Remarks			
9.	**Discharge Compliance Records**			
	G Air	G Readily available	G Up to date	G N/A
	G Water (effluent)	G Readily available	G Up to date	G N/A
	Remarks			
10.	Daily Access/Security Logs	G Readily available	G Up to date	G N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**
   G State in-house G Contractor for State
   G PRP in-house G Contractor for PRP
   G Other_____

2. **O&M Cost Records**
   G Readily available G Up to date
   G Funding mechanism/agreement in place
   Original O&M cost estimate_____ G Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ G Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A
   Remarks_____

B. Other Access Restrictions

1. Signs and other security measures G Location shown on site map G N/A
   Remarks on-base location

C. Institutional Controls

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented G Yes G No G N/A
   Site conditions imply ICs not being fully enforced G Yes G No G N/A

   Type of monitoring (e.g., self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.

   Reporting is up-to-date G Yes G No G N/A
   Reports are verified by the lead agency G Yes G No G N/A

   Specific requirements in deed or decision documents have been met G Yes G No G N/A
   Violations have been reported G Yes G No G N/A
   Other problems or suggestions: G Report attached

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A
   Remarks _____

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident
   Remarks _____

2. Land use changes onsite G N/A
   Remarks _____

3. **Land use changes offsite** G N/A
   Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
   Remarks_____

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. Vegetative Cover G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. Alternative Cover (armored rock, concrete, etc.) G N/A
   Remarks_____

7.	**Bulges**	G Location shown on site map	G Bulges not evident
	Areal extent_____	Height_____	
	Remarks_____		
8.	**Wet Areas/Water Damage**	G Wet areas/water damage not evident	
	G Wet areas	G Location shown on site map	Areal extent_____
	G Ponding	G Location shown on site map	Areal extent_____
	G Seeps	G Location shown on site map	Areal extent_____
	G Soft subgrade	G Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** G Slides	G Location shown on site map	G No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	G Applicable	G N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	G Location shown on site map	G N/A or okay
	Remarks_____		
2.	**Bench Breached**	G Location shown on site map	G N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	G Location shown on site map	G N/A or okay
	Remarks_____		
C. Letdown Channels	G Applicable	G N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement	G Location shown on site map	G No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	G Location shown on site map	G No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

4. Leachate Extraction Wells
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs O&M G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
G Flaring G Thermal destruction G Collection for reuse
G Good condition G Needs O&M
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
G Good condition G Needs O&M
Remarks_____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
G Good condition G Needs O&M G N/A
Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
G Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
G Erosion not evident
Remarks_____

3. **Outlet Works** G Functioning G N/A
Remarks_____

4. Dam G Functioning G N/A
Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable G N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A			
A. Groundwater Extraction Wells, Pumps, and Pipelines		G Applicable	G N/A
1.	**Pumps, Wellhead Plumbing, and Electrical** G Good condition G All required wells located G Needs O&M G N/A Remarks		
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs O&M Remarks		
3.	Spare Parts and Equipment G Readily available G Good condition G Requires upgrade G Needs to be provided Remarks		
B. Surface Water Collection Structures, Pumps, and Pipelines		G Applicable	G N/A
1.	**Collection Structures, Pumps, and Electrical** G Good condition G Needs O&M Remarks		
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** G Good condition G Needs O&M Remarks		

3. **Spare Parts and Equipment**
G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
G Metals removal G Oil/water separation G Bioremediation
G Air stripping G Carbon adsorbers
G Filters_____
G Additive (e.g., chelation agent, flocculent)_____
G Others_____
G Good condition G Needs O&M
G Sampling ports properly marked and functional
G Sampling/maintenance log displayed and up to date
G Equipment properly identified
G Quantity of groundwater treated annually_____
G Quantity of surface water treated annually_____
Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
G N/A G Good condition G Needs O&M
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
G N/A G Good condition G Proper secondary containment G Needs O&M
Remarks_____

4. **Discharge Structure and Appurtenances**
G N/A G Good condition G Needs O&M
Remarks_____

5. **Treatment Building(s)**
G N/A G Good condition (esp. roof and doorways) G Needs repair
G Chemicals and equipment properly stored
Remarks_____

6. Monitoring Wells (pump and treatment remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs O&M G N/A
Remarks_____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs O&M G N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

APPENDIX B

INTERVIEW FORMS

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson (CET) for John Johnson **Date:** 9-1-00

Phone: 909 955-1114 **Organization: (if any)** County of Riverside

Street Address: 4080 Lemon St.

City, State, Zip: Riverside, CA 92501

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? a concerted effort has been made.

2. What effect have cleanup operations had on the surrounding community?
Not aware of any.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details. Some citizens are concerned about the speedy cleanup and if anything endangering is left behind.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. Concerns regarding access and uses of transferred lands.

5. Do you feel well informed about the cleanup activities and progress?
yes, Air Force has made a good effort.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup? One issue - NPDES runoff from site now that permits are increasingly restrictive. Is there any runoff, and what BMPs might be applied?

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson (CET) for Linda Fisher **Date:** 9-1-00

Phone: 909 784-4300 **Organization: (if any)** Rep. Ken Calvert, 43rd Congressional District

Street Address: 3400 Central Ave, Suite 200.

City, State, Zip: Riverside, CA 92506

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? High visibility reuse led to even more responsiveness in cleanup on the Air Force's part.

2. What effect have cleanup operations had on the surrounding community?

   Not aware of any.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.

   NO.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details.

   NO.

5. Do you feel well informed about the cleanup activities and progress?

   Yes - good communication is maintained.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?

   Involvement of Congressman Calvert in conversion has assisted w/ hands-on involvement

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson (CET) for Chris Ormsby **Date:** 8-29-00

Phone: 909 413 3229 **Organization: (if any)**

Street Address: PO Box 88005
14177 Frederick St.

City, State, Zip: Moreno Valley, CA 92552

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Positive overall, a lot of effort has been made.

2. What effect have cleanup operations had on the surrounding community? Although toxic plume hasn't had an impact, it has to be considered by Cardinal Glass.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details. Not aware of any, ecological planning commission has assisted in providing the community w/ information.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. No.

5. Do you feel well informed about the cleanup activities and progress? Yes.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup? No.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson (CET) for Steve Nathan **Date:** 8-29-00

Phone: 909 737-3885 **Organization: (if any)** RAB

Street Address: 1951 Alhambra St.

