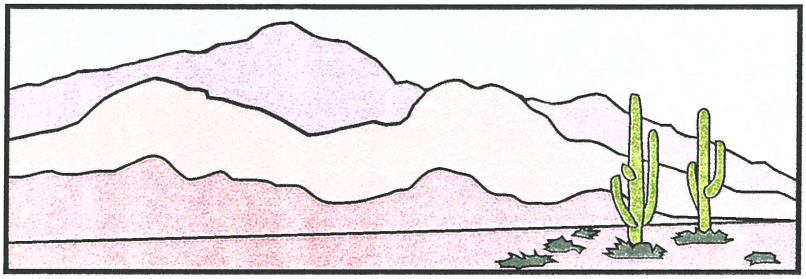
Record of Decision
Installation Restoration Program
Sites 4, 5, and 6

FINAL



Air Force Plant 44
Tucson International Airport Area Superfund Site

Tucson, Arizona

September 1998

UNITED STATES AIR FORCE
AERONAUTICAL SYSTEMS CENTER
Acquisition Environmental Management
Wright-Patterson AFB, Ohio

AIR FORCE CENTER
FOR ENVIRONMENTAL EXCELLENCE
Environmental Restoration Division
Brooks AFB, Texas

INSTALLATION RESTORATION PROGRAM (IRP)

FINAL
RECORD OF DECISION FOR
SOIL CLEANUP OF SITES 4, 5, AND 6

for
Air Force Plant 44
Tucson International Airport Area Superfund Site
Tucson, Arizona

Dennis Scott
Remedial Project Manager
United States Air Force
Aeronautical Systems Center
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September 1998

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Prepared by:

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LIST OF ACRONYMS & ABBREVIATIONS

ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
ADWR	Arizona Department of Water Resources
AFP 44	Air Force Plant 44
ARAR	Applicable or Relevant and Appropriate Requirement
BACT	Best Available Control Technology
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
DCE	Dichloroethylene
DERP	Defense Environmental Restoration Program
DOT	Department of Transportation
DPE	Dual Phase Extraction
EE/CA	Engineering Evaluation/Cost Analysis
FACO	Final Assembly and Checkout
FFA	Federal Facility Agreement
FS	Feasibility Study
GAC	Granular-activated Carbon
GPL	Groundwater Protection Level
GWTP	Groundwater Treatment Plant
HSWA	Hazardous and Solid Waste Amendment
HWMA	Hazardous Waste Management Act
IRP	Installation Restoration Program
ISV	*In-situ* Vitrification
µg/L	Micrograms per Liter
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
mg/kg	Milligrams per Kilogram
MSL	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene
RACT	Reasonably Available Control Technology
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
S/S	Solidification/Stabilization
SVE	Soil Vapor Extraction

LIST OF ACRONYMS & ABBREVIATIONS

Continued

TBC	To-Be-Considered
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
TPH	Total Petroleum Hydrocarbon
UCAB	Unified Community Advisory Board
USC	United States Code
USEPA	United States Environmental Protection Agency
VEMUR	Voluntary Environmental Mitigation Use Restriction
VOC	Volatile Organic Compound

SECTION 1.0

DECLARATION

1.1 SITE NAME AND LOCATION

Air Force Plant 44 (AFP 44) is located within the Tucson International Airport Area Superfund Site, Tucson, Arizona, and is identified as such on the National Priorities List. The Installation Restoration Program (IRP) sites addressed in this Record of Decision (ROD) are:

- **Site 4**: Former Unlined Surface Impoundments
- **Site 5**: Former Sludge Drying Beds
- **Site 6**: Drainage Ditch and Channels

It should be noted that IRP Site 4 consists of shallow soil contaminated with metals. Deeper soil and groundwater contaminated with volatile organic compounds (VOCs) are part of IRP Site 14, the shallow groundwater zone, and are being addressed in separate remedial actions and associated documentation. Additionally, note that IRP Site 5 includes VOC-contaminated soil located west of the sludge drying beds, which were discovered recently.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the selected remedial action for Sites 4, 5, and 6 at AFP 44, Tucson, Arizona, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site.

1.3 ASSESSMENT OF THE SITES

Hazardous substances present at these sites, if not addressed by implementing the response actions selected in this ROD, may result in a release or substantial threat of a release of a hazardous substance into the environment and associated threats to public health, welfare, or the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The Air Force has decided that excavation and offsite disposal in a Resource Conservation and Recovery Act (RCRA) Class I landfill with solidification/stabilization (S/S) is the preferred remedy for excavated metals-contaminated materials under CERCLA for these three specific sites and sources. The decision regarding metals-contaminated soil was based on treatability studies

conducted under the Feasibility Study (FS) (Reference 1) and other documents in the administrative record (see Appendix A for references). The preferred remedy will remediate soil to levels at or below the State of Arizona Final Soil Remediation Standards (residential levels) promulgated in December 1997 for each contaminant of concern. Due to the great depth to groundwater (e.g., 120-feet), the relatively low solubility of most of the contaminants of interest (e.g., metals), and previous research demonstrating negligible impacts to groundwater from metals at AFP 44 (Reference 2), the minimum groundwater protection levels (GPLs) are not applicable as remediation goals for metals in soils at Sites 4, 5, and 6.

The major components of the selected remedy for metals-contaminated soils at Sites 4, 5, and 6 include:

- Characterization trenching, as required
- Excavation of contaminated soils
- S/S for soils containing metals in excess of action levels
- Disposal of soils in a RCRA Class I landfill.

Recently discovered VOC-contaminated soil identified west of IRP Site 5 will be assessed using the U.S. Environmental Protection Agency's (USEPA's) presumptive remedy plug-in approach. The plug-in approach, which is discussed in detail in Section 2.10, defines a process by which a limited number of remedial alternatives are evaluated to address a specific, but relatively common set of contaminants and site conditions. The alternatives evaluated using the plug-in approach for Site 5 soils will be limited to no further action and SVE. SVE removes contaminants from the soil by withdrawing air at extraction wells, which induces an air flow from the surface. The withdrawn air is laden with volatilized contaminants, which are treated aboveground. A VOC detector may be installed to monitor for vapors in the treated air, and can automatically shut down the vapor treatment system if vapor concentrations exceed emissions standards. Treated air is then discharged to the atmosphere. For organic contaminants, rather than using numeric standards as remedial objectives, a narrative standard will be applied as allowed by Arizona Department of Environmental Quality (ADEQ) regulations (R18-7-206). The application of this narrative standard is detailed in Section 2.8.

The Air Force is currently performing non-time critical removal actions at these sites, implementing the selected remedies. These removal actions are being performed concurrently with the ROD process, and allowed site cleanup to begin in February 1996 instead of waiting until the conclusion of the ROD process.

Other sites at AFP 44 have been addressed in a separate ROD, with the following proposed remedies: SVE at Site 1 (Ranch Site), Site 2 (Final Assembly and Checkout [FACO] Landfill), and Site 3 (Inactive Drainage Channel Disposal Pits). A no further action ROD has been issued for four other sites including: Site 7 (North FACO Fire Training Area), Site 8 (South FACO Fire Training Area and Magnesium Burn Area), Site 9 (Explosive Detonation Pit), and Site 15 (Potential Trench Site) (References 4, 5, 6, and 7). Site 14 (Shallow Groundwater Zone) will be addressed in a separate ROD.

The groundwater at AFP 44 is addressed in a separate ROD, "*Final Air Force Plant 44 Remedial Action Plan Responsiveness Summary and Record of Decision*," dated April 1986 (Reference 8).

1.5 STATUTORY DETERMINATIONS

The selected remedies are protective of human health and the environment, comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost-effective. Offsite disposal and S/S and SVE utilize permanent solutions to the maximum extent practicable and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because all inorganic contaminants above required cleanup levels will be removed from Sites 4, 5, and 6, no future review of metals contamination related to this ROD is necessary. However, cleanup of VOCs west of Site 5 may require a five-year review of organic contamination to ensure protection of human health and the environment has been achieved.

Stewart E. Cranston — Date: 4/13/99
Lieutenant General, Air Force
Vice Commander, **Headquarters Air Force Materiel Command**
Wright-Patterson Air Force Base, Ohio

Daniel Opalski, Chief — Date: 9/29/98
Federal Facilities Cleanup Branch
United States Environmental Protection Agency
San Francisco, California

Russell F. Rhoades, Director — Date: 12/31/98
Arizona Department of Environmental Quality
Phoenix, Arizona

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SECTION 2.0

DECISION SUMMARY

The Air Force has selected excavation and offsite disposal at a RCRA Class I landfill with S/S for remediation of metals-contaminated soils that exceed universal treatment standards at Sites 4, 5, and 6. In addition, VOC-contaminated soils located west of Site 5 will be addressed utilizing the USEPA's presumptive remedy plug-in approach, which allows for no further action or SVE as remedial alternatives. The remediation objectives addressed in this ROD are cleanup of three sites to address potential risks to human health and the environment, which includes eliminating potential sources of groundwater contamination. This ROD serves the following three purposes:

- Certify that the remedy selection was carried out in accordance with the requirements of CERCLA and the NCP.
- Outline the engineering components and remediation goals of the selected remedies.
- Provide the public with a consolidated source of information about the history, characteristics, and risks posed by the conditions at the sites, as well as a summary of the cleanup alternatives considered, their evaluation, and the rationale behind selection of the remedies.

The ROD consists of three major components:

- The Declaration, which is an abstract of key information and includes signatures.
- The Decision Summary is the main component of the ROD, and provides background information, an overview of the site characteristics, the remedial alternatives evaluated, and a statutory determination of the selected remedy.
- The Responsiveness Summary, which addresses public comments received on the Proposed Plan and other information in the administrative record.

This ROD addresses three sites at AFP 44:

- **Site 4:** Former Unlined Surface Impoundments
- **Site 5**: Former Sludge Drying Beds
- **Site 6**: Drainage Ditch and Channels.

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1801 Tenth Street, Suite 2
Wright-Patterson AFB, Ohio 45433-7626
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2.1 AIR FORCE PLANT 44 HISTORY AND BACKGROUND

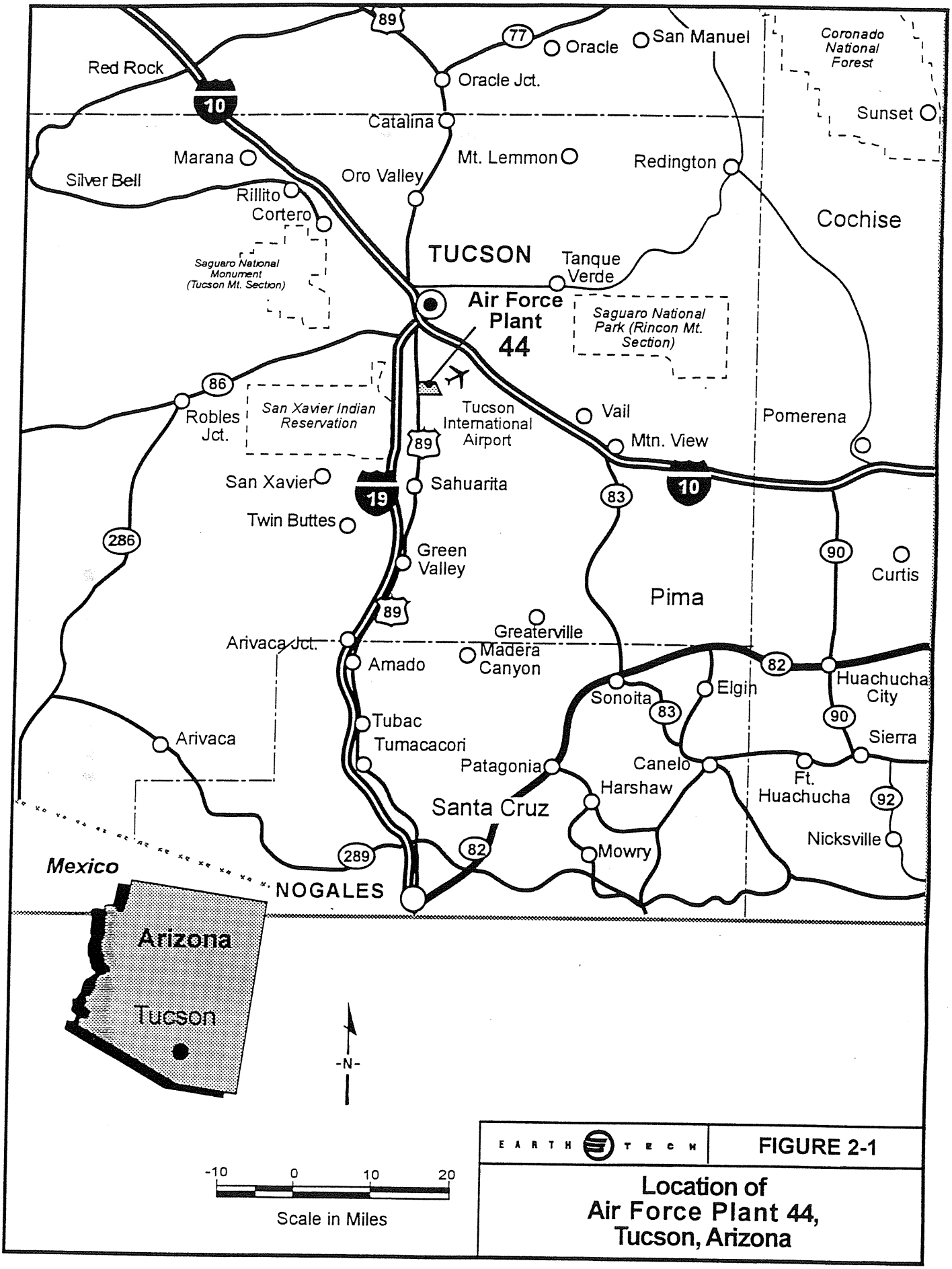
AFP 44 was first constructed in 1951 for the purpose of manufacturing Falcon air-to-air missiles. Over the years, industrial facilities have been constructed to support several other missile systems. At present, industrial facilities occupy a total building area in excess of 2 million square feet (Reference 9).

AFP 44 is located within the Tucson International Airport Area Superfund Site, Tucson, Arizona; a location map is provided in Figure 2-1. AFP 44 is located on flat terrain at an approximate altitude of 2,600 feet above mean sea level (msl). The plant is located 15 miles south of downtown Tucson and is bounded on the east by Tucson International Airport property. The Nogales Highway (Route 89) lies west of the facility. The plant is bounded to the south by Hughes Access Road and on the west by Southern Pacific's Tucson-Nogales railroad spur. A service spur enters the plant from the north, and a temporary spur was installed south of the surface impoundments in support of a RCRA closure effort. The northern boundary of AFP 44 lies along the north section line of Sections 29 and 30. Vacant land and light commercial property is located to the south. The Santa Cruz River, which is located approximately 1.5 miles west of the plant's western boundary, flows in a north-northwesterly direction and drains the Tucson Basin. Review of the Flood Insurance Rate Map for Pima County, Arizona (Reference 10) shows that AFP 44 is not in the 500-year floodplain of the Santa Cruz River.

Other neighboring areas include the San Xavier Indian Reservation (west of Route 89), Davis-Monthan Air Force Base (approximately 3 miles northeast of the plant), Saguaro National Park (the eastern unit is approximately 10 miles to the northeast and the western unit is approximately 15 miles to the northwest), and the Santa Rita Experimental Range (also known as the Sahuarita Bombing and Gunnery Range). The range, located approximately 10 miles south of AFP 44, has not been used since the 1950s.

2.2 SITE INVESTIGATION AND REGULATORY ACTIVITIES

Manufacturing activities at AFP 44 precede the November 19, 1980 effective date of the RCRA. Past disposal practices included treatment, storage, and disposal of industrial wastewater, use of unlined surface impoundments, as well as land disposal of general industrial wastewaters, spent solvents, and dilute and concentrated acids and alkalines (Reference 9).



EARTH TECH

FIGURE 2-1

Location of Air Force Plant 44, Tucson, Arizona

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In early 1981, the USEPA and the Arizona Department of Health Services (ADHS) identified contaminants in the upper zone of the regional aquifer underlying the areas around the Tucson International Airport in Tucson, Arizona. In response to this finding, the Air Force initiated extensive groundwater investigations to determine if contamination existed under AFP 44, and if so, to determine the extent of the contamination. These investigations showed contamination was present. A groundwater reclamation system was activated in 1987 and continues to operate under an April 1986 ROD (Reference 8).

In 1988, USEPA and ADEQ issued a joint permit to the Air Force and its contractor (Hughes Missile Systems Company) pursuant to the RCRA of 1976, 42 USC §6901 *et seq.*, as amended by the Hazardous and Solid Waste Amendments of 1984 ("HSWA"), (collectively referred to as "RCRA"). The joint permit consists of (I) a State permit (Hazardous Waste Management Act "[HWMA] Permit") issued pursuant to certain RCRA provisions authorized to be implemented by the State through its approved HWMA, and (ii) an USEPA issued permit which addresses corrective action regulations promulgated pursuant to HSWA, for which the State had not yet received authorization ("HSWA Permit"). When discussed together, the HWMA Permit and the HSWA Permit are collectively referred to as the Permit.

Since 1988, the Air Force has been conducting cleanup work at AFP 44 pursuant to the Permit. The Air Force, USEPA, and the State (the Project Management Team) have agreed to enter into a Federal Facilities Agreement ("FFA") that will address corrective action activities being conducted under the HSWA Permit to allow termination of the HSWA Permit. The FFA will not affect the HWMA Permit. The terms of the HSWA Permit remain in effect until the FFA is finalized and the HSWA Permit is terminated.

A Remedial Investigation (RI) of potential soil contamination at ten historic waste management sites was conducted in 1991, with supplemental field work in 1993 (Reference 11) and 1995 (Reference 12). A risk assessment, to identify sites for remediation, was completed in 1993 (Reference 13). A FS (Reference 1), which evaluated potential remedial alternatives for contaminated soils, was completed in January 1995. Cleanup of five sites to remove continuing sources of groundwater contamination or to address potential risks to human health and the environment is specifically addressed in the FS: Site 1 (Ranch Site), Site 2 (FACO Landfill), Site 3 (Inactive Drainage Channel Disposal Pits), Site 4 (Former Unlined Surface Impoundments) including portions of the area which were originally sampled during investigation of Site 6 (Drainage Ditch and Channels), and Site 5 (Former Sludge Drying Beds). A no further action ROD has been issued for four other sites including: Site 7 (North FACO Fire Training Area), Site 8 (South FACO Fire Training Area and Magnesium Burn Area), Site 9 (Explosive Detonation Pit), and Site 15 (Potential Trench Site) (References 4, 5, 6, and 7). Site 14 (Shallow Groundwater Zone) remediation will be addressed in a separate ROD. This ROD addresses Sites 4, 5, and 6 soils cleanup only. Figure 2-2 presents the locations of IRP sites addressed in this ROD.