City, State, Zip: Norco, CA 91760

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? They've done a good job.

2. What effect have cleanup operations had on the surrounding community?

   unaware of any.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.

   NO.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details.

   NO.

5. Do you feel well informed about the cleanup activities and progress?

   Yes.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?

   NO.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson for Nate Allen **Date:** 8-29-00

Phone: **Organization: (if any)**

Street Address: 24698 Fay ave.

City, State, Zip: Moreno Valley, CA 92553

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Outstanding, especially compared to some other bases

2. What effect have cleanup operations had on the surrounding community? Limited, because Community is transient and not connected - only a small group of people seem interested. The RAB could shut down and form a committee group.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.

   No.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. No.

5. Do you feel well informed about the cleanup activities and progress?

   Yes.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?

   No.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: MaryPearson(CET) for Ricardo Olalde **Date:** 8-30-00

Phone: 909 793-2691 **Organization: (if any)** KLIENFELDER, INC.

Street Address: 1940 Orange Tree Lane

City, State, Zip: Redlands, CA 92374

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Proceeding slowly & cautiously w/ proper procedures in place, well-documented.

2. What effect have cleanup operations had on the surrounding community?
   Not aware of any.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details. Containing the off-base plume - many people are aware of it, but unsure of what will happen in the future.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. NO

5. Do you feel well informed about the cleanup activities and progress?
   yes

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup? Notice of events are timely.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson (ET) for Bernie Schleicher **Date:** 8-29-00

Phone: 909 ~~943-6100~~ 358-5055 **Organization: (if any)** Co. of Riverside Public Health

Street Address: PO Box 7600

City, State, Zip: Riverside, CA 92513

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Good, compared to most bases.

2. What effect have cleanup operations had on the surrounding community? Resulted in UST closures, and currently closing oil/water separators through the Santa Ana Regional Water Quality Control.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details. IRP Site 40, although no notices or citations.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. NO.

5. Do you feel well informed about the cleanup activities and progress? Well informed, although information has slowed.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup? What will happen w/ the WSA? There's some public concern. Also, who decides cleanup levels, and why are PEAs used as well as PRGs? What about issue of MTBE in jet fuel. Will former fuel sites have to be retested for MTBE PEAs are more stringent.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson for Roger Turner **Date:** 8-25-00

Phone: 909 925-7676 **Organization: (if any)** Eastern Municipal Water District

Street Address: 3415 Santa Cruz Drive

City, State, Zip: Riverside, CA 92507

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Fairly satisfied – has been involved since the beginning of the process & helped develop land use & redevelopment plan.
2. What effect have cleanup operations had on the surrounding community?
   NA
3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details. Would like to see latest data of onbase monitoring and progress, although offbase information is sufficient
4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. NO.
5. Do you feel well informed about the cleanup activities and progress?
   Yes
6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?
   NO.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson for Sharon Terrell **Date:** 8-25-00

Phone: **Organization: (if any)** Assistant to Mary Bono

Street Address: 11401 Heacock St., Ste. 340

City, State, Zip: Moreno Valley, CA 92507

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? As Positive

2. What effect have cleanup operations had on the surrounding community?
   undetermined.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.
   Unaware of any.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details.
   NO.

5. Do you feel well informed about the cleanup activities and progress?
   Yes, really like the updates

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?
   NO

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson for ELIZA ECHEVARRIA **Date:** 8-27-00

Phone: 909-413-3109 **Organization: (if any)** City of Moreno Valley

Street Address: 14177 Frederick RD.

City, State, Zip: Moreno Valley

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Fine.

2. What effect have cleanup operations had on the surrounding community?
Not aware of any.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.
NO.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details.
NO.

5. Do you feel well informed about the cleanup activities and progress?
The Air Force has done a fairly good job.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?
NO.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson (ET) for Kathleen Dale **Date:** 8-31-00

Phone: 909 686-1070 **Organization: (if any)** Wells Area.

Street Address: 3788 McCray St.

City, State, Zip: Riverside, CA 92506

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Handled in capable fashion.

2. What effect have cleanup operations had on the surrounding community? Other than a few newspaper articles, haven't heard much feedback

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.

   NO.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details.

   NO.

5. Do you feel well informed about the cleanup activities and progress? yes, information is provided in a clear & timely manner

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?

   NO.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson (CET) for Jeff Greene **Date:** 8-27-00

Phone: 909 782-4111 **Organization: (if any)** Field Rep. for Sen. Haynes

Street Address: 6800 Indiana ave.

City, State, Zip: Riverside, CA 92506

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? As they have received any complaints or suggestions from their constituents, good.

2. What effect have cleanup operations had on the surrounding community?
   Not aware of any.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.
   NO.

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. No.

5. Do you feel well informed about the cleanup activities and progress?
   Yes.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?
   NO.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Mary Pearson for THOMAS SAFFORD **Date:** 8-28-00

Phone: 909 780-2487x24 **Organization: (if any)** Western Municipal Water District

Street Address: 1645 El Sobrante Rd.

City, State, Zip: Riverside, CA 92503

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Impressed – projects on schedule & under budget

2. What effect have cleanup operations had on the surrounding community? AF has done a good job in considering sites w/the community in mind & has provided advantages in quickly transferring property.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details. None but the general, good coverage for sites 6A+6B

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. NO.

5. Do you feel well informed about the cleanup activities and progress? yes

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup? RAB has carried out its duties well. Mr. Satran really did a good job.

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: Leland P Koyker **Date:** 12/12/00

Phone: 697-2390 **Organization: (if any)** AFVW

Street Address: 21448 Westover Cir.

City, State, Zip: Riverside, CA 92518

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base? Slight to swift going forward.

2. What effect have cleanup operations had on the surrounding community? Satisfaction

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details. No

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details. No

5. Do you feel well informed about the cleanup activities and progress? Yes - and Thanks for the info.

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup? Not presently

Five-Year Review Interview Record

March Air Force Base
Environmental Cleanup

Your Name: T. R. DICK BURSELL **Date:** 12-20-00

Phone: **Organization: (if any)**

Street Address: 823 KENTWOOD DR

City, State, Zip: RIVERSIDE, CA. 92507

The following questions have been adapted from the Environmental Protection Agency's Comprehensive Five-Year Review Guidance document (EPA 540R-98-050). This review is required by law and is being conducted in accordance with CERCLA Section 121(c) and the NCP part 300.430(f)(4)(ii) of the CFR. Your responses will be admitted into public record along with the Final Five-Year Review.