The CERCLA response process uses the RI and FS as succeeding steps in the investigation of a site. The goal of an RI is to gather site information to characterize the nature and extent of contamination, and to recommend either no further action or cleanup based, in part, on the results of a risk

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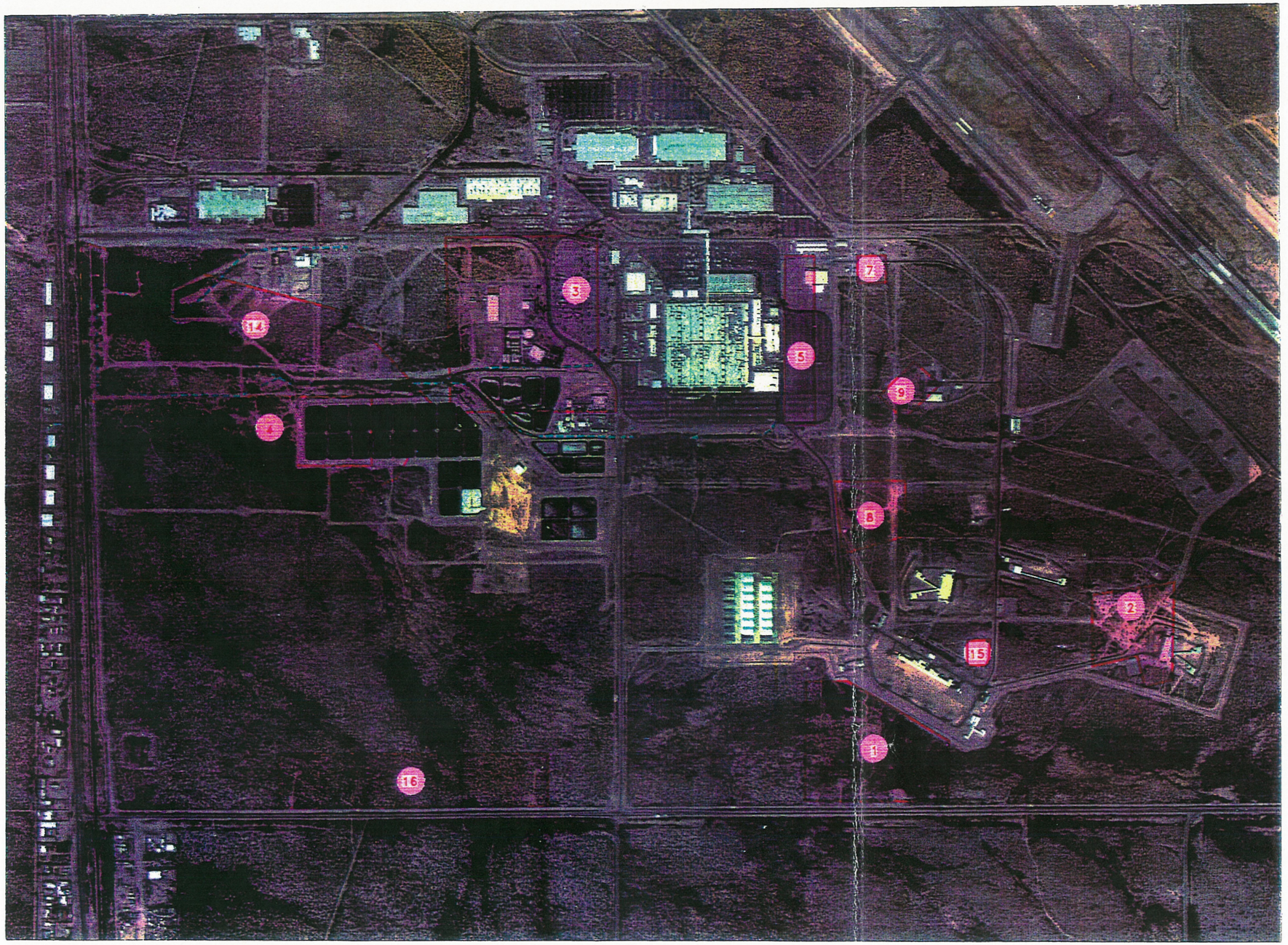

LEGEND

SITE 1	RANCH SITE
SITE 2	FACO LANDFILL
SITE 3	INACTIVE DRAINAGE CHANNEL DISPOSAL PITS
SITE 4	UNLINED SURFACE IMPOUNDMENTS
SITE 5	SLUDGE DRYING BEDS
SITE 6	DRAINAGE DITCH AND CHANNELS
SITE 7	NORTH FACO FIRE TRAINING AREA
SITE 8	SOUTH FACO FIRE TRAINING AREA
SITE 9	EXPLOSIVES DETONATION PIT
SITE 14	PERCHED GROUNDWATER ZONE
SITE 15	POTENTIAL TRENCH SITE
SITE 16	BACKGROUND SITE
- - - - - - - -	SITE 6 DRAINAGE DITCH AND CHANNELS

North

0 500 1000 FEET

SCALE

EARTH TECH

FIGURE 2-2

IRP SITE LOCATION MAP

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assessment to quantify potential exposure risks to the most likely receptors. The FS includes detailed evaluations of a variety of potential technologies for each site requiring cleanup and suggests specific cleanup actions for each site or group of sites based upon the results of the evaluations. RI and FS activities have been completed for AFP 44. The initial RI report dated January 1992 and its addenda, the Risk Assessment report dated August 1993, the FS report dated January 1995, the Proposed Plan (Reference 14), and this ROD are available for public review in the Information Repository located at:

TCE Superfund Library
El Pueblo Neighborhood Center
Building B-2
101 West Irvington
Tucson, Arizona 85714-3099
(520) 889-9194

This ROD will also be placed in the Administrative Record for AFP 44.

The Air Force is currently performing non-time critical removal actions for Sites 1 through 6, and Site 14 implementing the preferred alternatives identified in the FS. The Air Force determined the appropriateness of the non-time critical removal action based on the factors outlined in the NCP Sections 300.415 (b)(2) and 300.415 (b)(4). These removal actions are being performed concurrently with the ROD process, and are consistent with the final remedies selected in the ROD. This allowed site cleanup to begin in February 1996 instead of waiting for the extensive ROD process to be completed.

2.3 COMMUNITY PARTICIPATION

The Air Force has completed a RI, risk assessment, and a FS at AFP 44. A public meeting was held to discuss the results of the RI and the risk assessment. A second public meeting was held with a 45-day public comment period to obtain community input on the Draft Final FS which was made available to the public in October 1994. The final version of the FS report (January 1995) included written responses to comments received from the public and regulatory agencies (Reference 1). The FS recommended SVE for cleanup of volatile organic contaminants at IRP Sites 1, 2, and 3; and excavation with offsite disposal at a RCRA landfill for metal contaminants at IRP Sites 4 and 5, and portions of Site 6. Additionally, IRP Sites 7, 8, 9, and 15 have been recommended for No Further Action (References 4, 5, 6, and 7).

Engineering Evaluation/Cost Analysis (EE/CAs) (Reference 15, 16, 17, 18, 19, and 20) describing proposed removal actions, and a Proposed Plan (Reference 14) describing preferred final remedial alternatives at the sites requiring remediation, were released for a 30-day public comment period. The public comment period for the Proposed Plan was extended twice at the request of the Tucson Community. The first extension was for 15 days and the next extension was for 30 days, for a total review period of 75 days. A public meeting was held on July 18, 1995 to discuss these documents. A responsiveness summary was prepared following the close of the comment period. The Air Force prepared written responses to comments received from the public, USEPA, ADEQ, and any other

comments received. The responses are included in Section 3.0, Responsiveness Summary, of this ROD. This Responsiveness Summary represents an evaluation of community acceptance. These documents and the removal action work plan (Reference 21) were submitted to the USEPA and ADEQ for review and comment. The Air Force began implementation of the removal action work plan approximately two weeks after submittal of the final work plan.

Public input on all the cleanup alternatives considered and the preferred cleanup method was an important contribution to the remedy selection process. To assist the public in its review, an overview of the cleanup methods evaluated during the FS and an explanation of the reason for selecting the recommended cleanup methods were presented in the Proposed Plan (Reference 14). The Proposed Plan included a description of the ROD process under CERCLA and the intent to conduct early removal actions consistent with the final ROD remedy.

It should be noted that VOC-contaminated soils west of Site 5 were not identified in the remedial investigation/feasibility study (RI/FS) process and therefore the Proposed Plan did not address the remedial alternatives for this recently identified media. Under the guidance of the USEPA, the Air Force is proceeding to investigate these soils further and will utilize the USEPA's presumptive remedy plug-in approach to select the appropriate treatment technology. Section 2.10 of this ROD elaborates on the application of the plug-in approach under CERCLA.

The Air Force participated in monthly meetings of the Unified Community Advisory Board (UCAB), the group which represents the City of Tucson community's interest regarding the Tucson Airport area Superfund site. The UCAB was briefed monthly on the status of both the ROD and EE/CA removal action processes, including a treatability study using the preferred alternative for metals-contaminated soils. Comments were received from the UCAB on the Proposed Plan; responses to these comments are included in Section 3.0.

Detailed explanations of the extent of contamination at each site, possible health risks to unprotected workers at AFP 44 or to the community posed by the contaminants, and the methods considered for cleaning up the sites are contained in the RI (Reference 11), Risk Assessment (Reference 13), and the FS (Reference 1) reports.

PUBLIC COMMENT PERIOD: A 75-day public comment period for the Proposed Plan was held from July 10 to September 23, 1995 to accept comments from the Tucson community and other interested parties.

2.4 SCOPE AND ROLE OF RESPONSE ACTION AT AFP 44

Soil sites at AFP 44 were categorized in the FS into three groupings:

- Soil sites for which SVE is the preferred remedial method (Sites 1, 2, and 3).
- Soil sites for which excavation and offsite stabilization and disposal is the preferred remedial method (Sites 4, 5, and Site 6).
- Soil sites which required no further action (Sites 7, 8, 9, and 15).

Only Sites 4, 5, and 6 are addressed by this ROD; the remaining soil sites requiring cleanup have been addressed in a separate ROD (Reference 22). These site groupings were established due to the similarity of site conditions and proposed actions.

Groundwater at AFP 44 was addressed in a 1986 ROD (Reference 8), and is being remediated with a reclamation well field and treatment plant. In addition, IRP Site 14, the shallow groundwater zone, is being remediated as part of the regional groundwater remediation program. Site 14 remediation will be addressed in a separate ROD.

2.5 SUMMARY OF SITE CHARACTERISTICS

Brief overviews of the characteristics and contaminants associated with Sites 4, 5, and 6 are presented in the following sections.

2.5.1 Site 4 (Former Unlined Surface Impoundments)

Site 4 occupies approximately 10 acres, and consists of three former unlined impoundments which were used from approximately 1961 to 1977. The site is located in the vicinity of the former lined brine evaporation ponds (see Figure 2-2). The surface impoundments, which are known as Site 4 east and west, are currently undergoing closure under RCRA (Reference 23) (see Figure 2-3). Treated and untreated industrial wastewaters were discharged from the wastewater treatment plant to the former unlined impoundments. The wastewaters consisted primarily of rinsewater from plating processes, neutralized caustics, cooling tower blowdown, and some concentrated solutions of chromium and cyanide (Reference 11). Site 4 is located directly above IRP Site 14, the shallow groundwater zone. Remediation of VOCs associated with Site 14 will be addressed in a separate ROD.

2.5.1.1 Site 4 Soil Gas Contaminants

Eight soil gas samples collected at Site 4 in 1987 contained trichloroethylene (TCE), 1,1-dichloroethylene (DCE), toluene, ethylbenzene, and xylenes at concentrations less than 2.3 micrograms per liter (µg/L) (Reference 24).

A soil gas survey of Site 4 was conducted during the RI (Reference 11) which showed the presence of DCE, Freon 113, and TCE in concentrations on the order of 1 µg/L; 1,1,1-trichloroethane (TCA) was detected at an order of magnitude less. Carbon tetrachloride and tetrachloroethylene (PCE) were present in concentrations on the order of 0.001 µg/L. VOC concentrations detected were below action levels and therefore pose no risk to human health or the environment. Hence, VOC remediation is not a part of the Site 4 removal action or this ROD.

Site 4 overlies Site 14 (shallow groundwater zone). During preparation of an EE/CA and a removal action work plan in June 1996 for Site 14, concern was raised regarding the potential occurrence of VOC contamination in the vadose zone. This concern was raised based on SVE tests conducted on shallow groundwater zone wells. Low concentrations of VOCs were detected during these tests. Dual-phase extraction (DPE) of groundwater and soil vapors has been initiated at Site 14 as part of

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LEGEND

- FULL SCAN BORING LOCATIONS
- PHASED BORING LOCATIONS
- 10' DEEP BORING LOCATIONS
- PERCHED ZONE MONITOR WELL
- UPPER ZONE MONITOR WELL
- DISPOSAL PIT (APPROX. SIZE)
- SAMPLE LOCATIONS
- 04-T3-02-A / 04-T3-02-B * / 04-T3-02-C — APPROXIMATE SAMPLE DEPTH AT EACH LOCATION (A = 1 FOOT, B = 1.5 FEET, C = 2.5 FEET)
- * SAMPLES EXCEEDING ADEQ CLOSURE LIMITS FOR SURFACE IMPOUNDMENTS
- VISUAL LOCATION OF GREEN LAYER OF SOIL
- GEOPHYSICAL INVESTIGATION BOUNDARY
- DRAINAGE CHANNEL
- GEOPHYSICAL ANOMALY
- T1 — INVESTIGATIVE TRENCH

SITE 3 BOUNDARY →

03-S2-T2-01 TO 05
N1
N1
03-S2-T1-01 TO 05
03-N8-T1-01
N8
03-N4-T1-01 TO 02
03-N5-T1-01
N5
N4
N3
03-N3-T1-01
03-S1-T1A-01 TO 05
S1-T2
03-S1-T1A-01 TO 05
S1-T1A
S1-T1B
03-S1-T1B-01 TO 05
S2
S3
S4
S5
03-S3-T1-01 TO 11
03-S4-T1-01
03-S5-T1-01 TO 03

NW CORNER (GEOPHYSICS) — NE CORNER (GEOPHYSICS)

SITE 4 WEST

04-T4-01-A *
04-T4-01-B
04-T4-01-C
04-T4-01-D
04-T2-03-A *
04-T2-03-B *
04-T2-03-C
04-T2-01-A *
04-T2-01-B
04-T2-01-C
T4
T2
T1
T3
B1
M10
B2
B92
B91
B34
B89
B36
04-T3-01-A *
04-T3-01-B *
04-T3-01-C
PLUGGED W/B-1
B3
B90
04-T2-02-A *
04-T2-02-B *
04-T2-02-C
04-T4-02-A
04-T4-02-B
04-T4-02-C
04-T4-02-D
04-T1-01-A *
04-T1-01-B *
04-T1-01-C
04-T3-02-A
04-T3-02-B *
04-T3-02-C

SW CORNER (GEOPHYSICS) — SE CORNER (GEOPHYSICS)

SITE 4 EAST

04-SS-01
04-SS-02
04-SS-13
04-SS-05
04-SS-04
04-SS-03
04-SS-09
04-SS-07
04-SS-11
04-SS-12
04-SS-08
04-SS-06
04-SS-10
4A
4B
3A
4C
4D
3C
815-U
2
1

N

0 50 100 200
SCALE IN FEET

EARTH TECH

FIGURE 2-3

SITE 4
FORMER UNLINED SURFACE IMPOUNDMENTS

Scale: 1=160

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a broader groundwater remediation effort. DPE systems operating at Site 14 are removing more than 100 pounds of VOCs per month. Additional vapor monitoring wells were installed and sampled in Spring 1998 at Site 14. Both TCE and DCE levels in soil vapors were negligible down to approximately 55 feet and were elevated at depths of 70 and 80 feet below grade. The wells terminated 10's of feet above the water table, but the pattern of contamination suggests that no shallow VOC source is present. Additional future soil vapor monitoring will be performed to clarify the relationship between deep vadose zone contamination and groundwater contamination in the shallow groundwater zone. The Site 14 removal action addresses VOCs in the vadose zone associated with Site 14 which is overlain by Site 4. Remedial action goals associated with VOCs in the vadose zone will be addressed in the Site 14 ROD.

2.5.1.2 Site 4 Soil Contaminants

Metals detected at levels above background concentrations include antimony (maximum concentration 172 milligrams per kilogram [mg/kg]), cadmium (70.1 mg/kg), total chromium (8,535 mg/kg), copper (6,930 mg/kg), nickel (707 mg/kg), silver (45.9 mg/kg), and zinc (Reference 11). Surface soils also appear to be contaminated with metals. Soil will be remediated to meet ADEQ cleanup levels for target metals (e.g., chromium, cadmium, and nickel). Remediation of target metals is anticipated to reduce concentrations of all other metals to acceptable levels. The potential source for cadmium, chromium, copper, nickel, silver, and zinc is plating waste. Antimony, which was not detected in background samples is a hardening alloy and bearing metal; it is possible that antimony-containing metals were disposed at the site. Additional investigation of Site 4 in the area of geophysical anomalies identified during the RI (Reference 11) occurred in January to February of 1995 (Reference 12). Trenching was conducted at locations as shown in Figure 2-3. The trenches were visually inspected and soil samples were collected from the trenches for chemical analysis. Layers of dried green sludge were delineated. Samples were collected above, below, and in the sludge layers. Some samples contained metals in excess of cleanup levels established by the ADEQ for the closure of the former lined brine evaporation ponds.

2.5.1.3 Results Associated with Lined Surface Impoundment Closure

The area designated as Site 4 East is the portion of Site 4 underlying the former 3 and 4 series surface impoundments as shown in Figure 2-3. To achieve clean closure of the 3 and 4 series impoundments, the Air Force elected to remove Site 4 East soil exceeding ADEQ cleanup levels established for the impoundments. A removal action for Site 4 East was conducted under IRP, in conformance with CERCLA and in accordance with RCRA requirements in conjunction with the closure of the 3 and 4 series surface impoundments. Soils in Site 4 East were removed concurrently with the closure of the 3 and 4 series surface impoundments. In addition, portions of IRP Site 6 that were co-located with Site 4 were removed as part of the Site 4 cleanup. Excavation of contaminated soil was initiated in February 1996 and completed in June 1996. A total of 13,949 tons of soil were excavated and disposed of offsite at a RCRA Class I landfill (Reference 23).

2.5.2 Site 5 (Former Sludge Drying Beds)

The two sludge drying beds, located just east of Building 801 (Figure 2-4), were square in shape. The beds were originally unlined. At an unknown time, one was lined with a plastic membrane and the other with bentonite. These beds received treated wastewaters and precipitated metal sludge, which contained chromium and cyanides, as well as traces of cadmium, silver, lead, and copper compounds. The beds were constructed in the early 1960s and used until 1977, at which time they were excavated and covered with native soil (Reference 11). Both beds are currently covered by an asphalt parking lot.

A former oil spreading area was located southwest of Building 811 in an area approximately 200 feet wide and 1,400 feet long. Waste oils were spread on the area as a means of dust control. Much of the area is now covered by a structure and parking lot. The area was graded during construction of the parking lot and some soil was removed to an unknown location (Reference 1).

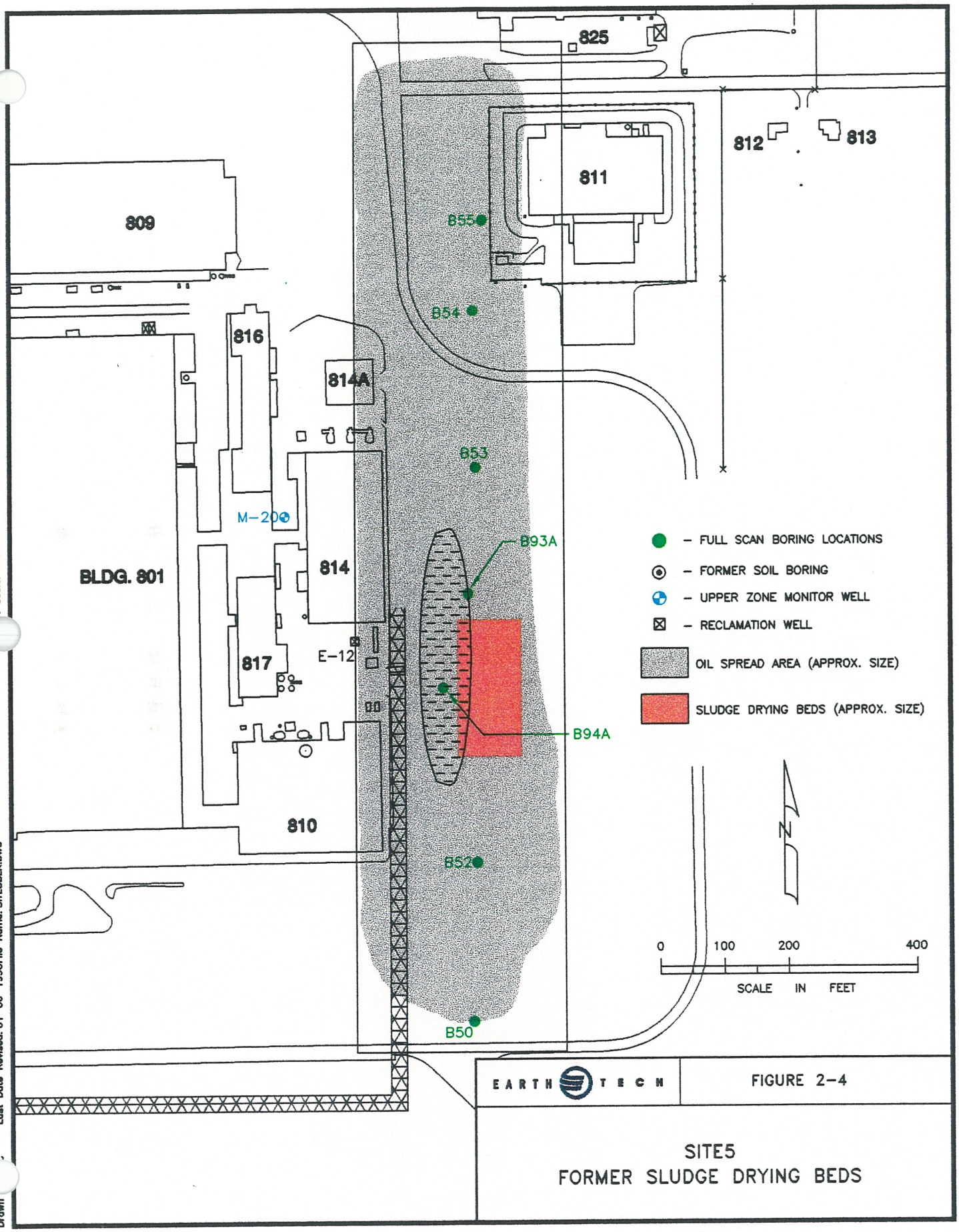
Pipelines conveying waste metals from the industrial wastewater treatment plant to the sludge drying beds were located west of Site 5. Additionally, VOC-contaminated soils have been identified west of Site 5, which may be related to Site 5 activities. These areas, while not explicitly within the mapped boundary of Site 5, are considered part of Site 5 and are subject to the provisions of this ROD.

2.5.2.1 Site 5 Soil Gas Contaminant

A shallow soil gas survey was conducted at Site 5 and in an area immediately west of Site 5 in May 1997 (Reference 26). This work was conducted to ensure that all potential sources of VOCs had been identified. No VOCs were present at significant levels (>0.04 µg/L) within the limits of IRP Site 5. However, west of Site 5 several widely spaced and isolated samples did contain elevated concentrations of VOCs, warranting further investigation and evaluation. Figure 2-5 presents total VOCs detected during that study. TCE levels were elevated at two points; one on the north side of Building 810 (22 µg/L at point SG-42), and one near the southeast corner of Building 801 (31 µg/L at point SG-40). DCE and TCA were also present at point SG-40 at concentrations of 0.1 µg/L and 13 µg/L, respectively. Near Building 814A, DCE was noted at 13 µg/L along with low levels of TCE and TCA (5 and 2 µg/L, respectively).

Supplemental investigative activities were performed west of Site 5 in March and April 1998 and reported in a Supplemental Investigation Report (Reference 28) in April 1998. The findings of the study indicated that VOC contamination in the shallow vadose zone was negligible (Figure 2-6), possibly indicating reduction of contamination due to ongoing DPE activities conducted in the immediate vicinity. Elevated levels of VOCs were noted in deeper soil gas samples (Figure 2-7). Additional investigative activities are planned to determine if potential sources of solvent contamination are present in or beneath the buildings west of Site 5.

Future discussions will be required to determine if the boundaries of Site 5 should be formally expanded or if a new IRP site should be designated to address the VOC soil contamination in the vicinity of Building 801.


825
812
813
811
809
B55
B54
816
814A
B53
M-20
BLDG. 801
814
B93A
817
E-12
B94A
810
B52
B50
– FULL SCAN BORING LOCATIONS
– FORMER SOIL BORING
– UPPER ZONE MONITOR WELL
– RECLAMATION WELL
OIL SPREAD AREA (APPROX. SIZE)
SLUDGE DRYING BEDS (APPROX. SIZE)
N
0
100
200
400
SCALE IN FEET
EARTH TECH
FIGURE 2-4
SITE5
FORMER SLUDGE DRYING BEDS
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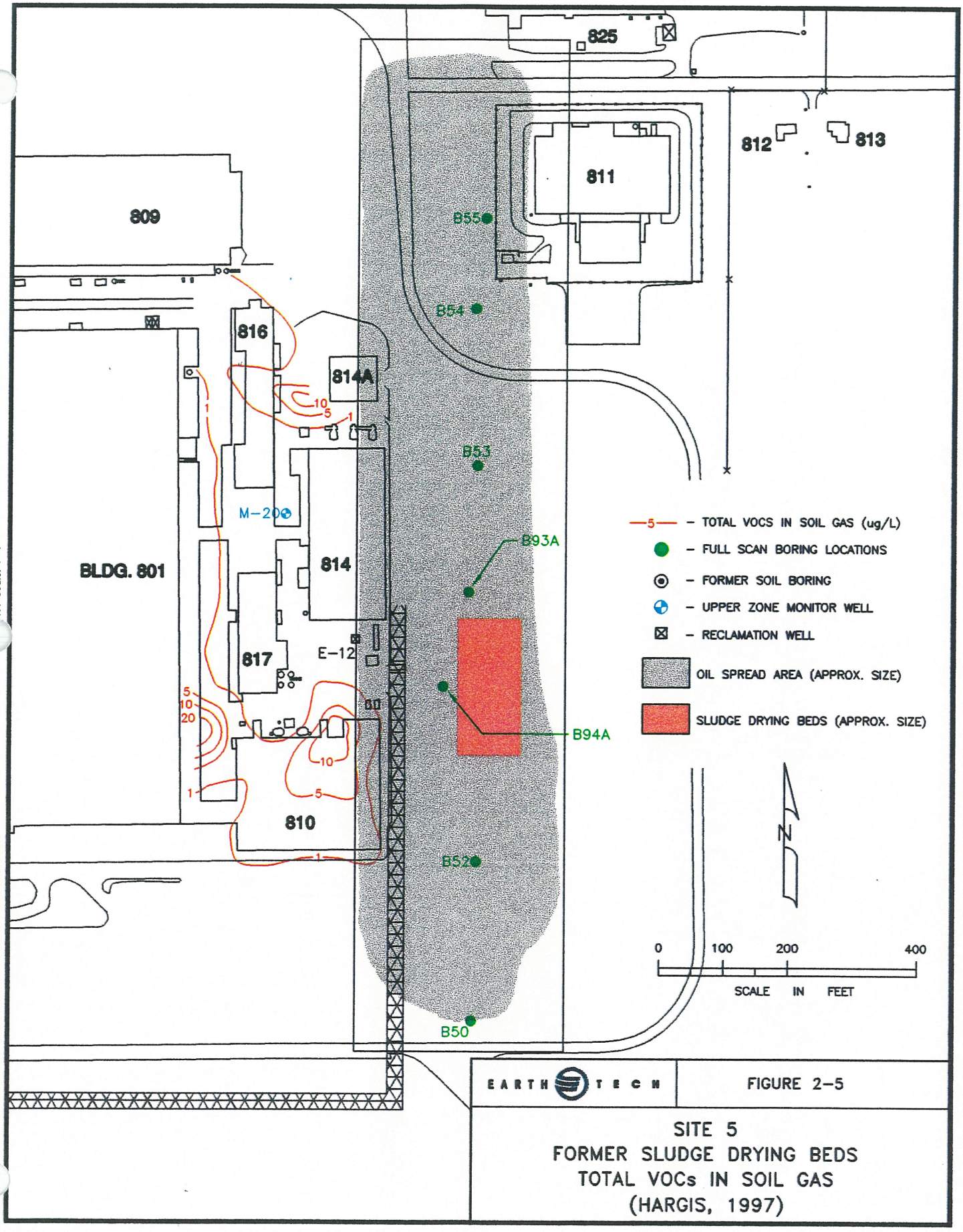
Drawn



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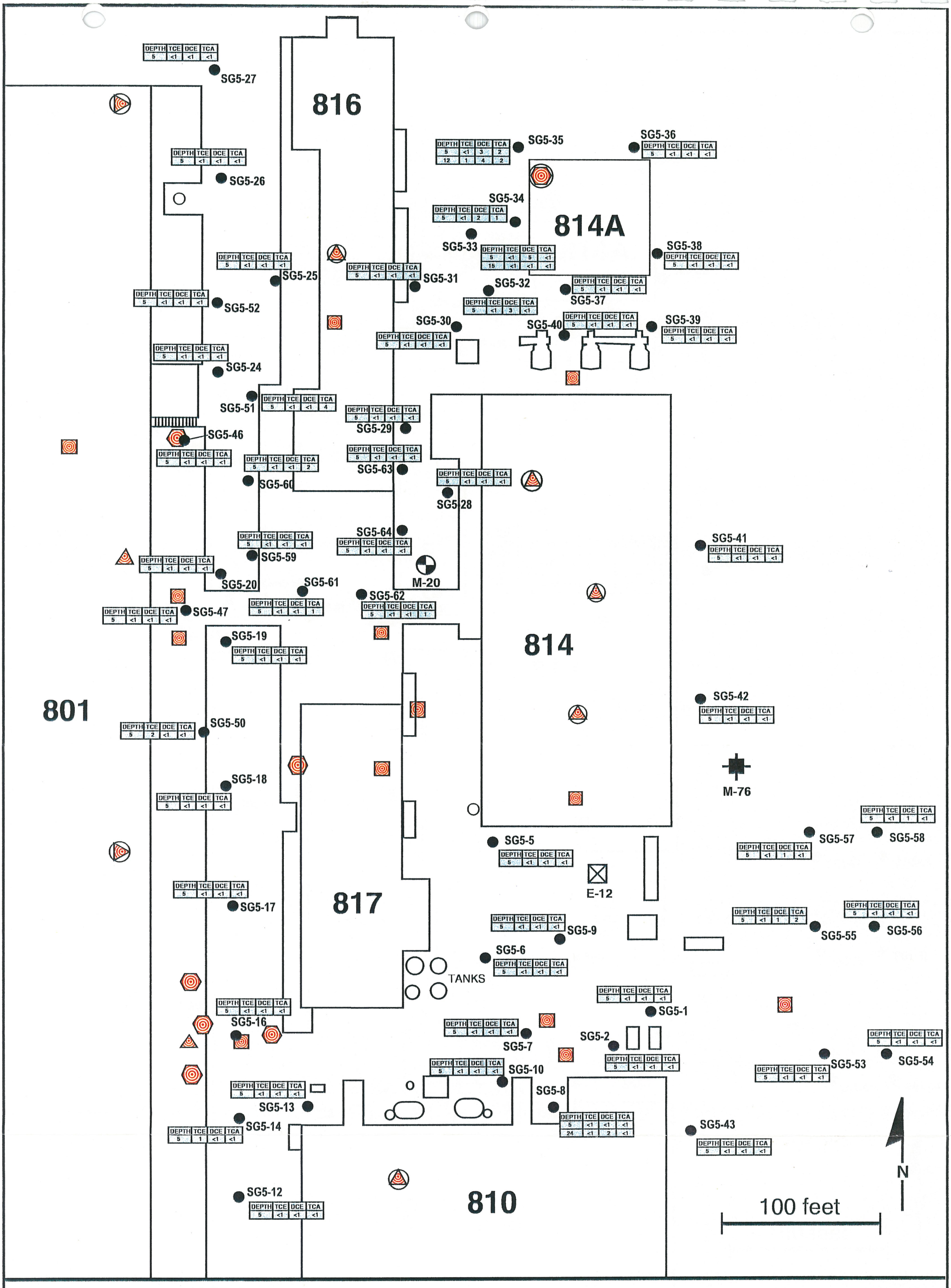
Last Date Revised: 09-21-1998File Name: SITE5BLK.DWG
Drawn: GC

EARTH TECH

FIGURE 2-5

SITE 5
FORMER SLUDGE DRYING BEDS
TOTAL VOCs IN SOIL GAS
(HARGIS, 1997)



LEGEND

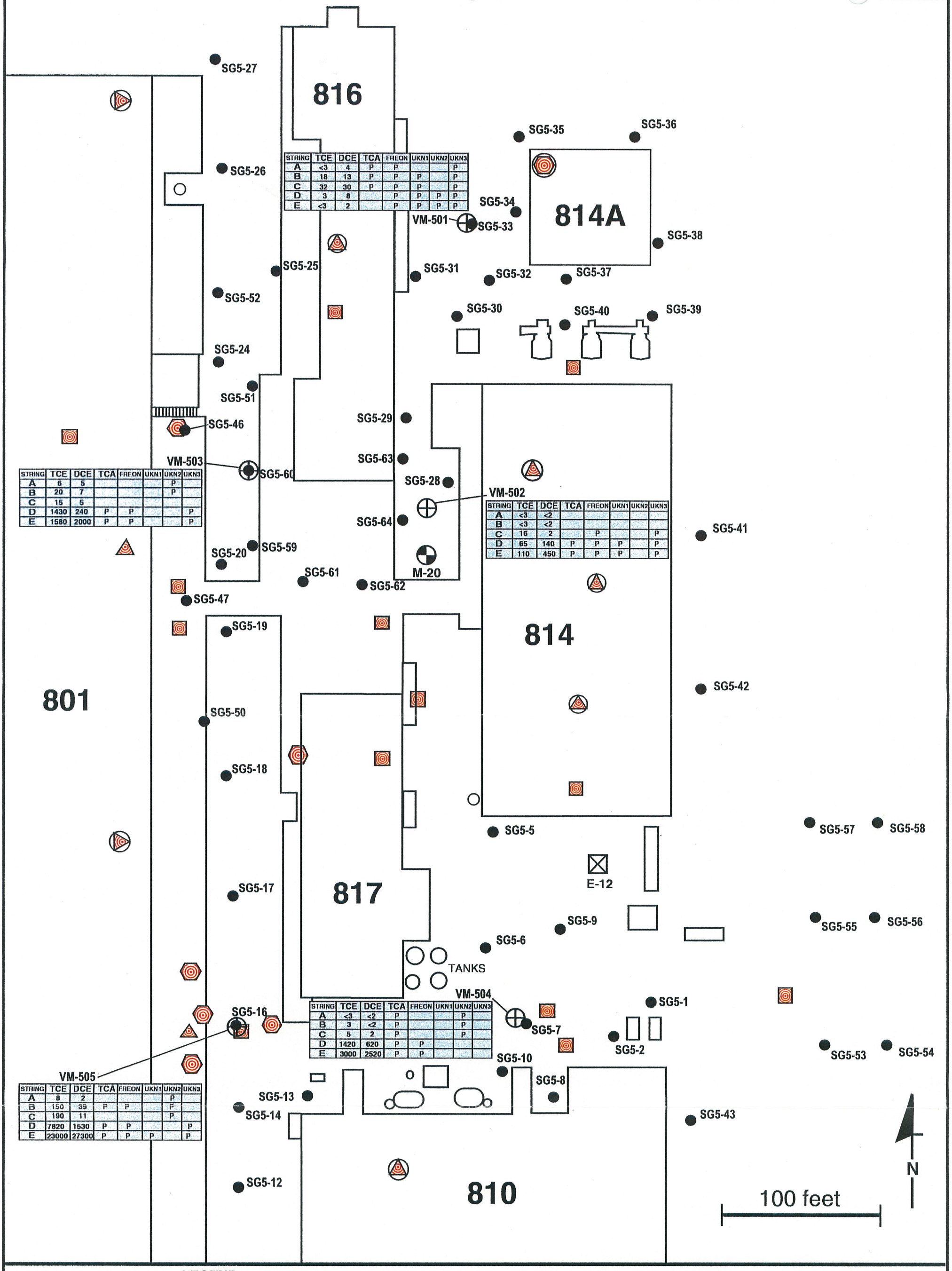
- Former Tanks
- Former Degreasers
  - TCE
  - TCA
- Former Degreasers/ Tanks in Concrete Containment
- Former Misc. Facilities/ Equipment
- Soil Vapor Extraction Well
- Groundwater Monitoring Well
- Dual Phase Extraction Well
- Soil Gas Point with Depth (feet) and Concentrations (ug/L)
- Stormwater System

EARTH TECH

FIGURE 2-6

Shallow Soil Gas Survey
Results West Site 5
March 1998

GF/0639/AFP44/10070



STRING	TCE	DCE	TCA	FREON	UKN1	UKN2	UKN3
A	<3	4	P	P			P
B	18	13	P	P	P		P
C	32	30	P	P	P		P
D	3	8		P	P	P	P
E	<3	2		P	P	P	P

STRING	TCE	DCE	TCA	FREON	UKN1	UKN2	UKN3
A	6	5				P	
B	20	7				P	
C	15	5					
D	1430	240	P	P			P
E	1580	2000	P	P			P

STRING	TCE	DCE	TCA	FREON	UKN1	UKN2	UKN3
A	<3	<2					
B	<3	<2					
C	16	2		P			P
D	65	140	P	P	P		P
E	110	450	P	P	P		P

STRING	TCE	DCE	TCA	FREON	UKN1	UKN2	UKN3
A	8	2				P	
B	150	39	P	P		P	
C	190	11				P	
D	7820	1530	P	P			P
E	23000	27300	P	P	P		P

STRING	TCE	DCE	TCA	FREON	UKN1	UKN2	UKN3
A	<3	<2	P			P	
B	3	<2	P			P	
C	5	2	P			P	
D	1420	620	P	P			
E	3000	2520	P	P			

STRING	TCE	DCE	TCA	FREON	UKN1	UKN2	UKN3
A	8	2		P	P		
B	150	39	P		P		
C	190	11			P		
D	7820	1530	P	P			P
E	23000	2730	P		P		

LEGEND

- Former Tanks
- Former Degreasers
  - TCE
  - TCA
- Former Degreaser/ Tanks in concrete containment
- Former Misc. Facilities/ Equipment
- Groundwater Monitoring Well
- Dual Phase Extraction Well
- Soil Gas Point (SG5-12)
- Soil Vapor Monitoring Well with Well String and Concentrations (ug/L) (VM-505)

NOTE: P = Present

EARTH TECH

FIGURE 2-7

Site 5 West
Soil Vapor Monitoring Well Results,
March 1998

GF/0808/AFP44/FIG3-1

2.5.2.2 Site 5 Soil Contaminants

Metals detected in soil at Site 5 in levels above background concentrations include cadmium (114 mg/kg), total chromium (18,144 mg/kg), copper (7,049 mg/kg) and zinc (247 mg/kg) (Reference 11). Soil was excavated then sampled for confirmation and reexcavated as necessary until the area of removal was confirmed to be below ADEQ soil cleanup standards for cadmium, chromium, cyanide, lead, and nickel (Reference 27). Polychlorinated biphenyls (PCBs) were detected in one Site 5 soil sample at 3.1 mg/kg (Reference 11). Site 5 was formerly sprayed with waste oil for dust control; this may have been the source of PCBs. Total petroleum hydrocarbon (TPH) concentrations ranged from 45.3 mg/kg to 1,905 mg/kg (Reference 11); however, this area is currently covered by an asphalt parking lot. Soil removal activities at Site 5 were conducted from March through May 1997. A total of 5,033 tons of contaminated soil was excavated from Site 5 and transported to a RCRA Class I landfill for disposal. The remediation of metals-contaminated soils at Site 5 is completed and final documentation has been submitted (Reference 27).