Questions:

1. What is your general impression of the environmental cleanup project at March Air Force Base?
   A VERY COMPREHENSIVE, EFFICIENT OPERATION. EXTREMELY PROFESSIONAL.

2. What effect have cleanup operations had on the surrounding community?
   A POSTIVE PUBLIC RELATIONS EFFECT THAT THE AIRFORCE IS CONCERNED WITH ENVIRONMENTAL ISSUES.

3. Are you aware of any community concerns about the cleanup at March or its operations and administration? If so, please provide details.
   NONE

4. Are you aware of any incidents at March or its properties such as vandalism, trespassing, or emergency response from local authorities? If so please give details.
   NONE

5. Do you feel well informed about the cleanup activities and progress?
   YES

6. Do you have any comments, suggestions, or recommendations about the operation or management of the cleanup?
   NONE

APPENDIX C

O&M REFERENCES

APPENDIX C

O&M REFERENCES

Earth Technology Corporation, 1997. *Installation Restoration Program Site 31, Aquifer and Soil Remediation – Soil Vapor and Groundwater Cleanup Targets and Rebound Test Program ITIR.* September.

Earth Technology Corporation, 1998. *Installation Restoration Program OU 1 Treatment System, Final O&M Manual, March AFB, California.* February.

Earth Technology Corporation, 1999. *Installation Restoration Program Site 18 Remediation System, Final O&M Manual, March ARB, California.* November.

Montgomery Watson, 1999. *O&M Manual, Soil Vapor Extraction System, Site 33 (Panero), March ARB, California*. January.

Montgomery Watson, 1999. *Final Project Plan for Operation and Maintenance of Soil Vapor Extraction System, Site 33 (Panero), March ARB, California. March.*

Montgomery Watson, 1999. *Final Operation and Maintenance Manual, Dual-Phase Extraction System, Site 36, March ARB, California*. September.

Montgomery Watson, 1999. *Final O&M Manual, Bioventing System, Site 39, March ARB, California.* September.

Montgomery Watson, 2000. *Final Quality Program Plan, Long Term Groundwater Monitoring, Long Term Operation, and Long Term Operation and Maintenance Programs, March ARB, California.* September.

Montgomery Watson, 2000. *Final Operation and Maintenance Plan, Remediation Systems, Operable Unit 1 Sites, March ARB, California.* June.

Montgomery Watson, 2000. *Final Operation and Maintenance Plan, Remediation System, Site 33, March ARB, California.* October.

Montgomery Watson, 2000. *Final Operation and Maintenance Plan, Remediation System, Site 36, March ARB, California.* October.

Montgomery Watson, 2000. *First Quarter 2000, Long-Term Groundwater Monitoring Informal Technical Information Report, March ARB, California.* October.

Tetra Tech, 1996. *Final Sampling and Analysis Plan (SAP) Addendum for the Regional Groundwater Basin Evaluation, March AFB, California*. October.

Tetra Tech, 1997. *Installation Restoration Program Stage 5 Remedial Investigation/Feasibility Study, Operable Unit 2, March Air Force Base, California.* August.

APPENDIX D

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Benzene, Toluene, Ethylbenzene and Xylene:

Typically the most toxic components of petroleum fuels. Petroleum fuels are made up of many components; the most toxic (benzene, toluene, ethylebenzene, and xylene) are used to determine the worst health effect.

Bioventing:

A soil cleanup method that involves blowing air into the soil to stimulate the natural breakdown of the contaminants by microbes in the soil.

Carbon adsorption:

A cleanup process where contaminated air or water is passed through carbon. The contaminants stick to carbon, cleaning the air or water. A series of carbon filters are used, and the carbon is changed when it is no longer effective in capturing the contaminants.

CERCLA:

Comprehensive Environmental Response, Compensation, and Liability Act. CERCLA, commonly known as “Superfund,” was passed into law in 1980. CERCLA established a program to identify sites where hazardous substances have been or might be released into the environment, ensure that they are clean up by the responsible parties or the government, and evaluate damages to natural resources. In 1986, the Superfund Amendments and Reauthorization Act (SARA) amended and reauthorized CERCLA fro five years.

NCP:

National Contingency Plan. The federal regulation that guides determination of the sites to be corrected under both the Superfund program and the program to prevent or control spills into surface waters or elsewhere.

PAHs:

Polycyclic aromatic hydrocarbons. A group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances. At March, these contaminants primarily come from burned fuels.

PCBs:

Polychlorinated biphenyls. Contaminants found in substances used as coolants and lubricants in transformers, capacitors, and other electrical equipment.

Removal Action:

An immediate action taken to address a release or threatened release of hazardous substances. A removal action is the cleanup action taken before the ROD has been signed. March has used removal actions to speed the pace of the cleanup.

SVE/Soil Vapor Extraction:

Soil vapor extraction involves blowing air through the soil to vaporize and carry off the contaminants, which are then vacuumed up through extraction wells and passed through a carbon tank – which will filter out the vapors – or a thermal oxidizer, a furnace-like unit that literally burns the contaminants. The exhaust from the thermal oxidizer meets federal and state emission requirements.

TCE:

Tricloroethene or trichloroethylene. A contaminant that is a component of cleaning solvents. TCE is a commonly found contaminant at Air Force bases resulting from the cleaning of aircraft and equipment.

APPENDIX E

COMMENT/RESPONSE MATRIX

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

November 19, 2003

Mr. Phil Mook
AFRPA/DD – McClellan
3411 Olson Street
McClellan CA 95652-1003

SUBJECT: 5-YEAR REVIEW REPORT FOR OU-1, FORMER MARCH AIR FORCE BASE, CALIFORNIA

Dear Mr. Mook,

The U.S. Environmental Protection Agency (EPA) has completed review of the subject document dated September, 2003. The document was well written and comprehensive. EPA's comments are included in the attachment.