2.5.3 Site 6 (Drainage Ditch and Channels)

Site 6 is a system of open, unlined drainage channels which transported industrial wastewaters west from Building 801, with the exception of the channel which enters AFP 44 along the northern boundary (Figure 2-8). This channel conveys stormwater from Tucson International Airport. The drainage channels and ditches originally led to the desert area of the western portion of AFP 44 but were routed to unlined surface impoundments (Site 4) in the early 1960s. The channels occupy approximately 3 acres, based on an estimated average width of 5 to 10 feet. The drainageways are dry most of the year, flowing only during and immediately following rainstorms (Reference 11).

From approximately 1955 to 1961, these drainage ditches received various types of wastewaters including treated chromium- and cyanide-bearing wastewaters, neutralized acid solutions, and chromium- and cyanide-free rinsewaters. From approximately 1962 to 1977, the only untreated liquid wastes that entered the channels were alkaline cleaning and chromium- and cyanide-free rinsewaters, paint booth wash, accidental spillage and accidental process tank overflows, and cooling tower blowdown and condensate from throughout the plant. All other wastes were initially treated. Since 1977, when a new wastewater treatment plant was installed, the industrial process rinsewaters and concentrated wastes have been transported in piping and managed in lined surface impoundments and tanks.

2.5.3.1 Site 6 Soil Contaminants

Portions of the Site 6 drainage ditches and channels are co-located with Site 4 (see Figure 2-2). Elevated metal concentrations (cadmium, chromium, copper, nickel, silver, and zinc) were detected in three boreholes within and to the northeast of Site 4, suggesting that the former unlined surface impoundments could have been a possible source of metal contamination in these areas. Soil samples collected from Site 6 during the RI contained metals and organic compounds (Reference 11). Potential risk to ecological receptors due to the presence of cadmium, chromium, copper, nickel, silver, and zinc were identified in the February 1993 Risk Assessment report (Reference 13). However, a large amount of uncertainty was associated with the risk evaluations.

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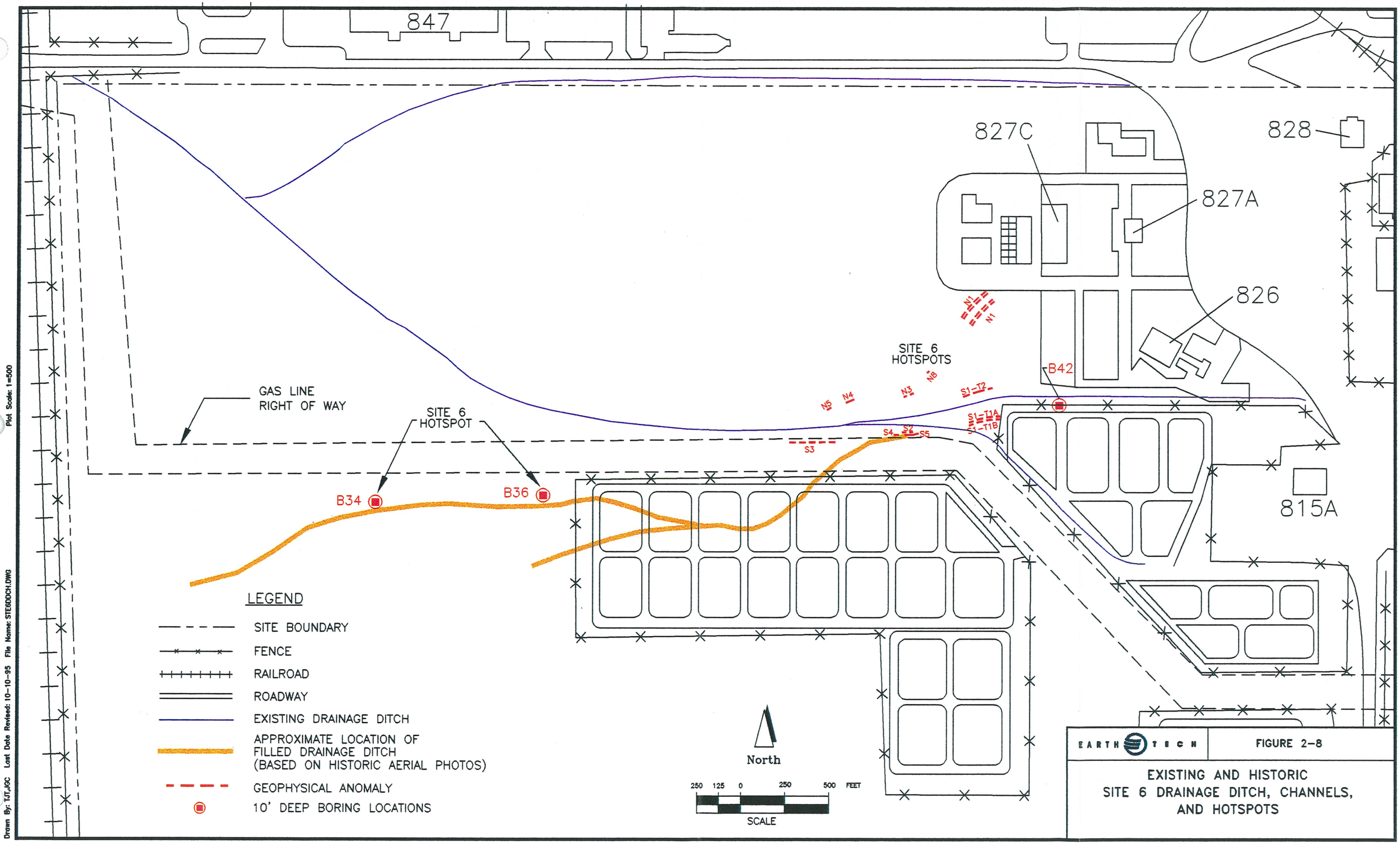

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Additional soil samples were collected to further characterize the site, and seed germination toxicity tests were conducted to determine if there is risk to ecological receptors. The sampling results and the seed germination test results indicated that risk to ecological receptors was over-estimated. No further action is planned for most of Site 6 (Reference 24).

Additional investigation of Site 6 in the area of geophysical anomalies identified during the RI (Reference 11) occurred from January through February of 1995 (Reference 12). Trenching was conducted at locations as shown on the Site 4 location map (Figure 2-3). The trenches were visually inspected and soil samples were collected from the trenches for chemical analysis. Layers of dried green sludge were delineated. Samples were collected above, below, and in the sludge layers. Metal concentrations in anomalies S1 and S3 exceeded ADEQ cleanup levels for the surface impoundment closure. A few VOCs (acetone, methylene chloride, and one detection of toluene) were detected sporadically, generally at or near the detection limit in soil samples from S1 and S3 and are not considered contaminants.

The cleanup of Site 6 soils is being conducted pursuant to the Site 6 Non-time Critical Removal Action Work Plan (Reference 21) and is due to be completed in February 1998. Soil is being remediated to meet ADEQ cleanup levels for target metals (e.g.; cadmium, chromium, nickel, and lead, as well as cyanide). Remediation of target metals is anticipated to reduce concentrations of all other metals to acceptable levels. To date, approximately 2,300 tons of metals-contaminated soil have been excavated and transported to a RCRA Class I landfill for disposal. As discussed in Section 2.5.1, some of the Site 6 drainage channels and ditches are co-located with Site 4 East and Site 4 West. The Site 6 soil co-located and Site 4 soil has been remediated in association with RCRA closure of former surface impoundments and brine beds. The remaining Site 6 soils are being addressed under the IRP in conformance with CERCLA.

During the execution of the approved Site 6 remedial action, additional soil metals contamination was observed west of Site 4. This area has been designated Site 6 West and is comprised of metals contaminated soil in channels, interchannel areas, and a sheet flow area. The area of additional soil contamination will be better defined in 1998 and removed in 1999.

2.5.4 Groundwater

In 1981, the ADHS discovered groundwater contamination in the upper zone of the regional aquifer in the vicinity of the Tucson International Airport. Extensive studies of the area from 1981 to 1982 revealed groundwater contamination under AFP 44. The principal contaminants of concern include chromium, TCE, DCE, and TCA. In 1987, the Air Force activated a Groundwater Treatment Plant (GWTP) to treat the groundwater and return it to the aquifer.

The reclamation wellfield system associated with the GWTP consists of extraction wells from which groundwater is pumped to a treatment facility. Treated groundwater is then reinjected into the aquifer through recharge wells. The extraction wells create a cone of depression drawing contaminated groundwater toward the wells. The recharge wells are located on the fringe of the contaminated areas. By pumping water into the recharge wells, a hydraulic gradient is formed which

forces water back toward the extraction wells. This system of extraction and recharge wells has altered the historical groundwater flow.

To date, over eleven billion gallons of water have been remediated to drinking water standards and returned to the aquifer, significantly reducing the areal extent and concentration of contaminants, and separating one large plume into three smaller plumes.

Remediation systems have been installed and are operating to treat contaminated groundwater in the shallow groundwater zone (IRP Site 14), which is overlain by Sites 4 and 6. These systems utilize bioremediation, pump and treat, and DPE (i.e., soil vapor and groundwater) technologies.

2.5.4.1 Groundwater Contaminants

AFP 44 personnel are responsible for the collection and analysis of groundwater samples from the reclamation wellfield on a quarterly basis. A contour map of TCE in the upper zone of the regional aquifer from February 1998 is presented in Appendix B. Source areas for these contaminants appear to be primarily associated with former unlined surface impoundments and the FACO landfill (IRP Site 2).

2.6 SUMMARY OF SITE RISKS

This section describes the risks which were analyzed in the risk assessment report (Reference 13), and describes the cleanup goals to be achieved at AFP 44. The State of Arizona promulgated Final Soil Remediation Standards in December 1997, which apply to soil remediation activities at Sites 4, 5, and 6. Soil remediation activities are being conducted to comply with these standards as well as RCRA permitted cleanup standards.

The risk assessment report considered the RI findings to determine if exposure to soil and air contaminants could be a risk to humans, plants, or animals. The baseline risk assessment was performed following Headquarters USEPA, USEPA Region IX, and ADEQ guidance (Reference 13). A baseline risk assessment is a scientific procedure that uses facts and assumptions to estimate the potential for adverse effects on humans, plants, or animals from exposure to chemicals, assuming no cleanup occurs. The risk assessment is used to determine if a site requires cleanup. For humans, risk was estimated by determining the amount of a chemical in soil that a person may ingest, inhale, or contact over a period of time (exposure) and comparing the exposure to a dose of the chemical known to cause harm. The risk potential was expressed in terms of the chance of a disease occurring. To calculate this chance, conservative (worst case) assumptions were made to protect public health.

Because cancer can result from exposure to chemicals at levels lower than that which cause other health problems, the greatest concern is that exposure may result in cancer. Therefore the exposure is compared to the probability of increasing the incidence of cancer in a potentially exposed population. A risk level of 1 in 1,000,000 means that one additional person out of one million people exposed could develop cancer as a result of the exposure. In accordance with federal regulations (40 Code of Federal Regulation [CFR] 300.430(e)(2)(I)(A)(2)), carcinogenic risk within

the benchmark range of 1 cancer case in 10,000 (10^{-4}) to 1 cancer case in 1,000,000 (10^{-6}) is considered acceptable. In the absence of applicable or relevant and appropriate requirements (ARARs), the 10^{-4} to 10^{-6} cancer risk level is used as a starting point for analysis of remedial alternatives (Reference 25). None of the carcinogenic risk estimates for potential receptors exceeded the 10^{-4} benchmark established in the AFP 44 Risk Assessment (Reference 13) as summarized in Table 2-1 and as discussed in Section 2.1 of the FS Report (Reference 1).

Non-cancer causing effects are measured in terms of their hazard index, which is an index of the potential for adverse, non-cancer health effects. A summary of hazard indices for AFP 44 is presented in Table 2-2. The hazard index acceptable to regulatory agencies for protection of human health is less than or equal to 1. This level was exceeded for receptors associated with Site 3. Noncarcinogenic cleanup levels were derived based on the hazard indices. However, these levels were too conservative, i.e., below background concentrations (Reference 1).

The ecological risk was estimated by considering the source of exposure for plants and animals; the primary source of exposure at AFP 44 is contaminated soil. Several exposure pathways were considered, including intake of contaminants by plants, intake of contaminants in soil by herbivores (plant-eating animals), intake of contaminants in plants by herbivores, and intake of contaminants in herbivores by carnivores (meat-eating animals). Factors were used to determine the concentration of a soil contaminant available for intake, transfer of contaminants from soil-to-plants, from plants-to-animals, and other factors which affect the transfer and uptake of contaminants. These factors were used to calculate the ecological quotient, which is an index of potential risk. Ecological receptors identified as potentially at risk in the risk assessment are listed in Table 2-3. If an ecological quotient is greater than or equal to one, the plant or animal may potentially be at risk as a result of exposure to the contaminant via the defined exposure pathway.

The human health and ecological risk assessment was completed in August 1993 for AFP 44 (Reference 13). Potential risks due to exposure to soil, groundwater, and air contaminants were estimated based on the assumption that no cleanup would occur. Comparisons were made between analyte concentrations at each site to background concentrations, and the soil depth of concern at which humans, plants, or other animals are exposed.

The following pathways for migration of contaminants were identified: migration of VOCs from soil to the atmosphere; migration of dust containing particulate-bound contaminants to the atmosphere; migration of surface soil contaminants in surface water runoff through drainage channels and ditches; and migration of soil contaminants to groundwater.

Humans considered included current workers, resident children, and future excavation workers. Plants and animals were selected following a biological field survey conducted in February 1992, an endangered species clearance study conducted in September 1992, and discussions with local, state, and federal agencies (Reference 13).

Table 2-1 Total Site Human Receptor Cancer Risk[1]				
Current Land Use				
Site	**Receptor**	**Total Cancer Risk Range**		
		Average Case	**Reasonable Maximum Case**	**Receptor at Risk**
4	Offsite Non-AFP 44 Workers Who Jog Onsite and Work Offsite in Building 847	2×10^{-5}	5×10^{-5}	No
6	Resident Children	7×10^{-8}	9×10^{-8}	No
Future Land Use				
Site	**Receptor**	**Total Cancer Risk Range**		
		Average Case	**Reasonable Maximum Case**	**Receptor at Risk**
4	Excavation Worker	2×10^{-6}	2×10-5	Yes
5	Excavation Worker	4×10^{-7}	8×10^{-6}	Yes

[1] Cancer risk benchmark is 10^{-4} to 10^{-6}.

Table 2-2 Total Site Human Receptor Hazard Index[1]				
Current Land Use				
Site	**Receptor**	**Total Hazard Index Range**		
		Average Case	**Reasonable Maximum Case**	**Receptor at Risk**
4	Offsite Non-AFP 44 Workers Who Jog Onsite and work Offsite in Building 847	7	9	Yes
6	Resident Children	2×10^{-1}	5×10^{-1}	No
Future Land Use				
Site	**Receptor**	**Total Hazard Index Range**		
		Average Case	**Reasonable Maximum Case**	**Receptor at Risk**
4	Excavation Worker	5×10^{2}	7×10^{3}	Yes
5	Excavation Worker	1×10^{3}	3×10^{4}	Yes

[1]Hazard index benchmark is 1.

Table 2-3
Ecological Receptors Potentially at Risk at AFP 44 Due to Soil Contamination: All Depths

Ecological Receptor(s) at Risk	Depth (feet)	Site Number	Total Risk EQtr Values[a]	Uncertainty	Driver Contaminant(s) Causing Risk	Driver EQs Values[b]
All Plant Receptors©	0-6	4	1	10,000	Cadmium	0.6
Black-throated Sparrow (*Amphispiza belli*)	0-6	4	3	1,000	Chromium Copper	1.9 1.0
Pocket Mouse (*Perognathus spp.*)	0-6	4	38	1,000	Chromium	36.9
Round-tailed Ground Squirrel (*Spermophilis tereticaudus*)	0-6	4	14	1,000	Cadmium Chromium Copper	2.2 9.2 2.5
Creosote Bush (*Larrea tridentata*) and Mesquite (*Prosopis juliflora*)	0-58	4	1	10,000	Cadmium	0.4
All Plant Receptors©	0-6	6[d]	1	10,000	Silver	0.3
Black-throated Sparrow (*Amphispiza belli*)	0-6	6	1	1,000	Copper Chromium Silver	0.4 0.4 0.4
Pocket Mouse (*Perognathus spp.*)	0-6	6	7	1,000	Chromium	6.6
Round-tailed Ground Squirrel (*Spermophilis tereticaudus*)	0-6	6	4	1,000	Cadmium Copper Chromium	0.9 0.9 1.6

(a) EQtr = Expression of total risk for each receptor at each site which is the sum of all contaminant specific EQs, as described in Section 3.3.4.2 of Reference 13.
(b) EQs = All pathway-specific EQ values as described in Section 3.3.4.2 of Reference 13.
© Estimated EQtr value for each plant receptor at the given site.
(d) This assessment is also applicable to offsite receptors downgradient to drainage.

There are uncertainties when estimating risk of exposure to site contaminants. Risk at AFP 44 has been deliberately overestimated for a worst-case scenario. For example, average exposures may be overestimated by an order of magnitude. A detailed discussion of uncertainties is presented in the risk assessment report (Reference 13).

The results of the risk assessment show that the actual or threatened releases of hazardous substances from some sites at AFP 44, if not addressed by the preferred cleanup methods or other measures considered in the Proposed Plan (Reference 14), may present a future threat to public health, welfare, or the environment.

Site-by-site conclusions from the risk assessment are discussed below.

SITE 4: The following VOCs were selected for human risk characterization: carbon tetrachloride, Freon 113, PCE, DCE, TCE, and TCA. The following metals in soil were selected for human and ecological risk characterization: antimony, cadmium, chromium, copper, nickel, silver, and zinc. The risk assessment identified potential risk for humans, plants, and animals (Reference 13).

SITE 5: No VOCs were selected for risk evaluation at Site 5 because the area is paved. Ecological risk at Site 5 was not assessed because the area is covered by an asphalt parking lot, and no plants or animals are present. The following organic compounds in soil were selected for human risk characterization: bis(2-ethylhexyl)phthalate and PCB-1260. Metals in soil selected for human risk characterization are cadmium, chromium, copper, and zinc. The risk assessment identified a potential risk for humans from inorganic contaminants (Reference 13). VOC-contaminated soils west of Site 5 may pose a threat to local groundwater, based on site conditions similar to those present at IRP Sites 1, 2, and 3.

SITE 6: VOCs considered for Site 6 risk evaluation were incorporated in the analyses of Sites 3 and 4, which Site 6 overlies. Bis(2-ethylhexyl)phthalate, methylene chloride, and total xylenes were selected for evaluation as organic compounds in soil. The following metals in soil were selected for human and ecological risk characterization: cadmium, chromium, copper, nickel, silver, and zinc.

No significant risk to human health was identified for Site 6. The risk assessment identified unacceptable risk for plants or animals at Site 6 (Reference 13). However, the report also stated a high degree of uncertainty was associated with the assessment, and recommended performing a seed germination test to assess the potential for adverse effects on plants. The test concluded that Site 6 soils did not inhibit seed growth, and Site 6 was not adversely affecting plants or animals (Reference 24). However, subsequent investigation (Reference 12) within Site 6 revealed elevated metals contamination in specific areas which warranted remediation. As a result of this finding, specific areas contaminated with metals will be subject to excavation and offsite S/S.

2.7 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121(d) of the CERCLA requires that site cleanups comply with Federal ARARs or state and local ARARs in cases where these requirements are more stringent than federal requirements. A requirement may be either "applicable" or "relevant and appropriate." Applicable requirements are

those promulgated federal and state requirements that would be legally applicable to the response action if that action were not taken pursuant to Sections 104 or 106 of CERCLA. Relevant and appropriate requirements are those promulgated federal or state requirements that, while not legally applicable, are designed to apply to problems sufficiently similar to those encountered at CERCLA sites that their application is appropriate. Relevant and appropriate requirements are applied in the same manner as applicable requirements.

In determining whether a requirement applies to AFP 44, potential ARARs were initially screened for applicability. If determined not to be applicable, the requirement was then reviewed for both relevance and appropriateness. Requirements that are determined to be relevant and appropriate command the same importance as applicable requirements.

In addition to ARARs, federal, state, and local criteria, advisories, or guidances that also may apply to the conditions found at the site were reviewed and are "to-be-considered (TBC)" materials. TBCs, which generally address health effects, technical effects and policy, may be useful in determining what is protective at a site or how to carry out certain actions or requirements. ARARs (and TBCs necessary for protection) must be attained for remedial actions regarding hazardous substances.

Potential ARARs to be reviewed for CERCLA sites fall into three broad categories, based on the chemical contaminants, site conditions, and the remedial alternatives being considered:

- ***Chemical-specific ARARs*** are numeric values that represent a health- or risk-based standard or the results of methodologies used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment. An example of a chemical-specific ARAR is a maximum contaminant level or air quality standard.

- ***Location-specific ARARs*** govern activities in certain environmentally sensitive areas. Examples are floodplains, wetlands, endangered species habitat, or historically significant resources.

- ***Action-specific ARARs*** are technology- or activity-based requirements or restrictions. Examples of action-specific ARARs include monitoring requirements, effluent discharge limitations, hazardous wastes manifesting requirements, and occupational health and safety requirements.

AFP 44 is also a RCRA Part B permitted facility and the three sites undergoing removal actions are classified as inactive Solid Waste Management Units. The Project Management Team (Air Force, USEPA, and ADEQ) are negotiating a FFA. Upon finalization of the FFA, the State and USEPA will terminate portions of the RCRA Part B Permit which pertain to the remediation and all procedural requirements will be governed by the FFA. Any substantive requirements set forth in the RCRA Permit will be included as ARARs in this ROD.

Chemical-, location-, and action-specific ARARs were reviewed and described in the FS (Reference 1) and the Proposed Plan (Reference 14). Table 2-4 presents a summary of chemical-specific ARARs and TBCs.

Table 2-4
Contaminants of Concern and Associated ARARs and TBCs at AFP 44 IRP Sites 4, 5, and 6[1]

Analyte	Maximum Detected Concentrations in Soils by Site (mg/kg)			TBCs	ARARs				
	Site 4[2]	Site 5	Site 6	USEPA Proposed RCRA Corrective Action Level (mg/kg)	Maximum Background (mg/kg)	ADEQ Closure Standard (mg/kg)	ADEQ Final Soil Cleanup Standard (mg/kg)		ROD Cleanup Standards
							Non-Residential	Residential	
Cadmium	70.1	114	70.1	40.0	0.8	40	850	38	38
Chromium, Total	8,535	18,144	2,278		20.9	400	4,500	2,100	400
Cyanide, Total	9.6	13	NA	2,000	ND	2,000	14,000	1,300	1,300
Lead	74.8	56.5	54.3		25.1	400	2,000	400	400
Nickel	707	13.5	2,472	2,000.0	15.9	2,000	34,000	1,500	1,500
Trichloroethylene	0.006	ND	0.041	60.0	ND		70[4]	27[4]	[5]
1,1-Dichloroethylene	ND	ND	0.045		ND		0.8[4]	0.36[4]	[5]
1,1,1-Trichloroethane	ND	ND	ND		ND		4,800[4]	1,200[4]	[5]

1. Double Underlined text indicates exceedance of ARARs or TBCs.
2. Includes one sample location from Site 6 which overlaps Site 4.
3. Chromium (VI) is used for RCRA Corrective Action Level.
4. ADEQ Soil Cleanup Standards may not be sufficiently low to prevent groundwater contamination for these relatively mobile contaminants.
5. In accordance with ADEQ regulations (R18-7-206), a narrative standard will be applied to VOC contaminants of concern.

USEPA Proposed RCRA Corrective Action Level = Proposed concentrations that trigger need for action (40 CFR 264.521(a)(2)(I-vi)).
ADEQ Soil Cleanup Standard = Arizona Department of Environmental Quality, "R-18-7-201 Appendix A", ADEQ December 1997.
ND = Not detected. There were no valid detections above the instrument detection limit.
ROD = Record of Decision
NA = Not Analyzed or Not Applicable.
mg/kg = Milligrams per kilogram.

Although the concentrations of some analytes (beryllium and thallium) exceed ARARs or TBCs, they fall within 20 percent of the background range and are considered to be naturally occurring. These analytes are not considered to be contaminants of concern as described in detail in the Risk Assessment (Reference 13). Table 2-5 summarizes location-specific ARARs and Table 2-6 summarizes action-specific ARARs.

2.8 SUMMARY OF CLEANUP LEVELS

The selected remedies required by the ROD shall comply with all Federal and State ARARs as listed in Tables 2-4, 2-5, and 2-6. In addition, the Air Force will comply with all laws applicable to offsite transport, treatment, or disposal activities. Site 4 is being cleaned up to prevent exposure of potential future workers and joggers, and to prevent potential migration of metal contaminants in soil to groundwater. Sites 5 and 6 are being cleaned up to prevent potential migration of metal contaminants in soil to groundwater. VOCs have been confirmed in Site 5 soils at sufficient levels to warrant further investigation and evaluation using the USEPA's presumptive remedy plug in process. If a VOC remedy is found to be required, a narrative standard will be applied to ensure protection of the groundwater from migration of VOC contaminants. The goal of soil and groundwater cleanup efforts at AFP 44 is to protect human health and the environment. Cleanup levels for AFP 44 are listed in Table 2-4.

2.8.1 Inorganic contaminants

The cleanup levels for metals-contaminated soils at AFP 44 are listed in Table 2-4. Remediation of metals-contaminated soil at Sites 4, 5, and 6 was initiated to achieve removal to closure standards issued by ADEQ for RCRA impoundments on site. Subsequently, ADEQ promulgated Final Residential Cleanup Standards (R18-7-201) in December 1997. All cleanup activities for metal-contaminated soils will be completed to meet the December 1997 ADEQ residential soil standards.

2.8.2 Organic Contaminants

For organic contaminants, the state has promulgated regulations (R18-7-206) which set forth the following narrative standard to prevent leaching from causing a release to groundwater in excess of the maximum contaminant level (MCL) (or the state standard if there is no MCL):

> At the conclusion of remediation, the remaining concentration for the contaminants of concern will not cause or threaten contamination of groundwater to exceed any Arizona Water Quality Standard pursuant to R18-11-405 and R18-11-406 at a program-specific point of compliance.

Based on this ARAR, the narrative cleanup level at Site 5 is to reduce the level of each VOC contaminant concentration in soils to levels that do not cause or contribute to contamination of the regional aquifer in excess of the MCL for each such contaminant (or State Aquifer Water Quality Standard if there is not MCL).

Table 2-5 Location-Specific ARARs at AFP 44	
ARAR	**Requirement**
The Archaeological and Historical Preservation Act, 16 United States Code (USC) 469a-1	Any artifacts discovered during construction must be preserved and the Secretary of Interior must be contacted.
Endangered Species Act, 16 USC 1531, 50 CFR 402 and 50 CFR 17	Pima Pineapple Cactus, a plant species listed in October 1993 as endangered, is present at AFP 44. Any remedial action that may affect federally listed species or their critical habitats requires consultation with the United States Fish and Wildlife Service and the state conservation agency. No Pima Pineapple Cacti are located in or near areas to be remediated.

Table 2-6 Action-Specific ARARs at AFP 44	
ARAR	**Requirement**
RCRA Land Disposal Restrictions, 40 CFR 268.35	Contaminated soil must be treated to meet a toxicity characteristic leach procedure (TCLP) level before land disposal.
Pima County Code 17.12.080 (G)	Reasonably available control technology (RACT) must be proposed to reduce all actual emissions of metallic particulates to the air (no standard is given). Metallic particulate means antimony, beryllium, cadmium, chromium, cobalt, lead, mercury, nickel, phosphorus, or selenium.
Pima County Industrial Wastewater Ordinance No. 1991-140	Water or non-hazardous liquid sludge discharged to the local Publicly Owned Treatment Works must be in compliance with Industrial Waste Pretreatment Program.
RCRA Part B Hazardous Waste Management Permit AZ009005422	Stipulates corrective action and closure requirements and schedules. Numeric standards for cleanup under Resource Conservation and Recovery Act (RCRA) were approved by Arizona Department of Environmental Quality (ADEQ) and are contained in Table 2-4. Present requirements for groundwater monitoring will soon be eliminated with acceptance of clean closures of all RCRA permitted facilities as well as the Federal Facility Agreement (FFA).
Poor Quality Groundwater Withdrawal Modified Permit No. 59-516313	Permit requires modification if annual withdrawal rate will exceed 8,200-acre feet/year. If new groundwater extraction wells are constructed or existing wells are modified, a permit modification must be requested from and payment of fees made to Arizona Department of Water Resources (ADWR) and a Notice of Intent (NOI) to drill well must be filed.
National Pollutant Discharge Elimination System (NPDES), 40 CFR 122.26(a)(14)	Areas where industrial activities have taken place and significant materials remain and are exposed to stormwater including hazardous substances regulated under Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) and sludge that have the potential to be released with stormwater discharges require a NPDES permit.
AAC Title 18, Chapter 8, Article 16, Best Management Practices for Petroleum Contaminated Soil	These regulations set standards for treatment, storage, and disposal of petroleum contaminated soils.
AAC Title 18, Chapter 7, Article 2, Soil Remediation Standards	This December 1997 regulation supersedes previous guidance setting standards for cleanup of contaminated soils.
Hazardous Waste Operations and Emergency Response (HAZWOPER), 19 CFR 1910.120	Establishes health and safety requirements for workers conducting cleanup operations involving hazardous substances.
RCRA Subtitle C, 40 CFR Part 264, Subpart X	Establishes narrative criteria for regulating miscellaneous treatment units (such as soil vapor extraction [SVE] systems). Applicable to operation, maintenance and closure of the SVE system, including any on-site disposal.
RCRA Subtitle C, 40 CFR Part 264, Subpart I	Establishes requirements for containers holding RCRA hazardous waste for treatment, storage, or disposal including condition, management, and inspection of containers, container compatibility with wastes and design and operation of container storage areas. Containers storing treatment system waste (including RCRA waste water from any SVE air/water separator or any granular-activated carbon (GAC) carbons) must comply with substantive provisions.

Table 2-6 Action-Specific ARARs at AFP 44	
ARAR	**Requirement**
40 CFR Part 264, Subpart J	Establishes requirements for design, installation, containment and detection of releases, operations, inspections, response to leaks or spills and closure and post-closure for tanks used to store or treat hazardous waste in the SVE system.
40 CFR Part 268, Subpart E (§ 268.50)	Land disposal restriction which limits on-site storage of hazardous wastes to 90 days, unless within the exception for accumulation to allow for proper recovery treatment and disposal.
Clean Air Act (CAA) 42 USC §§ 7401, Pima Co. Bureau of Air Pollution Control Rules and Regulations, Title 17 Pima Co. Air Quality Code, 17.16.430, Subparagraph F	Requires reasonably available control equipment from a stationary source that emits VOCs.
Clean Air Act, 42 USC 7401-767Q, 40 CFR Part 61	Controls air emissions of volatile organic compounds (VOCs) and gaseous contaminants. Requires reduction of VOC emissions from product accumulator vessels. Also, requires leak detection and repair programs.
40 CFR Part 264 AA and BB	Establishes design, performance, and operation and maintenance requirements for air emissions from RCRA regulated units (including SVE treatment units and SVE off-gas treatment units).
Clean Water Act (CWA) 402, SWPCD Order No. 92-08-DWQ, NPDES General Permit No. CAS000002 (Waste Discharge Requirements for Discharges of Stormwater Associated with Construction Activity)	Substantive portions of the general permit are relevant and appropriate to construction of the SVE system.

Key:

AAC	=	Arizona Administrative Code
ARAR	=	Applicable or Relevant and Appropriate Requirement
CFR	=	Code of Federal Regulations
USC	=	United States Codes

The methodology to test compliance with the above narrative standard shall be conducted via vadose zone and groundwater modeling as specified in the Operation and Maintenance (O&M) Manual for SVE system at Sites 1, 2, and 3. Because the predominant VOC soil contamination consists of TCE and 1,1-DCE, this methodology may assign these two VOC contaminants to be used as indicator chemicals. The MCLs as of March 1997 for TCE and 1,1-DCE are listed in Table 2-7. Because all inorganic contaminants above required cleanup levels will be removed from Sites 4, 5, and 6, no future review of metals contamination is necessary. However, SVE remedial action at IRP Site 5 may necessitate a five-year review of organic contamination to ensure that protection of human health and the environment has been achieved.

Table 2-7
Applicable Drinking Water Maximum Contaminant Levels

Constituent	Cleanup Level (mg/L)
Trichloroethylene	0.005
1,1-Dichloroethylene	0.007

Key: TCE = Trichloroethylene
1,1-DCE = 1,1-Dichloroethylene
mg/L = Milligrams per liter

2.9 DESCRIPTION OF REMEDIAL ALTERNATIVES

A wide range of cleanup methods that could reduce the risks posed by inorganic chemicals at each site were evaluated during the FS (Reference 1). Some methods were eliminated during a preliminary screening if they did not effectively address contamination at AFP 44, could not be implemented at a site, or had excessive costs compared to another method that achieves the same degree of protection. Those methods that successfully passed the preliminary screening were then evaluated in detail. Brief summaries of the alternatives considered in the preliminary screening are presented below.

ALTERNATIVE 1 — NO ACTION: Every site was evaluated for the "no action" alternative to provide a basis for comparison of existing site conditions with other proposed alternatives. Under this alternative, no action would be taken to address soil contamination or to minimize further contaminant releases or migration. It is appropriate for use at sites where the risk has been determined to be acceptable.

ALTERNATIVE 2 — LIMITED ACTION: Limited action was evaluated for every site. Under the limited action response, mechanisms to prevent access to the site and direct contact with the contaminants are implemented. Under this alternative, access to the site is controlled and periodic monitoring of the soil contaminant concentrations is conducted. This alternative reduces risk by limiting exposure to contaminants.

ALTERNATIVE 3 — ONSITE RCRA LANDFILL: This alternative was considered for every site and would require construction and permitting of a RCRA landfill within the boundaries of AFP 44. The landfill would be constructed to fulfill RCRA requirements, including a multilayered base of sand, clay, high-density polyethylene plastic, a leachate collection system, and a cap. The cap would include a drainage layer and vegetation to prevent infiltration and erosion. A groundwater monitoring system and provisions for inspection, maintenance, and closure of the landfill would also be required, as well as provisions for post-closure care.

ALTERNATIVE 4 — SOIL FLUSHING: Soil flushing was considered for use at Sites 4, 5, and 6. It involves the *in-situ* extraction of contaminants from vadose zone soils with water, solvents, surfactants, or chelating agents. The spent flushing solutions are recovered for further treatment. The flushing solutions are poured through the soil; the contaminants are removed in the flushing agents as they percolate through the soil, leaving behind remediated soil. The spent flushing solution is collected with wells or subsurface drains and is then treated prior to disposal.

ALTERNATIVE 5 — *IN-SITU* VITRIFICATION: *In-situ* vitrification (ISV) was considered for use at Sites 4, 5, and 6. ISV is an effective treatment for inorganic and organic compounds at depths less than 40 feet below ground surface. The process works by melting soil containing silica, pyrolyzing organic compounds, and fusing or vaporizing metallic materials. A hood is placed over the area to collect off-gassing volatile compounds, metals, and particulate matter. Soils are heated to temperatures above the silica melting point (i.e., in excess of 1100°C) using an electrical current. When the melt reaches the desired depth, the current is turned off and the vitrified block is allowed to cool.