The EPA does not agree with the statement that no deficiencies were detected during the 5-year review. We agree with the Air Force that the OU-1 ROD was implemented as intended in the decision document. However, since the ROD was signed additional data has been collected that may impact the long-term protectiveness of the remedy and both the Air Force and EPA recognize that additional Institutional Controls (ICs) are required. Therefore, we agree that the remedies selected are considered protective in the short term, however in order for the remedies to remain protective, in the long-term, the following must be completed:

- Institutional Controls (ICs) must be put in place through a ROD amendment or ESD. The ICs should be based on the language currently being developed as part of the Air Force Real Property Agency OU2 ROD dispute,

- current groundwater data collected from off-site monitoring wells, indicates that concentrations of VOCs detected in groundwater may be increasing off-site. There is no immediate risk from the groundwater because the groundwater in this area is not currently being used for domestic purposes. Additional data will be collected to confirm if VOC concentrations detected in the off-base wells is an increasing trend. Once this data is collected, the Air Force must re-evaluate the containment portion of the groundwater remedy to determine if additional extraction wells should be installed. If installation of additional extraction wells are not sufficient to contain the VOC contamination to the on-base portion of March Air Force Base, then other remedial options may be evaluated and documented in a ROD amendment, as appropriate,

- the impact from the rising groundwater at Site 4 should be evaluated to determine compliance with the remedial action objective to prevent direct contact with the groundwater, and

- the Site 5 landfill should be re-evaluated to confirm that there is no immediate risk to human health and the environment because the landfill was never capped and does not currently have a fence restricting access or any other ICs.

If you have any questions regarding these comments, please contact me at (415) 972-3015.

Sincerely,

Sheryl Lauth
Remedial Project Manager

Attachment

cc: Mr. John Broderick, RWQCB
Mr. Stephen Niou, DTSC
Mr. Kent Parrish, URS Corporation
Mr. Robert Carr, EPA ORC

EPA Comments on the
5-Year Review Report for Former March Air Force Base and March Air Reserve Base, California
September 2003

General Comments

1. Five-Year Review Summary Form. The Five-Year Review Summary Form has been omitted from the 5-year review report. Please present a completed Five-Year Review Summary Form on a page following the Executive Summary. An example of the form is provided in Appendix E of the *Comprehensive Five-Year Review Guidance (OSWER No. 9355.7-03B-P, June 2001*).

2. The protectiveness statements for each site do not use the standard language provided in the applicable USEPA guidance. The USEPA standard language is provided to encourage consistency in preparing 5-year reviews. Please apply the appropriate standard language provided in Appendix E of the USEPA guidance cited in general comment 2 to the protectiveness statements for each site.

Specific Comments

3. p. 2-1 Table 2-1. There is no acknowledgment of the formal dispute over institutional controls (ICs) in Table 2-1 that is mentioned several times in Section 4.0. Additionally, Table 2-1 does not list the other decision documents, including Explanation of Significant Difference (ESD), applicable to operable unit (OU) 1. For example, Table 3.1-1 states ESDs were issued for Site 10 and 15. Please identify in Table 2-1 the formal dispute resolution(s) and all relevant OU 1 decision documents.

4. p. 3-22 Last paragraph. The list of appendixes would seem to better apply at the end of Section 1.0 Introduction. Please revise, as appropriate.

5. p. 4-5 Fourth complete paragraph, second sentence. The text states that a final OPS determination for EGETS was conducted and the results were submitted to the regulators in January 2003. The text also needs to state that OPS determination is awaiting installation of additional monitoring wells near existing well OU1OW1 to answer questions about capture in this area of the EGETS.

6. p. 4-6 Section 4.1.1.3 System Operations/Operations and Maintenance. For Site 4-Landfill No. 6, a comparison of original system operation/operation and maintenance (O&M) costs in the record of decision (ROD) and the actual costs has been omitted from this 5-year review. Cost information is useful in evaluating O&M effectiveness and provides an indication of problems with the selected remedy. Please provide a comparison of the original and actual system annual operation/O&M cost or a statement why cost information is not available.

7. p. 4-6 First complete paragraph, second sentence. The text states that Site 4 is currently considered a nonhazardous site for O&M activities. The term nonhazardous site is confusing because the text suggests that this is no longer a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site or a hazardous waste operation.

63. p. 4-77 Second complete paragraph. The text states that the only standards that have changes since the OU1 ROD was signed are EPA Region IX PRGs. This is not a correct statement. It is apparent that only the remedial goals were assessed. Please review the ARARs applied to the OU1 ROD and identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that may affect this site. See Comment 013 above,

64. p. 4-78 First paragraph. The EPA standard language is provided to encourage consistency in preparing a 5-year review. The standard language used to formulate the protectiveness statements has not been used. Please apply the appropriate standard language provided in Appendix E of the EPA 5-year review guidance.

65. p. 4-79 First paragraph, last sentence. The text discusses the eastern and southern extent of the off-base contaminant plumes. It is unclear what the definition of plume is in this discussion. The text should be revised to clearly indicate whether the plume described refers to the contamination above cleanup standards or the detectable plume.

66. p. 4-79 Last paragraph. The RAOs are not presented and it is not clear if the remedy was to attain cleanup below the level for unlimited use and unrestricted exposure. Consequently, it is not clear if a statutory 5-year review would be required in the future. Please clarify the RAOs for OU1-Groundwater Plume.

67. p. 4-82 Section 4.10.1.3 System Operations. For OU1-Groundwater Plume, a comparison of original annual system operation/O&M costs in the ROD and the actual costs has been omitted from this 5-year review. Cost information is useful in evaluating O&M effectiveness and provides an indication of problems with the selected remedy. Please provide a comparison of the original and actual system annual operation/O&M cost or a statement why cost information is not available.

68. p. 4-83 Section 4.10.3.3 Risk Information Review. This section evaluates the standards selected for the cleanup levels in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.10.4. Recommend eliminating Section 4.10.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.10.4.

69. p. 4-84 Second to the last paragraph. The importance of health and safety of workers and complying with OSHA requirements is acknowledged for OU 1-Groundwater Plume. The remedy included ICs placed at this site. Specific conditions of covenant and restrictions should be discussed in the Implementation of Institutional Controls and Other Measures subsection.

70. p. 4-84 Last paragraph, first sentence. The sentence states that California Health and Safety Code $25230 requires implementation of deed restrictions as an IC. The cited state law applies to hazardous waste property or border zones and the establishment of covenants and restrictions. Please clarify if this was identified as an ARAR in the OU1 ROD for this site.