ALTERNATIVE 6 — SOIL WASHING WITH CHEMICAL PRECIPITATION: Soil washing is a water-based process for removing contaminants, such as metals, from excavated soils. It was considered for use at Sites 4, 5, and 6. Contaminants are removed by dissolving or suspending them in the wash solution or by particle size separation. Most metal contaminants are non-volatile and tend to bind to clay and silt particles. Separating these materials from coarser sand and gravel concentrates the contaminants into a smaller volume of soil for further treatment.

The excavated soil is mixed with the wash solution to remove contaminants from the soil and transfer them into the wash solution. The soil and wash solution are then separated, and the soil is rinsed with clean water. Clean soil is then returned to the excavation or placed elsewhere. Soil particles suspended in the wash water, which contain the bulk of the contamination, are held for further treatment or disposal. Water used in the process is treated by conventional wastewater treatment processes to enable it to be recycled for further use in the soil washing process. Four types of residuals are generated from soil washing: contaminated solids, wastewater, wastewater treatment sludges, and in some cases, air emissions.

ALTERNATIVE 7 — ONSITE SOLIDIFICATION/STABILIZATION AND DISPOSAL: The S/S process, sometimes referred to as immobilization, fixation, or encapsulation, uses additives to physically or chemically immobilize non-volatile soil contaminants, such as metals. It was considered for use at Sites 4, 5, and 6. The basic S/S procedure involves pretreatment of contaminated soils to concentrate

the contaminants into a smaller volume of soil for further treatment. A stabilizing reagent is mixed with the soil, which is then allowed to cure. The treated soil can then be landfilled.

ALTERNATIVE 8 — OFFSITE SOLIDIFICATION/STABILIZATION AND DISPOSAL IN AN INDUSTRIAL LANDFILL: The S/S process has been described in Alternative 7. This alternative was considered for Sites 4, 5, and 6. It would require excavation of contaminated soils, backfilling of excavations with clean fill, and bulk transportation of soils to an industrial landfill for stabilization and disposal. This process would not be suitable for materials classified as a RCRA hazardous waste since land disposal of a listed waste is restricted to a RCRA Class I landfill.

ALTERNATIVE 9 — ONSITE SOLIDIFICATION/STABILIZATION AND PLACEMENT IN A RCRA LANDFILL: This alternative is similar to Alternative 8 above and was considered for Sites 4, 5 and 6. Soils with metals content above certain thresholds would be stabilized and disposed in an offsite RCRA Class I landfill.

After completion of the RI/FS and Proposed Plan, VOC contamination was identified in the vadose zone west of Site 5. This portion of the site was not evaluated in the above referenced documents, so none of the remedial alternatives described above address VOC contamination in soil. Under the guidance of the USEPA, the Air Force is conducting additional investigative activities at Site 5 to identify potential VOC sources and to better characterize the vertical and horizontal extent of contamination. In accordance of recent USEPA guidance, the remedy selection will be achieved using the presumptive remedy plug-in process. This process is described in detail in Section 2.10. The remedial alternatives for VOC-contaminated soils at Site 5 are no further action and SVE. SVE was evaluated as a remedial alternative for similar contaminants and geologic conditions at Site 1, 2, and 3. The following three alternatives were extracted from the approved ROD for IRP Sites 1, 2 and 3.

VOC ALTERNATIVE 1 — NO ACTION: Every site was evaluated for the "no action" alternative to provide a basis for comparison of existing site conditions with other proposed alternatives. Under this alternative, no action would be taken to address soil contamination or to minimize further contaminant releases or migration. It is appropriate for use at sites where the risk has been determined to be acceptable.

VOC ALTERNATIVE 2 — SVE WITH RESIN ADSORPTION: SVE is a technique for *in-situ* removal of VOCs from contaminated soils and was considered for use at Sites 1, 2, and 3, and now Site 5. The process can be used to treat sites where excavation of contaminated soils is not practical. In an SVE system, fresh air is introduced into the contaminated subsurface. As the air moves through the soil, VOCs are stripped into the air. The vapor-laden air is withdrawn under vacuum from extraction wells and brought to the ground surface for treatment. At sites where contaminants are concentrated in the capillary fringe, dewatering the site to lower the water table and expose soils to the vacuum may be desirable to enhance removal rates. This alternative uses the SVE system with a resin adsorption process to treat the vapors. The system considered for use at Sites 1, 2, and 3 is the proprietary PADRE™ system, manufactured by the Thermatrix Company. This system removes contaminants from the vapor stream by adsorption onto a proprietary resin. The process involves using parallel resin beds, where one bed treats the vapor stream while a second bed undergoes a

desorption cycle. The desorption cycle uses a combination of temperature and pressure to remove the VOCs from the resin. The vapors are then condensed and transferred to a storage tank. The recovered liquid VOCs may then be redistilled for product recovery or disposed of offsite.

VOC ALTERNATIVE 3 — SVE WITH GRANULAR-ACTIVATED CARBON ADSORPTION: This alternative uses the SVE system discussed in VOC Alternative 1 above to remove contaminants from soil, but with granular activated carbon to treat the vapors. Carbon adsorption systems typically consist of a single large vessel with two smaller vessels all connected in series. Vapors enter the larger vessel, where most of the vapors are adsorbed to the carbon. The vapor stream continues through the next two smaller vessels, and treated air is discharged to the atmosphere. A VOC detector installed downstream of the final vessel continuously monitors for VOCs in the treated air, and will automatically shut down the system if concentrations exceed the Pima County standard. The GAC is considered fully saturated when the removal efficiency of the first small vessel falls below 85 percent for TCE or DCE. At this point, the blower is shutoff and the GAC is removed for regeneration or disposal offsite at a permitted facility.

2.10 COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives were evaluated using USEPA's nine evaluation criteria. The cleanup methods evaluated for AFP 44 are described in Section 2.9 together with certain categories which encompass the nine criteria analysis. A detailed presentation of the cleanup method selection and screening process is presented in the FS report (Reference 1).

USEPA'S NINE EVALUATION CRITERIA: The remedial alternatives were evaluated using the nine criteria set forth in the N.C.P., 40 CFR 300.430(o)(9)(iii). A detailed presentation of the cleanup method selection and screening process is presented in the FS report. The USEPA criteria used to evaluate cleanup methods are given in "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (October, 1988) and are listed below:

1. ***Overall Protection of Human Health and the Environment.*** Addresses whether a cleanup method provides adequate protection in both the short- and long-term, and describes how risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. ***Compliance with ARARs.*** Addresses whether a cleanup method will meet all federal and state requirements.

3. ***Long-Term Effectiveness and Permanence.*** Refers to the ability of a cleanup method to maintain reliable protection of human health and the environment over time and the permanence of the alternative.

4. ***Reduction of Toxicity, Mobility, or Volume Through Treatment.*** Refers to the anticipated ability of a cleanup method to reduce the toxicity, mobility, or volume of the hazardous substances present at the site through treatment or recycling.

5. ***Short-Term Effectiveness***. Addresses the short-term risks to workers or the community, potential environmental impacts of the cleanup alternative, and the time needed until protection is provided.

6. ***Implementability***. Refers to the technical and administrative feasibility of a cleanup method, including the availability of materials and services required by the method.

7. ***Cost***. Evaluates the estimated capital and O&M costs of each cleanup method.

8. ***State Acceptance***. Assessment against this criterion evaluates the technical and administrative concerns regulatory agencies may have for each alternative.

9. ***Community Acceptance***. This assessment evaluates the issues and concerns the public may have for each alternative. Public comment is an important part of the final decision. A public comment period addressing the FS was held on November 1 through December 15, 1994. The Proposed Plan provided the community a second opportunity to comment (July 10 - September 23, 1995) on the proposed cleanup methods.

The USEPA criteria were applied to the evaluations of potential cleanup methods. The following remedial alternatives passed the preliminary screening and were evaluated in detail: No Action, Limited Action, Soil Washing, Solidification/Stabilization. For a detailed discussion of the comparative analysis of alternatives, please refer to the FS Report (Reference 1).

The evaluation summary tables presented in this section list the alternatives considered to be feasible based on data available at the time of the FS. Estimated costs and the preferred alternatives are presented. The preferred alternatives provide the best balance of tradeoffs among the other alternatives with respect to the evaluation criteria. The Air Force expects that the preferred alternatives will satisfy the statutory requirements in CERCLA Section 121(b) that the selected alternatives:

- Be protective of human health and the environment
- Comply with ARARs
- Be cost-effective
- Utilize permanent treatment alternatives
- Satisfy the statutory preference for treatment.

The comparative analyses for selection of the preferred cleanup method for Sites 4, 5, and 6 are summarized in the following sections.

2.10.1 Site 4: Former Unlined Surface Impoundments and Site 6: Drainage Ditch and Channels, Preferred Alternative: Offsite Stabilization and Disposal in a RCRA Landfill

Site 6 is considered with Site 4 due to their geographic proximity, co-location of contaminated soil areas, and the presence of similar contaminants. The preferred method for cleanup of metals-contaminated soil is to remove the soil, transport it to an off-site RCRA-permitted facility for stabilization as needed, and dispose of it in a RCRA-permitted landfill. A schematic diagram of the process is shown in Figure 2-9. This alternative provides the overall best balance in terms of satisfying the nine evaluation criteria described in Section 2.10 of this document, and will result in the cleanup being accomplished in a timely and cost-effective manner. As noted previously, Site 4 is underlain by Site 14 the perched groundwater zone. VOCs associated with the deep vadose zone are being remediated along with Site 14 groundwater using dual vapor extraction.

The selected method removes the contaminated soil from the site, then stabilizes it offsite to render the contaminant immobile. The stabilized soil is then disposed in a RCRA landfill, which is constructed and monitored to ensure no leaching contamination escapes to the environment. This alternative effectively reduces risks, is technically easy to implement, and has been proven in numerous other projects nationwide. More than 100 vendors offering hazardous waste solidification services exist in the United States. Many of these vendors have wide experience and offer custom mixtures of solidification agents for various wastes.

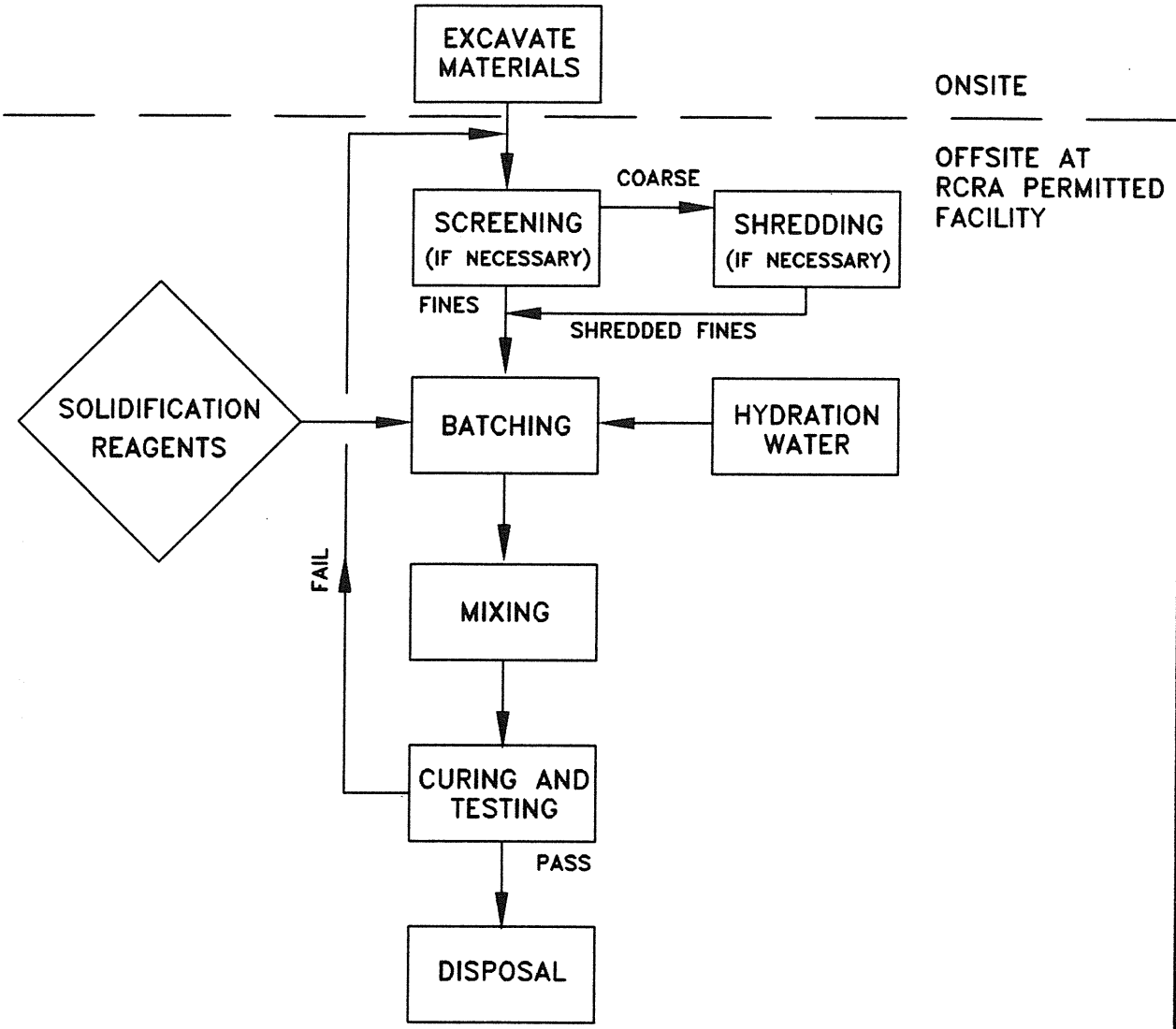
S/S techniques will increase waste volume, but will decrease contaminant mobility and toxicity. Short-term effectiveness considerations include exposure of workers and the public during excavation, transport, mixing, and curing of contaminated soils. These exposures can be minimized through the use of engineering controls, personnel protective equipment, and standard operating procedures.

The removal action at Site 4 was completed in June 1997. Approximately 13,589 tons of soil were excavated and disposed of offsite at a RCRA Class I Landfill (Reference 23). The removal action at the originally defined Site 6 is in progress with an expected completion date of December 1997. To date, 8,674 tons of soil have been excavated and transported to a RCRA Class I Landfill for disposal.

2.10.2 Site 5 - Former Sludge Drying Beds Preferred Alternative: Offsite Stabilization and Disposal in a RCRA Landfill and SVE Presumptive Remedy

The preferred method for cleanup of metals-contaminated soil at Site 5 is similar to Sites 4 and 6 above, where the contaminated soil is removed, stabilized, and disposed of in a RCRA-permitted landfill. This alternative provides the overall best balance in terms of satisfying the nine evaluation criteria described in Section 2.10 of this document, and will result in the cleanup being accomplished in a timely and cost-effective manner.

The removal action for metals contaminated soils at Site 5 was completed in May 1997. A total of 5,033 tons of contaminated soil was excavated from Site 5 and transported to a RCRA Class I landfill for disposal.



SOURCE:

"SILICATE TECHNOLOGY CORPORATION'S SOLIDIFICATION/STABILIZATION TECHNOLOGY FOR ORGANIC AND INORGANIC CONTAMINANTS IN SOIL," EPA/540/AR-92/010, DEC., 1992.

EARTH TECH

FIGURE 2-9

SOLIDIFICATION/STABILIZATION PROCESS SCHEMATIC

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As noted previously, additional investigative activities related to shallow VOCs in soil west of Site 5 have indicated remediation will be required in the future. The contaminants of concern and geological conditions present at Site 5 are comparable to those found at Sites 1, 2, and 3. Due to similarities and based on the success of SVE systems operating at Sites 1, 2, and 3. The USEPA's presumptive remedy plug-in approach (as described in the following sections) will be used to determine if SVE will be performed as the selected remedy or if no further action is required.

2.10.3 Plug-in Approach for VOC-Contaminated Soils

The remedial action objective for the VOC-contaminated soils remedy is to reduce VOC concentrations in soil such that any further contaminant migration will not cause groundwater to exceed chemical performance standards. The specific components and technologies necessary to achieve and comply with performance standards will be selected during remedial design. The plug-in approach, described below, will be used to determine if the Air Force needs to implement an SVE remedy at Site 5 or if site conditions allow the no further action alternative.

Following the additional field investigations at Site 5, the site will be evaluated and vapor transport modeling performed, as necessary, to determine the potential threat to groundwater quality. If Site 5 soils are concluded to pose no present or future threats to groundwater quality, they would be given "No Further Action" status. If Site 5 soils are determined, based on the Plug-in Criteria described below, to likely pose a threat to future groundwater quality they would be remediated with SVE. The type of off-gas treatment equipment will be determined during remedial design. Groundwater monitoring will be used to detect impacts in excess of cleanup standards.

2.10.3.1 Plug-In Process and Criteria

Traditionally, a responsible party investigates, evaluates and proposes a separate cleanup remedy for each source of contamination. However, there are a number of source areas or sites that have the same type of VOC contamination found in the same soil types. For sites that are substantially similar, the repetition of the investigation/evaluation/proposed remedy process can be avoided using an innovative approach called the "plug-in" approach.

The ROD does not select a remedial action for a specific site. Rather, it selects a remedial action (in this case SVE) to apply to any site exhibiting certain conditions. This section defines what these conditions are and identifies a process for determining whether they exist.

The remedy is selected prior to fully characterizing the plug-in sites. If the conditions at a site match pre-defined conditions, the site will "plug in" to the SVE remedial action and be subject to its requirements. This section fully contains the basis and process to be used for all plug-in decisions. Therefore, following the prescribed process in this section completes the remedy selection process for any particular site. The plug-in process contains a "blueprint" directing decisions as to its own application.

The following sections describe the plug-in process components and terminology.

EXISTING SITE PROFILE: The SVE remedy used in the plug-in approach must be able to address the vast majority of plug-in sites for the approach to be efficient. To achieve this, the site profile for the individual sites must be very similar. The site profile is defined in terms of various physical and contaminant parameters that might have an impact on the effectiveness of a remedial alternative. For example, for SVE, the air permeability of the soil and the volatility of the contaminants strongly impact its effectiveness. The existing site profile for Site 5, as defined in the RI and FS Reports, is sufficiently similar to other sites at AFP 44 (IRP Sites 1, 2, and 3) to implement the plug-in approach.

PRESUMED REMEDY: The Presumed Remedy is the action that will be taken at all sites that meet the Remedy Profile and in the plug-in criteria (defined below). The Presumed Remedy is selected to meet all ARARs. The Air Force has selected SVE as the Presumed Remedy for the cleanup of VOC-contaminated soils in this ROD in accordance with the presumptive remedy approach (described in the following paragraphs). Performance standards for SVE systems are described below.