71. p. 4-85 First complete paragraph, last sentence. The text states that the Air Force has agreed to install additional wells in late 2003 to fill data gaps. Please add text that indicates that the results from these additional efforts will be evaluated and recommendations will be developed for evaluation by the project team.

Please clarify this statement.

8. p. 4-6 First complete paragraph. The selected remedy for Site 4-Landfill No. 6 included an impermeable vertical barrier to isolate the storm drainage system from the landfill material. However, the text states only a channel was cut along the western boundary of the site to divert runoff. The discussion of an impermeable vertical barrier is also absent from the remedial actions presented on p. 4-3. Please reconcile the remedial action with the remedy stated in the OU1 ROD.

9. p. 4-7 Second to last paragraph second to last sentence. The text states that deeper landfill gas probes were set approximately one foot above first groundwater. Groundwater has been rising approximately 2 feet per year at March AFB, on average. Even though groundwater has reportedly stabilized recently, these probes should be monitored closely to avoid them becoming submerged.

10. p. 4-8 Last paragraph. Section 4.1.3.3 Risk Information Review, evaluates the standards selected for the remedial goals (cleanup levels) in the ROD and concludes the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment section presented in Section 4.1.4. Recommend eliminating Section 4.1.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.1.4.

11. p. 4-9 Last paragraph, first sentence. The text states the 1995 closure report indicates that the landfill cap achieved the remedial action objectives (RAOs) for Site 4-Landfill No. 6. However, the document is not referenced in Section 5.0. Please review the reference section to identify all the relevant documents that were reviewed for this 5-year review. Appendix B of the EPA 5-year review guidance document provides direction on reviewing and referencing documents for a 5-year review.

12. p. 4-10 Second paragraph, eighth sentence. There are errors in the both the references for the Code of Federal Regulations and the California Code of Regulations. Please correct.

13. p. 4-10 Second paragraph, last sentence. The text states that eight wells show increasing contaminant concentration trends over time. Several of these wells are downgradient of the newly installed extraction wells (4EX01 and 4EX02) west of the landfill. Increasing trends downgradient of the extraction wells could indicate incomplete capture. In addition, two wells (4MW20 and 4MW23) with increasing contaminant concentration trends may be outside the capture zones for these new extraction wells. These wells are located in the northern portion of Site 4 where waste is reportedly submerged in groundwater, facilitating contaminant mass loading to groundwater. EPA recommends that this issue be further evaluated and modifications to the system be implemented, if warranted, prior to the next five-year review.

14. p. 4-11 Second paragraph, first sentence. The importance of worker health and safety and complying with Occupational Safety and Health Administration (OSHA) requirements is acknowledged for the site. Although EPA agrees that compliance with OSHA requirements is necessary, it appears irrelevant to the remedy and cleanup of Site 4-Landfill No. 6. It is highly unlikely this was identified as an applicable or relevant and appropriate requirement (ARAR) for the site (i.e., not a environmental requirement). So it is questionable why it is relevant now. With regards to occupational health requirements, please explain why this is relevant to the

cleanup.

15. p. 4-12 Fourth complete paragraph. The text states “...standards that have changes since the OU1 ROD was signed...are not significant enough to affect the protectiveness of the remedy.” The text is consistent with Section 1.0 that stated that newly promulgated ARARs would be reviewed as part of the technical assessment. However, it is not clear if these statements are correct. For example, California hazardous waste regulations on land use covenants became effective in April 2003 and implement the intent of State Assembly Bill (AB) 2436 (effective on January 1, 2003). These new requirements specifically address land use covenants applicable to federal facilities. Please state if this new state requirement has been evaluated and if it affects the remedy selected for this site. Equally important is that a regulatory review was completed on the state and federal chemical-, location-, and action-specific requirements and to-be-considered guidance (TBCs) are being referenced in this statement. Appendix E of the EPA 5-year review guidance (p. E-29) suggests a method to present this information.

16. p. 4-14 Second to the last paragraph, first sentence. The text states that the remedial action is protective of human health. However, the remedial action objective is to “eliminate contaminant loading to the groundwater”. Considering the landfill waste is at least 5 feet below the water table at the site and there is some question on whether the action-specific ARARs are being met, it is not immediately apparent how this remedy and the protectiveness statement are being attained. EPA recommends retracting this protectiveness statement and stating “A protectiveness determination of the remedy at Landfill No. 6 cannot be made...” (see p.E-30 of the EPA 5-year review guidance for standard language).

17. p. 4-18 First paragraph. Section 4.2.3.3, Risk Information Review evaluates the standards selected for the remedial goals (cleanup levels) in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment section presented in Section 4.2.4. Recommend eliminating Section 4.2.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.2.4.

18. p. 4-18 Fourth paragraph. The importance of worker health and safety and complying with OSHA requirements is acknowledged for the site. Although EPA agrees that complying with OSHA requirements is necessary, it is irrelevant to the remedy and cleanup of IRP Site 5-Landfill No. 3. It is highly unlikely this was identified as an ARAR for the site (i.e., not an environmental requirement). So it is questionable why it is relevant now. With regards to occupational health requirements, please explain why this is relevant to cleanup.

19. p. 4-18 Fifth paragraph, First and second sentences. To respond to Question A, the text states that ICs are not included in the remedy for IRP Site 5-Landfill No. 3 but the importance was recognized for waste left in place above regulatory levels. This statement is troubling because it leads the reader to conclude that a remedy was selected that did not comply with CERCLA $121(i.e., protective of human health and the environment) and did not comply with the threshold criteria in the feasibility study (i.e., applicable or relevant and appropriate requirements [ARARs)). Please clarify what is meant by this statement.

20. p. 4-19 Sixth complete paragraph. The text states “...standards that have changes since the OU1 ROD was signed...are not significant enough to affect the protectiveness of the remedy.” It is not clear if this is a correct statement. Please identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that are being referenced in this statement. See Comment @13 above,

21. p. 4-19 Last paragraph. NFA was identified for Site 5-Landfill No. 3. Additionally, ICs were not identified for this site. The response to Question C does not discuss new information that questions the protectiveness of the remedy and the need for ICs. However, the response to Question A has already identified a protectiveness issue in regards to the lack of ICS. Response to Question C should present the new information that has led the Air Force and the regulatory agencies to recognize the importance of ICS at this site.

22. p. 4-20 Last paragraph. The EPA standard language is provided to encourage consistency in preparing a 5-year review. The standard language used to formulate the protectiveness statements has not been used. Please apply the appropriate standard language provided in Appendix E of the EPA 5-year review guidance.

23. p. 4-26 Section 4.3.3.3 Risk Information Review. This section evaluates the standards selected for the remedial goals (cleanup levels) in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.3.4. Recommend eliminating Section 4.3.3.3 and moving the evaluation of the chemical specific standards to Question B in Section 4.3.4.

24. p. 4-28 First paragraph, first and second sentences. The importance of worker health and safety and complying with OSHA requirements is acknowledged for the site. Although EPA agrees that complying with OSHA requirements is necessary, complying with the Air Force health and safety plan (HASP) is only a condition placed on the lease agreement for Site 7-Fire Protection Training Area No. 2. The remedy included ICS placed at this site. Specific conditions of covenant and restrictions should be discussed in the Implementation of Institutional Controls and Other Measures subsection.

25. p. 4-28 Seventh complete paragraph. The text states “...standards that have changes since the OU1 ROD was signed...are not significant enough to affect the protectiveness of the remedy.” It is not clear if this is a correct statement. Please identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that are being referenced in this statement. See Comment 013 above

26. p. 4-33 First paragraph. The text states that the remedy for Site 10 was ‘altered slightly’ from low-temperature thermal desorption to bioremediation. Bioremediation was an alternative presented but not selected in the OU1 ROD. However, the text does not reference a Superfund decision document used to record this ROD change. EPA is aware that an ESD was prepared. Please provide the specific details on the ESD for this site. Recommend replacing the words ‘altered slightly’ to ‘changed’.

27. p. 4-33 Sixth paragraph, first sentence. The text states that the Site 10 5-year review process included a review of related documents. Section 4.4 fails to identify and reference the related documents. Please identify the documents reviewed for this site in this 5-year review.

28. p. 4-34 Section 4.4.3.3 Risk Information Review. This section does not evaluate the standards selected in the ROD to develop the remedy for the site. Although the remedy changed from that presented in the ROD, the remedy for Flightline Drainage Channel left no residual contamination at the site. The text should clearly and concisely state that no hazardous substances, pollutants, or contaminants remain on the site above levels that allow for unlimited use and unrestricted exposure. The text can then be used to support the protectiveness statement for the site, conclude the site has achieved unlimited use and unrestricted exposure, and that the 5-year review should be discontinued for this site.

29. p. 4-34 Section 4.4.3.3 Risk Information Review. This section evaluates the standards selected for the cleanup levels in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.4.4. Recommend eliminating Section 4.4.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.4.4.

30. p. 4-34 Third to the last paragraph. The importance of worker health and safety and complying with OSHA requirements is acknowledged for the site. Although EPA agrees that complying with OSHA requirements is necessary, it is irrelevant to the remedy and cleanup of IRP Site 10-Flightline Drainage Channel. With regards to occupational health requirements, please explain why this is relevant.

31. p. 4-35 Fifth complete paragraph. The text states that the review “did not identify any standards or to be considered that would require a different remedy.” It is not clear if this is a correct statement. Please identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that are being referenced in this statement. 8ee Comment #13 above

32. p. 4-36 First paragraph. The EPA standard language is provided to encourage consistency in preparing a 5-year review. The standard language used to formulate the protectiveness statements has not been used. Please apply the appropriate standard language provided in Appendix E of the EPA 5-year review guidance.

33. p. 4-37 Second to the last paragraph. The text does not state the RAOs selected in the OU1 ROD for IRP Site 15-Fire Protection Area No. 3. To assess this site under the 5-year review, it is necessary to state the RAOs. Without this information it is unclear if the site was remediated to levels below unlimited use and unrestricted exposure and the 5-year review discontinued. Please identify the RAOs at Site 15.

34. p. 4-37 Last paragraph. The text states that the remedy for Site 15 was changed from low-temperature thermal desorption to bioremediation. Bioremediation was an alternative presented but not selected in the OU1 ROD. The text does not reference a Superfund decision document used to record the alternative change until p. 4-43. Please reconcile the text to provide the signatories, date, and details on the ESD.

35. p. 4-40 Section 4.5.3.3 Risk Information Review. This section evaluates the standards selected for the cleanup levels in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.5.4. Recommend eliminating Section 4.5.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.5.4.

36. p. 4-42 Second paragraph. The importance of worker health and safety and complying with OSHA requirements is acknowledged for the site. Although EPA agrees that complying with OSHA requirements is necessary, it is irrelevant to the remedy and cleanup of IRP Site 15-Fire Protection Area No. 3. This site has been remediated to below levels required for unlimited use and unrestricted exposure. Please explain why a HASP is relevant to this site.

37. p. 4-42 Second to the last paragraph. The text states “...standards that have changes since the OU1 ROD was signed...are not significant enough to affect the protectiveness of the remedy.” It is not clear if this is a correct statement. Please identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that are being referenced in this statement. See Comment 013 above

38. p. 4-45 Last paragraph. It is not clear if the RAOs were to attain a cleanup below the level for unlimited use and unrestricted exposure. Consequently, it is not clear if a statutory 5-year review would be required in the future. Please clarify the RAOs for IRP Site 18-Engine Test Cell.

39. p. 4-48 Section 4.6.1.3 System Operations. For Site 18-Engine Test Cell, a comparison of original annual operation/O&M costs in the ROD and actual system costs has been omitted from this 5-year review. Please provide a comparison of the original and actual system annual operation/O&M cost or a statement why cost information is not available.

40. p. 4-49 Section 4.6.3.3 Risk Information Review. This section evaluates the standards selected for the cleanup levels in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.6.4. Recommend eliminating Section 4.6.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.6.4.

41. p. 4-50 Second to the last paragraph. The importance of health and safety of workers and complying with OSHA requirements is acknowledged for the site. Although EPA agrees that complying with OSHA requirements is necessary, complying with the Air Force HASP is only a condition placed on the lease agreement for Site 18-Engine Test Cell. Although the remedy for this site did not include ICS, the specific conditions of covenant and restrictions (i.e., HASP) should be discussed in the Implementation of Institutional Controls and Other Measures subsection.

42. p. 4-51 Fourth complete paragraph. The text states that the review “...did not note any changes in standards or other issues to be considered...” It is not clear if this is a correct statement. Please identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that are being referenced in this statement. See Comment #13 above.