Presumptive Remedy Approach. USEPA has studied various technologies applied at CERCLA sites with VOC-contaminated soils as part of its effort to streamline the FS process. This evaluation consisted of an analysis of the technical literature and review of the results of the remedy selection process from FSs and RODs. The purpose of the evaluation was to formulate general conclusions about the application of these technologies at sites with VOC contamination in soils. The evaluation is summarized in USEPA's report titled *Feasibility Study Analysis for CERCLA Sites with Volatile Organic Compounds in Soils*, August 1994. The evaluation concluded that certain technologies were routinely screened out during the FS process based on lack of effectiveness, difficult implementation, or excessive costs. The evaluation also concluded that three remedies (SVE, thermal desorption, and incineration) were frequently selected to address VOC contamination in soils at CERCLA sites. Based on its evaluation, USEPA also determined that several treatment technologies could be eliminated from consideration during the FS process at sites where the presumptive remedy of SVE, thermal desorption, or incineration would be appropriate. Furthermore, USEPA recommended that its August 1994 report could be used as a reference in an FS when the technology identification and screening steps are abbreviated or eliminated when adopting the presumptive remedy approach.

As part of the AFP 44 RI/FS, various site-specific factors (including subsurface conditions and contaminant type) were reviewed to evaluate the applicability of SVE to remediation of soils at IRP Sites 1, 2, and 3, which are located near Site 5 and exhibit similar geological conditions and contaminants of concern. The results of this evaluation indicate that the types of contaminants present, distribution of contaminants and physical parameters of the soil at AFP 44 are well-suited to remediation using SVE. In according with the USEPA guidance document titled *Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compound* (OSWER Directive 9355.0-48FS), only SVE was further evaluated for sites exhibiting VOC-contaminated soils.

REMEDY PROFILE: The range of conditions appropriate for the Presumed Remedy is called the Remedy Profile. After the RI is completed at a site, the first test of whether it can be plugged in to the remedy is whether it exhibits conditions within the Remedy Profile. Like the existing site profile, the Remedy Profile is defined in terms of physical and contaminant parameters that may have an impact on the effectiveness of the Presumed Remedy.

Based on investigations completed to date, the Project Management Team (Air Force, USEPA, and ADEQ) has initially determined that Site 5 meets the plug-in remedy profile for SVE.

PLUG-IN CRITERIA: Even if conditions at a particular plug-in site are amenable to SVE (within the Remedy Profile), there still may not be enough VOC contamination present to make SVE necessary. Therefore, "plug-in criteria," based on potential health threats, are necessary to serve as the standard for determination of whether an action is necessary. Those sites not exceeding the plug-in criteria do not need a soil VOCs remedy and the Air Force will not plug in such sites to the remedy.

Because the AFP 44 Risk Assessment (Reference 13) already determined that the VOC contamination in soil does not represent a significant human health risk for non-groundwater pathways, only potential groundwater impacts are considered in the plug-in criteria. Potential groundwater impacts are defined by VOC concentrations in soils that could result in groundwater concentration in excess of cleanup standards.

This SVE remedy will be applied whenever certain conditions exist. There are two conditions that a site must meet before being plugged in. First, the site must exhibit conditions consistent with the Remedy Profile (the Project Management Team has already determined that Site 5 meets this criteria), and second, the site must exhibit contamination exceeding the plug-in criteria. The determination of whether to plug a site into the SVE remedy will be made at the Plug-in Decision Point. This decision is made according to the process set in advance by this ROD.

This remedy addresses VOC-contaminated soils as future sources of groundwater contamination. The amount that the concentration of VOCs in groundwater would increase due solely to VOCs in Site 5 soils is referred to as the incremental concentration. The plug-in criteria are limits on the incremental concentrations of VOCs from Site 5 soils.

The plug-in criteria are not point-specific concentration limits for the soil medium itself. Rather, they apply to the effect of soil VOCs on the groundwater media. This effect is estimated by evaluation and modeling, as described below. It is important to ensure that the future threat to groundwater is reduced sufficiently so Site 5 could not by itself produce enough groundwater contamination to make a groundwater remedy necessary in areas where it is not otherwise needed today. The Arizona drinking water classification for aquifers, which is an ARAR, requires that stringent source control be implemented with the objective of keeping or restoring the aquifer to drinking water standards.

The plug-in criteria are based directly on the cleanup standards. SVE will be selected at any plug-in site where data evaluation and modeling (described below) indicate the potential for an increase in the concentration of VOCs in groundwater (incremental concentration) by an amount greater than

the cleanup standards (federal MCLs, if available, or state of Arizona drinking water criteria). Note that this plug-in criterion does not set a limit on the allowable total concentration of VOCs in groundwater. Rather, it limits that part of the groundwater concentration due solely to the incremental (extra) VOCs from soils at Site 5 that would reach the groundwater over time.

SOIL CLEANUP STANDARDS: VOCs in the vadose zone at Site 5 may pose a threat if they migrate from soils to groundwater. The purpose of the soil remedy is to limit the amount of VOCs that can enter the groundwater from any particular site. Evaluating the threat of a site must depend, therefore, on making an estimate of the incremental VOCs that will enter the groundwater over time because of migration from Site 5 soils. The process described in this section will be used to estimate the maximum effect that the VOC mass distribution at Site 5 could potentially have on groundwater in the future. This estimated effect will then be compared with the plug-in criteria (groundwater cleanup standards). The steps involved in evaluation of soil cleanup standards include additional data collection, VOC mass estimates, T2VOC vadose zone transport modeling (or another vadose zone model acceptable to USEPA) and estimating incremental groundwater concentrations.

Additional Data Collection. Data will be obtained from investigative activities at Site 5. Examples of the type of information to be obtained shall include:

- Subsurface lithology from soil borings;
- Vertical distribution and type of VOC contaminants in the vadose zone from soil gas samples obtained from soil vapor monitoring;
- Sufficient numbers of soil vapor samples to provide a mass estimate of vadose zone contamination at the site;
- Groundwater quality information obtained by sampling monitoring wells at and in the vicinity of the site; and
- Any additional information or activities deemed necessary by USEPA pursuant to regulation, statute, or USEPA guidance.

VOC Mass Estimates. The total contaminant mass and the horizontal and vertical distribution of mass shall be estimated for each VOC. The sources of data that will be available to estimate the horizontal and vertical mass distribution are shallow soil gas surveys and depth-specific soil gas samples. The measured soil gas concentrations shall be converted to total contaminant mass estimates.

T2VOC Vadose Zone Transport Model (Note: T2VOC may not be the only acceptable vadose zone model for Site 5). The maximum future incremental groundwater concentrations resulting from the VOCs in soils at Site 5 will be estimated using a computer model, subject to USEPA approval. The model to be used shall be T2VOC, or an equivalent model approved by USEPA. T2VOC is a three-dimensional, computer-based finite difference numerical model. The mass distribution of VOCs with depth in soils is input to T2VOC. The model then simulates the movement of VOCs in the vadose zone and predicts the mass loading (flux, or rate of leaching) of VOCs to groundwater and ambient air over time. A separate T2VOC analysis is required for each VOC identified in the vadose zone, however, due to its high mobility and prevalence at the site, TCE will be considered a surrogate for other VOCs that may be present at low levels.

In cases where it can be demonstrated that the outcome of T2VOC is mathematically certain without running the model, USEPA may approve that the conclusion be accepted without running the model. For example, one could make the extreme assumption that the entire VOC mass in the vadose zone instantly arrived in groundwater. An estimate of the effect of VOCs on groundwater under such an assumption would be much greater than corresponding T2VOC estimate, as T2VOC computes the gradual arrival of VOCs over many years. If even under this assumption, the plug-in criteria would not be exceeded, then actually running T2VOC may not be necessary.

Estimating Incremental Groundwater Concentration. For groundwater, T2VOC calculates the mixing of migrating VOCs and groundwater beneath the site. This mixing zone approach calculates groundwater concentrations on the basis of an assumed mixing depth in the groundwater zone beneath the site and an estimated flow of clean groundwater originating from upgradient sources. The depth of the mixing zone shall be based on site-specific conditions, but shall not exceed 30 feet.

Note that clean water flow-through is assumed in the mixing cell model, even though the current groundwater may be already contaminated. This is because the plug-in criteria address the incremental VOCs resulting from leaching from soils only.

CLEANUP DESIGN AND EXECUTION: Locations determined to be appropriate for plug-in to the SVE remedy can proceed directly with cleanup design and execution. The Air Force will notify the public each time a plug-in decision is made. This step will be implemented after the ROD is finalized.

2.10.3.2 Performance Standards for VOC-Contaminated Soil Cleanup at Site 5

The SVE system at Site 5 will operate continuously until the VOC concentrations in soil have been reduced such that the narrative standard as described in Section 2.8 is no longer exceeded. Evaluation of whether a narrative standard is still exceeded as cleanup nears completion shall be accomplished by the same process and methods used to determine that the narrative standard was exceeded originally; through sampling of soil vapor and use of the T2VOC and mixing zone models, or USEPA-approved alternative models.

The SVE system shall be designed to draw soil vapors from the entire lateral and vertical extent of contamination that represents a threat to groundwater quality.

A monitoring program will be required for the SVE system. Components of the monitoring program shall include:

- Provisions to meet all requirements in this ROD;
- Periodic sampling of soil vapor monitoring wells to estimate the mass of VOC contamination remaining in the vadose zone;
- Sampling of off-gas, before and after treatment, to assess the quality of discharged air;
- Minimum number of sampling events over a specified time period that must show contamination not exceeding cleanup standards before the SVE system can be shut down;

- Reporting procedure to notify USEPA when cleanup requirements have been consistently met (after any VOC rebound period); and
- Provisions for SVE decommissioning and potential continued monitoring after cleanup requirements have been met, if determined necessary by USEPA.

If VOC levels rebound to above cleanup standards after an SVE system has been shut down, SVE operation shall be resumed. An appropriate discussion of monitoring and shutdown procedures for SVE systems at AFP 44 can be found in the O&M Manual for Sites 1, 2, and 3 (Reference 29).

2.11 THE SELECTED REMEDY FOR SITES 4 AND 6: OFFSITE STABILIZATION, DISPOSAL IN A RCRA LANDFILL

Sites 4 and 6 are grouped together for discussion of remedies because Site 4 overlies Site 6 and the removal actions will be concurrent. Off-site stabilization and disposal in an off-site RCRA landfill removes the contaminated soil from the site, then stabilizes it offsite to immobilize the contaminants. The stabilized soil is then disposed of in an off-site RCRA landfill, which is constructed and monitored to ensure no leaching contamination escapes to the environment. This alternative will require a short time frame, one year or less, to implement for Site 4 and Site 6.

Soil removal actions at Site 4 were completed in June 1996. A total of 13,589 tons of soil were excavated from Site 4 and disposed of offsite at a RCRA Class I Landfill (Reference 23). Soil removal actions at Site 6 are scheduled to be complete in February 1997. This soil removal includes segregating clean rip-rap from contaminated rip-rap to reduce the quantity of material disposed. To date, approximately 8,674 tons of soil of rock have been excavated and transported to a RCRA Class I landfill for disposal. Groundwater and deep vadose zone VOC contamination immediately below Sites 4 and 6 is being addressed as part of the Site 14 (Shallow Groundwater Zone) remedial actions, which will be detailed in a separate ROD.

During Site 6 removal actions and confirmation sampling, additional metals contaminated soil was observed west of Site 4. This area, designated as Site 6 West, consists of soil contamination in channels, interchannel areas, and a sheet flow area. The area will be better defined through sampling and trenching in 1998 and will be excavated in 1999.

2.12 THE SELECTED REMEDY FOR SITE 5: OFFSITE STABILIZATION, DISPOSAL IN A RCRA LANDFILL AND SVE PRESUMPTIVE REMEDY

Off-site stabilization and disposal in a RCRA landfill removes the metals-contaminated soil from the site, then stabilizes it offsite to render the contaminants immobile. The stabilized soil is then disposed of in a RCRA landfill, which is constructed and monitored to ensure no leaching contamination escapes to the environment. This alternative will require a short time frame, one year or less, to implement for Site 5. Soil removal activities at Site 5 were completed in May 1997. A total of 5,033 tons of contaminated soil was excavated and transported to a RCRA Class I Landfill for disposal (Reference 27).

Additional investigation west of Site 5 is in progress; the results of the investigation have shown the presence of VOC contamination, therefore, either no further action or SVE will be considered the presumptive remedy for the site in accordance with the USEPA's plug-in approach, as described in Section 2.10.3. SVE removes contaminants from the soil by withdrawing air at extraction wells, which induces an air flow from the surface. The withdrawn air is laden with volatilized contaminants, which are treated aboveground. A VOC detector may be installed to monitor for vapors in the treated air, and can automatically shut down the vapor treatment system if vapor concentrations exceed emissions standards.

Off-gas treatment technology selection for an SVE system shall be made during remedial design of that system. Available options for SVE off-gas treatment include:

- Vapor-Phase Carbon; and
- Vapor-Phase Resin Adsorption.

During the remedial design process, after additional data are available on anticipated influent rates and concentrations, the Air Force will determine which of the off-gas treatment option(s) listed above best attains the SVE performance standards described in Section 2.10.3.2. Prior to construction, the Air Force will take appropriate action to inform the public of the actual technologies selected for inclusion in the SVE remedy.

The SVE off-gas treatment system must comply with all of the ARARs for air emissions described in Section 2.8.

The Project Management Team believes that the SVE off-gas treatment options for this remedy would meet both reasonably available control technology (RACT) and best available control technology (BACT) requirements even though emissions are expected to be well below the mass generation rates that impost these requirements. The following additional performance standards shall apply to SVE off-gas controls:

- Emission controls for off-gas treatment shall attain a minimum 85 percent efficiency rate, however once influent levels are less than 100 µg/L, this standard may not be achievable.
- Routine monitoring of the off-gas shall be performed during the remedial action to ensure that no ARARs or performance standards are being violated
- If the emission controls should fail, the SVE system will be shut-down until the emission controls are again effective. If necessary, additional treatment processes shall be installed to ensure compliance with the performance standards.

Operation of the SVE off-gas treatment system will generate some liquids (primarily condensate). If feasible, these liquids will be handled in the groundwater treatment system installed at the facility. Thus, the groundwater treatment plant performance standards would also be applicable to these liquids. If the concentrations in the SVE off-gas treatment wastewater are sufficiently elevated that the treatment plant will not be able to handle them, the liquids shall be disposed of at an off-site disposal facility approved by USEPA.

2.13 SHUTDOWN AND DECOMMISSIONING

The major contaminants of concern at Sites 4, 5, and 6 are metals. Excavation procedures, confirmation sampling, waste management, and site restoration activities will be conducted in accordance with the Sites 4 and 5, and Site 6 Hot Spots Removal Action Work Plan (Reference 21). Because all inorganic contaminants above required cleanup levels will be removed from Sites 4, 5, and 6, no future review of metals-contamination related to this ROD will be necessary. However, remediation of VOC-contaminated soils found west of Site 5 may necessitate a five-year review of organic contamination to ensure that protection of human health and the environment has been achieved.

The organic-contaminants of concern at Site 5 are TCE and DCE. Other similar VOCs are also present. Because these other VOCs are physically similar to TCE and DCE, they will also be removed from soils when the TCE and DCE are removed. Measurements of TCE and DCE in the AFP 44 on-site laboratory, as well as TO-14 analyses at an off-site laboratory will be used to monitor the progress of SVE cleanup activities at Site 5 as described in Section 3.0 of the O&M Manual for SVE Systems at IRP Sites 1, 2 and 3 (Reference 29).

System operations may vary depending on site conditions, such as focused efforts on specific hot spots or cycling individual wells on- and off-line to measure rebound. These variations are at the discretion of the operator using the procedures described in the Site 1, 2 and 3 O&M Manual.

The progress of the soil remediation will be measured by a combination of methods as listed below:

- SVE/Treatment system performance monitoring.
- Routine site monitoring (including collection and analysis of depth-specific soil gas samples).
- Periodic evaluation of the impact of soils on groundwater quality:
  - initial baseline computer model
  - annual cleanup progress evaluation.

When these measurements indicate cleanup levels for all of Site 5 or portions of it have been met, more sampling will be conducted for confirmation. The SVE system(s) or portions of the system(s) will be shut off and the following statistically-based activities will occur:

- Depth-specific soil gas sampling and analysis.
- Reevaluation of the impact of soils on groundwater quality.

If the results of these activities show the cleanup levels have not been met, the SVE system(s) will be turned back on. If the results show cleanup levels have been met, monitoring of soil vapor will continue for four quarters to verify the cleanup levels have been met. If the results show the cleanup levels have not been met, the SVE system(s) or portions of the system(s) will be turned on again. This process will continue until the cleanup levels have been met. At the end of the cleanup process, soil samples will be collected from the ground surface to the water table and analyzed to provide further confirmation that the cleanup levels have been met. If soil vapor data indicate contamination

extends beyond the areal extent of the SVE wellfields, the Air Force may consider installing additional wells.

When the site cleanup levels have been met, the schedule for removal of SVE system or portions of the system(s), including equipment, piping, and wells will be at the discretion of the Air Force. Wells will be destroyed to the standard in effect at the time of destruction as established by the Arizona Department of Water Resources (ADWR). The sites will be restored to a land use compatible with the immediately adjacent land, or as required to accommodate production requirements.

2.14 STATUTORY DETERMINATION

The Air Force has selected excavation of soils, coupled with offsite S/S and disposal in a RCRA Class I landfill as the cleanup method for metals-contaminated soils at AFP 44 IRP Sites 4, 5, and 6, and SVE for VOC-contaminated soils west of Site 5.

This ROD incorporates by reference the comparative nine criteria analysis set forth in Table 5-3 of the FS as the basis for its remedy selection pursuant to the NCP, 40 CFR 300.430(e)(9)(iii) and 300.430(f)(4). According to the NCP preamble, the nine evaluation criteria give effect to the statutory mandates of Section 121 of CERCLA, and in particular, the remedial action factors of section 121(b)(1)(A)-(G); an analysis performed pursuant to the nine criteria concludes with selection of a remedy that meets the statutory mandates.

2.14.1 Protection of Human Health and the Environment

Soil excavation with offsite S/S and disposal in a RCRA Class I landfill will achieve adequate protection of human health and the environment at Site 4 by preventing exposure of potential future workers and joggers, and eliminating a source of potential ongoing contamination of groundwater. Soil excavation with offsite S/S and disposal in a RCRA Class I landfill will achieve adequate protection of human health and the environment at Sites 5 and 6 by eliminating a potential continuing source of groundwater contamination. The SVE presumptive remedy for VOC-contaminated soils at Site 5 will eliminate a potential continuing source of groundwater contamination. There are no short-term threats associated with the selected remedies that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the remedies.

2.14.2 Compliance with ARARs

The selected remedies will comply with all applicable or relevant and appropriate chemical-, location-, and action-specific requirements (ARARs). These ARARs are:

- ***Chemical-Specific ARARs:***
  - See Table 2-4.

- ***Location-Specific ARARs:***
  - See Table 2-5.

- *Action-Specific ARARs:*
  - See Table 2-6.

In addition to the site-specific ARARs listed above, the Air Force will comply with all applicable laws related to offsite transportation, treatment, and disposal activities related to AFP 44 waste.

2.14.3 Cost Effectiveness

The selected remedies are cost-effective because they have been determined to provide overall effectiveness proportional to their costs.