43. p. 4-52 Second to last paragraph. The EPA standard language is provided to encourage consistency in preparing a 5-year review. The standard language used to formulate the protectiveness statements has not been used. Please apply the appropriate standard language provided in Appendix E of the EPA 5-year review guidance.

44. p. 4-53 Sixth paragraph, 1“ sentence. This sentence states that implementation of ICS were proposed for IRP Site 29, Fire Protection Training Area No. 15. Correct this statement to state it is a part of this remedy.

45. p. 4-53 Sixth complete paragraph. Contaminants were left at the site above levels that allow for unlimited use and unrestricted exposure at this NFA site. To assess this site under the 5-year review, it is necessary to state the RAOs. Please identify the RAOs in the OU1 ROD for IRP Site 29-Fire Protection Training Area No. 15.

46. p. 4-55 Section 4.7.3.3 Risk Information Review. This section evaluates the standards selected for the cleanup levels in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.7.4. Recommend eliminating Section 4.7.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.7.4.

47. p. 4-57 First paragraph, last sentence. The text states that ICS are an appropriate remedy for the site but section 4.7.1.1 Remedy Selection states that the OU1 ROD identified that no further remedial action was required for Site 29. It seems that implementation of ICS is a remedial action. Please explain the apparent discrepancy between these two texts.

48. p. 4-57 Third paragraph. The text states no HASP exist for IRP Site 29, Fire Protection Training Area No. 15. Specific conditions of covenant and restrictions (i.e., IC) should be discussed in the Implementation of Institutional Controls and Other Measures subsection.

49. p. 4-57 Fourth paragraph, fourth sentence. The text should be revised to be the following, “The AFRC will identify the site as an IRP site with residual contamination remaining above the concentrations which would allow for unlimited use and unrestricted exposure.

50. p. 4-58 Second complete paragraph. The text states that the only standards that have changes since the OU1 ROD was signed are EPA Region IX preliminary remedial goals (PRGs). This is not a correct statement. Please review the ARARs applied to the OU1 ROD and identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that may affect to this site; See Comment #l3 above

51. p. 4-59 Second to last paragraph. The EPA standard language is provided to encourage consistency in preparing a 5-year review. The standard language used to formulate the protectiveness statements has not been used. Please apply the appropriate standard language provided in Appendix E of the EPA 5-year review guidance.

52. p. 4-63 Second to the last paragraph. The text does not present the RAOs and it is unclear if remedy was to attain a cleanup below the level which would allow for unlimited use and unrestricted exposure. Consequently, it is not clear if a statutory 5-year review would be required after cleanup levels are attained in the future. Please clarify the RAOs for IRP Site 31-Solvent Spill.

53. p. 4-64 Section 4.8.1.3 System Operations. For the Site 31 solvent spill, a comparison of original annual system operation/O&M costs in the ROD and actual costs has been omitted from this 5-year review. Please provide a comparison of the original and

actual system annual operation/O&M cost or a statement why cost information is not available.

54. p. 4-66 Section 4.8.3.3 Risk Information Review. This section discusses the remedial goals (cleanup levels) that were selected in the ROD for the site concluding the changes are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.8.4. Recommend eliminating Section 4.8.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.8.4.

55. p. 4-67 First paragraph, third sentence. The text states that there are no standards that directly regulate subsurface contaminant levels. This sentence is awkwardly worded and misleading. Standards either apply or are relevant and appropriate. Please rephrase this sentence.

56. p. 4-68 Second complete paragraph. The importance of health and safety of workers and complying with OSHA requirements is acknowledged for Site 31-Solvent Spill. The remedy included ICS placed at this site. Specific conditions of covenant and restrictions should be discussed in the Implementation of Institutional Controls and Other Measures subsection.

57. p. 4-69 First complete paragraph. The text states that the only standards that have changes since the OU1 ROD was signed are EPA Region IX PRGs. This is not a correct statement. Please review the ARARs applied to the OU1 ROD and identify the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that may affect this site. See Comment @13 above,

58. p. 4-70 First paragraph. The EPA standard language is provided to encourage consistency in preparing a 5-year review. The standard language used to formulate the protectiveness statements has not been used. Please apply the appropriate standard language provided in Appendix E of the EPA 5-year review guidance.

59. p. 4-71 Last paragraph. The RAOs are not presented and its not clear if the objective is cleanup below the level for unlimited use and unrestricted exposure. Consequently, it is not clear if a statutory 5-year review would be required in the future. Please clarify the RAOs for IRP Site 34-Pritchard Refueling System.

60. p. 4-73 Section 4.9.1.3 System Operations. For Site 34-Pritchard Refueling System, a comparison of original system annual operation/O&M costs in the ROD and the actual costs has been omitted from this 5-year review. Please provide a comparison of the original and actual system annual operation/O&M cost or a statement why cost information is not available.

61. p. 4-74 Section 4.9.3.3 Risk Information Review. This section evaluates the standards selected for the remedial goals (cleanup levels) in the ROD concluding the changes in the standards are not significant and do not affect the protectiveness of the remedy. This evaluation provides the support to respond to Question B in the Technical Assessment presented in Section 4.9.4. Recommend eliminating Section 4.9.3.3 and moving the evaluation of the chemical specific standards to respond to Question B in Section 4.9.4.

62. p. 4-76 Fourth complete paragraph. The importance of health and safety of workers and complying with OSHA requirements is acknowledged for Site 34-Pritchard Refueling

System. The remedy included ICS placed at this site. Specific conditions of covenant and restrictions should be discussed in the Implementation of Institutional Controls and Other Measures subsection.

72. p. 4-85 Fifth complete paragraph. The text states that no changes to the standards have occurred since OU1 ROD was signed. This is not a correct statement. It is apparent that only the remedial goals were reviewed and location-and action-specific ARARs were not assessed. Please review the ARARs applied to the OU1 ROD and assess the changes to the state and federal chemical-, location-, and action-specific requirements and TBCs that may affect this site. See Comment #'13 above.

73. p. 4-86 Second to last paragraph. The EPA standard language is provided to encourage consistency in preparing a 5-year review. The standard language used to formulate the protectiveness statements has not been used. Please apply the appropriate standard language provided in Appendix E of the EPA 5-year review guidance.

74. Appendix A contains the Site Inspection Checklist for the sites in OU1. A checklist is not provided for IRP Site 4-Landfill No. 6, IRP Site 5-Landfill No. 5, IRP Site 10-Flightline Drainage Channel, IRP Site 34-Pritchard Refueling System, and OU1-Groundwater Plume. Please provide the checklist for all the OU1 sites.

California Regional Water Quality Control Board
Santa Ana Region

Terry Tamminen
Secretary for Environmental Protection

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Arnold Schwarzenegger
Governor

November 24, 2003

Mr. Philip Mook, Jr., P.E.
March Environmental Coordinator
AFRPA/DD
3411 Olson Street
McClellan, California 95652-1003

COMMENTS ON 5-YEAR REPORT, FORMER MARCH AIR FORCE BASE

Dear Mr. Mook:

We have reviewed the above referenced document, dated September 2003, which we received September 31, 2003. We have no comments.

For any questions, please call me at (909) 782-4494 or email me at jbroderic@rb8.swrcb.ca.gov.

Sincerely,

John Broderick
SLIC/DoD Section

cc: Mr. Eric Lehto, March ARB, 452 MSG/CEV
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October 14, 2003

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FINAL FIVE-YEAR REVIEW REPORT, FORMAL MARCH AIR FORCE BASE (MAFB) AND MARCH AIR RESERVE BASE (MARB)

Dear Mr. Mook:

The Department of Toxic Substances Control (DTSC) has received the Final Five-Year Review Report (FRR) for MAFB and MARB on October 1, 2003. The report documents the evaluation results of the remedial actions at MAFB and MARB following procedure provided in the Final Work Plan for Five-Year Review of Remedial Actions (Earth Tech, November 2000). The FRR concludes that "the remedies were functioning as designed and were operated and maintained in an appropriate manner. No deficiencies impacting the protectiveness of the remedies were noted during this review." DTSC provides the following comments for your consideration.

General Comments

1. DTSC commented on the Draft FRR requiring field data to be summarized in the FRR to support statements such as "no follow-up actions for Site 31." In response, the Air Force (AF) references to other document such as the Annual Long-Term Groundwater Monitoring Report. However, the FRR is a public document required by the National Contingency Plan and the Comprehensive Five-Year Review Guidance (EPA, June 2001) specifies in Section 2.5.1 that "EPA considers Five-Year Review reports to be stand-alone primary documents..." DTSC recommends that the AF provide summaries of field sampling results to support statements made in the FRR rather than referring to other documents.

2. For those sites requiring institutional controls (ICS), please provide with regulatory agencies copies of the Base Comprehensive Plan (BCP) documenting the implementation of such IC's.

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3. The evaluation of groundwater contamination should be based on sampling results at monitoring wells. Sampling results from extraction wells may be considered as indicators but may not be applied in decision making processes. Please modify the conclusions made based on sampling data from extraction wells. Incase no monitoring wells is available (e.g.), in the vicinity of Extraction Well 31BGEW2 and 31BGEW3), the AF should state the situation in the sections of site deficiencies and propose additional monitoring wells.

Specific Comments

1. Section 4.5.1.2, Remedy Implementation

The FRR states that the AF has completed the removal action at Site 15 and has submitted a final closure report in March 1996. However, because this is the first FRR of MAFB and MARB and the FRR is a stand-alone document, the AF should provide a summary of confirmation sampling results in this section.

3. Section 4.8.5, Site 31 Issues

This section states “no deficiencies at Site 31 were noted during this 5-year review.” However, groundwater samples collected from extraction wells 31BGEW1, 31BGEW2, and 31BGEW3 indicate that the aquifer is contaminated with volatile organic compounds (VOCs). Monitoring data also shows groundwater is flowing to the southeast in the vicinity of Site 31B yet no groundwater monitoring wells are available between 31BGEW1 and 4MW7 and OU1OW1. The distance from 31BGEW1 to OU1OW1 is approximately 1,200 feet. In addition, Monitoring Well OU1OW1, located at the Base’s eastern boundary approximately 1,000 feet southeast of the site, was detected of containing trichloroethene (TCE) at 94 µg/L during the second quarter of 2001. It appears that the VOC plume at Site 31B is not defined and not contained.

DTSC disagrees with the above statement and recommends that the AF take actions to delineate and to contain the VOC plume southeast of Site 31B.

4. Section 4.8.6, Site 31 Assessment

The first paragraph states that the groundwater remedy has been protective of the environment. DTSC disagrees with this statement because groundwater is part of the environment (please see the above comment for details). We recommend that the AF take actions to delineate and to contain the VOC plume southeast of Site 31B.

5. Section 4.8.8, Site 31 Protectiveness Statements

DTSC disagrees that the groundwater remedy is protective of the environment “and complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial actions.” Please see Specific Comment #3 for details. We recommend that the AF take actions to delineate and to contain the VOC plume southeast of Site 31B.

6. Section 4.9.3.4, Data Review

The text states that the State of California “has concurred that the subsurface soils at Site 34 had been remediated” based on the 1997 Site 34 Confirmation Soil and Groundwater Sampling Report. However, during 2001-2002, the AF conducted additional soil sampling and risk calculations. It is based on the risk calculation results in 2002 that DTSC concurred that Site 34 may not require additional removal actions and ICs will be implemented at this site. Please modify the text to reflect recent site development.

7. Section 4.10.5, OU1 Plume Issues

The text states that to "prevent contaminants from migrating off base" is one of the objectives of groundwater remediation. However, a groundwater monitoring well OU1OW1, located at the Base's eastern boundary approximately 1,000 feet southeast of the site, was detected of containing TCE at 94 µg/L during the second quarter of 2001. It appears that the TCE plume may continue to migrate offsite in the vicinity of this well.

DTSC recommends that the AF reflect this deficiency in the text. In addition, the AF should install groundwater monitoring and extraction wells in the vicinity of Well OU1OW1 to fulfill the remedial objectives of OU1.

8. Section 8, Reference

Please include the Final Work Plan for Five-Year Review of Remedial Actions (Earth Tech, November 2000) in this section.

Because of the above concerns, DTSC does not concur with the FRR as it is written. If you have any questions, please contact me at (714) 484-5458.

Sincerely,

Stephen Niou, PE
Base Closure Unit
Southern California Branch
Office of Military Facilities

cc: Mr. John Broderick
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