2.14.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The Air Force has determined that the selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Air Force has determined that these selected remedies provide the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility or volume achieved through treatment, short-term effectiveness, implementability and cost; also considering the statutory preference for treatment as a principal element and considering State of Arizona and community preference.

The selected remedies treat the principal threats posed by the soils, achieving significant reduction of metal and VOC concentrations. The remedies can be implemented in the short term in a cost-effective manner.

2.14.5 Preference for Treatment as a Principal Element

Excavated soils that exceed action levels established by ADEQ will be treated by S/S to immobilize metal contaminants. In addition, the SVE presumptive remedy for VOCs in soils at Site 5 will be coupled with off-gas treatment such that VOC-laden vapors will be withdrawn from the soil, then captured for offsite destruction or recycling. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

SECTION 3.0

RESPONSIVENESS SUMMARY:

PROPOSED PLAN AND ENGINEERING EVALUATION/COST ANALYSIS SITES 1, 2, 3, 4, AND 5

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PREFACE

This section presents the Responsiveness Summary related to comments received on the Proposed Plan and Engineering Evaluation/Cost Analysis for Sites 1, 2, 3, 4, and 5 (References 14 through 20). The comments and responses reflect questions and answers from public meetings, as well as written questions from various community members and organizations, that were received and addressed during 1995. This section has not been updated to reflect the current regulatory climate, recently promulgated regulations, or site conditions that may have changed.

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INSTALLATION RESTORATION PROGRAM (IRP)

PROPOSED PLAN AND ENGINEERING EVALUATION/COST ANALYSIS SITES 1, 2, 3, 4, AND 5 RESPONSIVENESS SUMMARY

at

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Tucson International Airport Area Superfund Site
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ACRONYMS AND ABBREVIATIONS

ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
AFCEE	Air Force Center for Environmental Excellence
AFP 44	Air Force Plant 44
ARAR	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EE/CA	Engineering Evaluation/Cost Analysis
FACO	Final Assembly and Checkout
IRP	Installation Restoration Program
GAC	Granular Activated Carbon
DNAPL	Dense Nonaqueous Phase Liquid
DOD	Department of Defense
MCL	Maximum Contaminant Level
mgd	Million gallons per day
mg/L	Milligrams per liter
mg/cm^3	Milligrams per cubic meter
NAPL	Nonaqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SVE	Soil Vapor Extraction
TCE	Trichloroethylene
UCAB	Unified Community Advisory Board
$\mu g/L$	Micrograms per liter
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

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RESPONSE TO ADEQ COMMENTS

ON PROPOSED PLAN FOR SOIL CLEANUP (JULY 1995)

1. **Page 1-1:**

Comment: Explain that the removal actions for Sites 1-5 are in advance of the Record of Decision (ROD) and may be modified, if so required.

Response: A statement will be added to Section 1.1 subparagraph (2) that the remedial actions finalized in the ROD may result in modifications to work being conducted under the removal action.

2. **Page 1-2:**

Comment: Correct the apparent typo in the last sentence of the Public Hearing paragraph. Also, review all documents for editorial correctness.

Response: The last sentence will be corrected to read "A transcript of the hearing..."

3. **Page 1-3:**

Comment: Clarify the third paragraph to show that the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) processes require extensive public and government review of design documents. The time for that process is not a delay.

Response: The sixth sentence of the third paragraph will be changed to "Both CERCLA and RCRA allow early implementation of cleanup actions provided that...".

4. **Page 1-5:**

Comment: Figure 1-1 should include a remedial action event after the ROD.

Response: The Remedy Operation and Maintenance event will be renamed to Remedial Action Operation and Maintenance.

5. **Page 3-12:**

Comment: Will an effectiveness program be defined in the ROD? That program must be subject to government approval and public review. The program must include both a quantifiable determination and a mandatory restart of the soil vapor extraction (SVE) after some period of shutdown to determine if volatile organic compound (VOC) removals can occur. Those elements must be defined in the Operation and Maintenance Manual. There is also a need for site restoration and proper shut down and removal of equipment. When will this be defined?

Response: Shut down, equipment removal, and site restoration will be addressed in the ROD for Sites 1, 2, and 3. Site restoration for Sites 4, 5, and Site 6 hotspots is addressed in the Work Plan. After these issues are resolved, they will be attached as addenda to the Operation and Maintenance Manual.

6. **Page 3-13:**

Comment: As above, when will the site restoration be addressed? The excavated sites must be filled and covered for sound drainage and compatible land use.

Response: The ROD will address restoration of Sites 1, 2, and 3 to a land use compatible with Government-related activities. The restoration of Site 4, 5, and 6 Hotspots is described in the Removal Action Work Plan.

7. **Page 5-1:**

Comment: While deemed acceptable, the Purus system has not been tested at steady state conditions using the proper resin. Arizona Department of Environmental Quality (ADEQ) reserves all rights to re-evaluate the effectiveness of the Purus system during final operations.

Response: The Pursorb 200 resin used in the treatability study was the optimal resin for Site 3, and was adequate at Site 2. The Pursorb 400 resin proposed for use at Site 2 is better suited for the high levels of trichloroethylene (TCE) encountered at that site, and will enhance the already-satisfactory performance of the Purus system.

8. **Tables 5-1 thru 5-5:**

Comment: The estimated costs for the selected alternatives were revised, based upon data reanalysis since the Feasibility Study was completed. Similar changes should have been made to the cost of other alternatives. Why weren't these costs revised?

Response: The costs for SVE with Resin Adsorption were revised using actual operating cost data determined from the treatability study. These data were specific to resin adsorption only, resulting in no change to the estimate for SVE with catalytic oxidation. The costs for offsite stabilization were refined due to the economy of scale gained by combining this work with similar work being conducted under closure of the surface impoundments at Air Force Plant 44 (AFP 44).

9. **Page 5-3:**

Comment: Figure 5-1 does not indicate a loss of nitrogen, yet considerable nitrogen was consumed during the Purus field tests. If this loss occurred during cycling from desorption to adsorption, then please show the anticipated nitrogen losses and related TCE carry off.

Response: Figure 5-1 will be revised to indicate that nitrogen and non-condensed VOC vapors are returned to the process inlet line where the VOCs are exposed to the adsorbing bed. The nitrogen passes through and is released with air to the atmosphere.

10. **Page 5-3:**

Comment: Figure 5-2 shows screening offsite, while Page 5-5 of the overall Engineering Evaluation/Cost Analysis (EE/CA) states that screening and homogenization are pretreatment activities that occur onsite. Which protocol is applicable, and what precautions for health and safety will be taken?

Response: Health and safety precautions are described in the work plan and health and safety plan. All pretreatment activities such as screening and homogenization will be conducted at the disposal facility, and will be performed under the health and safety plan for that facility. The second and third sentences of the second paragraph on page 5-5 of the overall EE/CA will be changed to "If necessary, pretreatment of excavated contaminated soils will be conducted offsite. Pretreatment will include screening size reduction, and homogenization of the soil."

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RESPONSE TO USEPA COMMENTS

ON PROPOSED PLAN FOR SOIL CLEANUP (JULY 1995)

GENERAL COMMENTS:

1. *Comment:* U.S. Environmental Protection Agency (USEPA) strongly recommends adding either granular activated carbon (GAC) or a second set of resin beds in series to the two parallel resin beds of a Purus treatment system. This second tier of vapor treatment would significantly reduce VOC levels in the off-gas and practically eliminate the potential of an unwanted air release.

   Response: Results from treatability studies conducted at AFP 44 in 1995 indicate this extra safeguard is not necessary (Site 2 and Site 3 Purus Demonstration Letter Report, September 1995). Pima County air emission regulations (Pima County Code 17.20.090 (E)) require 85 percent removal of contaminants prior to venting the off gas to the atmosphere. Sampling during the startup period will be performed to optimize the adsorption/desorption process. A VOC detector permanently installed on the effluent line will shut down the system in the event effluent VOC concentrations that would result in an exceedance of Pima County air emission standards are encountered. The Purus system parameters will be set to ensure emissions are within this standard.

2. *Comment:* USEPA has published guidance on the preparation of Superfund decision documents (PB91-921265). These guidance documents are available from the National Technical Information Service. USEPA strongly recommends using these documents as a resource in preparation of the upcoming ROD for the AFP 44 Site.

   Response: This guidance will be considered during development of the ROD.

SPECIFIC COMMENTS ON THE PROPOSED PLAN

1. **Page 2-5, Paragraph 4:**

   Comment: Please use consistent soil gas units throughout the document; USEPA prefers micrograms per liter.

   Response: The units expressing VOC concentrations will be converted from milligrams per cubic meter to micrograms per liter (μg/L)..

2. **Section 3 General Comment:**

   Comment: Please use risk terminology consistent with USEPA guidance and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)

regarding such terms as baseline risk assessment, reasonable maximum exposure scenario, acceptable and unacceptable risk. USEPA again suggests including in this section a table summarizing the results of the baseline risk assessment for the Sites.

Response: Some terminology will be changed as recommended. Summary tables (similar to Tables 4-1 and 4-2 in the August 1993 Risk Assessment) will be added to the Proposed Plan.

3. **Page 3-1, Paragraph 4:**

Comment: Pursuant to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Section 300.430 (e) (2) (I) (A) (2)) the 10^{-6} risk level shall be used as the point of departure in the absence of applicable or relevant and appropriate requirements (ARARs). Therefore any cleanup levels not established at the 10^{-6} risk level must be explained and justified.

Response: The following statement is from 40 CFR 300.430(e)(2)(I)(A)(2) of the NCP:

> "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} to 10^{-6} using information on the relationship between dose and response. The 10^{-6} risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure."

As is stated, the 10^{-6} risk level should be used as a point of departure for determining remediation goals for alternatives in the absence of ARARs. But, acceptable exposure levels can be considered within the risk range of 10^{-4} to 10^{-6}. For the AFP 44 approved risk assessment, the regulators as risk managers accepted and approved exposure levels which fall within the risk range of 10^{-4} to 10^{-6} as acceptable. Consequently, exposure levels which cause risk exceeding the benchmark of 10^{-4} would require remedial alternatives.

4. **Section 3.3:**

Comment: This section acknowledges the need to remediate soils at the Sites in order to prevent further migration of contaminants to ground water thereby assisting in the exceedence of maximum contaminant levels (MCLs). USEPA again suggests adding a section discussing the development of residual soil cleanup levels for the protection of ground-water quality. As a starting point, this section could include the following cleanup standard for subsurface soils:

"Each contaminant shall be removed from target area soils until an Allowable Residual Contaminant Concentration (ARCCP) is achieved. An ARCCP is any CCP that will not cause or contribute to ground-water (first saturated unit) contamination in excess of site ground-water cleanup levels."

This standard would supplement (not replace) numeric soil standards adopted for this site. All key words (such as target area, ground-water, etc.) in the above soil cleanup standard discussion would need to be defined.

Response: A similar comment on the Draft Final Feasibility Study was resolved by adding the following statement, which will be added to Section 3.3:

"Subsurface soil remediation will continue until no adverse impact to groundwater in excess of risk-based clean up levels is achieved. Risk-based clean up levels will be established which are protective of human health and the environment, and consider migration of soil contaminants to groundwater. A method to demonstrate that this has been achieved will be established through the joint efforts of the U.S. Air Force, USEPA Region IX, and the ADEQ."

5. **Page 5-2, Table 5-1:**

Comment: There is no explanation in the text of this section on how these four evaluation criteria were developed and used, particularly in light of the fact that USEPA uses a nine criteria evaluation. Please include some explanatory language in the text, or use the nine criteria evaluation.

Response: These tables summarize the results of the detailed evaluations described in the Feasibility Study. The Feasibility Study considered both the nine USEPA evaluation criteria and the seven evaluation Air Force Center for Environmental Excellence (AFCEE) criteria. Readers are referred to the Feasibility Study for a detailed discussion of the comparative analysis. The first paragraph of Section 5.0 will be expanded to reference the USEPA and AFCEE evaluation criteria presented in Section 4.0, and an added statement that the tables represent a synopsis of the USEPA and Air Force criteria.

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RESPONSE TO UCAB COMMENTS

ON PROPOSED PLAN FOR SOIL CLEANUP (JULY 1995)

1, 2. *Comment:* Final levels of (soil) cleanup standards should be lower than the Maximum Contaminant Levels, if the technology is capable of achieving the lower levels.

2. *Comment:* Because measurements of the groundwater cleanliness will be the determining indicator for a successful soil cleanup, assurances must be placed in the ROD to equate soil cleanup levels to this groundwater measurement. These should be based on a change to residential use with children involved.

Response: The Arizona Health-Based Guidance Levels are the cleanup standards for Sites 4, 5, and Site 6 Hotspots. ADEQ and Arizona Department of Health Services (ADHS) considered the migration pathway to protect groundwater in approving the soil cleanup standards for metals at AFP 44. No cleanup standards exist for the deep soil. The Air Force, USEPA, and ADEQ will work together to determine the standard for cleanup of Sites 1, 2, and 3. Computer models or other means may be used to determine the point at which groundwater is no longer adversely impacted by soil contamination. Once this is determined, the standard will be formally established in the ROD. Groundwater which does not exceed the MCLs is protective of resident children.

3. *Comment:* Individual (air) emissions must be identified in terms of pounds per day. Total of all emissions must be stated in pounds per day and this must be agreeable to the citizens of Tucson. Use of Pima County DEQ to monitor air quality more closely (ex. unannounced inspections with a qualified citizen). Possible grant from USEPA to fund this.

Response: Pima County requires that air pollutant sources which emit more than 2.4 pounds of VOCs per day must be equipped with a control device to remove at least 85% of the VOCs. The Purus resin adsorption system is capable of removing up to 99% of the VOCs. A VOC detector will be permanently installed which will shut down the system if VOC emissions approach the 85% limit. The actual pounds per day emitted will depend on the concentrations of extracted vapors and the flow rate. Adjusting the system to a lower flow rate will reduce the number of pounds emitted, but will result in a longer time to remediate the soils. Pima County DEQ has the authority to make unannounced inspections.

4a. *Comment:* Soil vapor extraction technology requires a draw-down at the capillary fringe which may disturb the soil vapor levels over time.

Response: Water levels are already being drawn down by operation of the groundwater treatment plant. This exposes contamination in the capillary fringe to the SVE system and enhances removal of contaminants.

4b,15. *Comment:* A longer term monitoring program is essential for the protection of the citizens.

Comment: Is the 1 year period to verify cleanup goals adequate?

Response: The Proposed Plan includes monitoring soil gas concentrations for a year after completion of the cleanup. If soil vapor concentrations were to rebound after shutting down the system, it would typically occur within a few months. Increasing this time to a year is much more conservative and adequately protective of human health. Monitoring requirements may be formally established in the ROD.

4c. *Comment:* A plan is desirable detailing how citizens will be informed of activities in the future including current reports and unannounced tests.

Response: The AFP 44 Community Relations Plan describes the methods used by the Air Force to keep the public informed of cleanup activities. A copy is available in the Superfund Library.

4d. *Comment:* The superfund library must be funded for the life of the project and the library address must become the official Unified Community Advisory Board (UCAB) address.

Response: The Superfund Library is funded by the USEPA, which is subject to adequate funding by the U.S. Congress.

5. *Comment:* The concerns of the Neighboring Nations must be addressed. Suggest Federal Agencies authorize funds for the Tohono O'odham Nation for an independent consultant to help with their questions and concerns.

Response: AFP 44 environmental managers have been meeting with the Tohono O'odham Nation for the past several years. The most recent meeting was held on October 17, 1995 with the San Xavier District to make sure that their concerns are being considered during cleanup decisions. A representative of the Nation is a member of the UCAB for the Superfund Site and another position on the Board has been offered to the San Xavier District. The Tohono O'odham Nation may wish to submit a request for a Technical Assistance Grant for consulting services to the USEPA, Region IX. Information on how to do this is available at the TCE Superfund Library at the El Pueblo Neighborhood Center.

6. *Comment:* The ROD should include assurances in the event the property in question is transferred or sold.

Response: On July 21, 1994, the Air Force signed a lease with Hughes Missile Systems Company for a 10-year period with provision for two 10-year extensions by mutual agreement of the parties. The rent proceeds from the lease are used to fund capital maintenance of the property as payment in kind, as provided in 10 USC 2667 (b)(4) and (b)(5). During the lease period, all Air Force environmental restoration efforts required by RCRA and CERCLA will be completed. At that time, the Air Force will seek to dispose of AFP 44 in accordance with applicable statutes, which may require notification or deed restrictions.

7, 8. *Comment:* While the agencies and involved parties are the authorities on the requirements regulating the transportation of hazardous waste materials during a cleanup, it is essential that this plan be reviewed with the community.

Comment: (Emergency response plans) must be reviewed prior to the start of work.

Response: The plan for the transportation of the hazardous materials from AFP 44 to a disposal site has been discussed with the public at the Public Meeting in July of 1995 and is laid out in the EE/CAs for the individual sites. Transport of hazardous waste is heavily regulated by the Department of Transportation and AFP 44 will follow all of these regulations carefully. Emergency Response Teams are under the control of local agencies and are on call 24 hours a day in every community. They are trained to deal with any accident that may occur. The transportation of the soils from Sites 4 and 5 has been discussed in the quarterly Progress Reports sent by AFP 44 to almost 3,000 area citizens. AFP 44 will be glad to give a more detailed presentation on this matter to the UCAB at any time. Please see the response to Question #1 from the Response Cards and to Question Number #1 from the Sunnyside School District for a detailed description of the health and safety measures that are in place.

9. *Comment:* What additional steps will be taken in the event the Soil Vapor Extraction and removal of contaminated soils does not stop the ongoing contamination of the groundwater? What are the plans if it becomes evident that dense nonaqueous phase liquid (DNAPL) is a problem on AFP 44? How will this affect the remediation plans?

Response: The treatability study demonstrated the ability of the SVE system to effectively remove VOCs from contaminated soils. In the event contaminant removal is not effective and an alternative remedial method is considered, regulatory review and a public comment period would be required. Based on existing data, there is no DNAPL in the groundwater at AFP 44. The 1986 ROD outlines the groundwater remediation. If the presence of DNAPL was suspected, a response action may be taken under the 1986 ROD. Possible actions could include adjustments to the

groundwater reclamation system and installation of additional groundwater extraction wells.

10. *Comment:* What means of transportation will be used to move excavated material from site.

Response: Excavated materials from Sites 4, 5, and Site 6 Hotspots will be hauled primarily by railroad to Henderson, Colorado, where they will be transferred to trucks for ultimate disposal in the Rollins Highway 36 landfill in Colorado. Some materials may be hauled from AFP 44 by truck.

11. *Comment:* Is there an Emergency Response Plan required for accidental spills during transport?

Response: Once materials are loaded and removed from AFP 44, the hauler's emergency response plan will be in effect. All transporters and disposal facilities have extensive emergency response plans and are ready to implement immediate action in the event of an emergency. CHEMTREC, a company that provides information to emergency response personnel about appropriate response actions in an emergency, has been contracted by AFP 44 to provide accurate and timely information regarding the waste material transported by rail.

12. *Comment:* Were the concentrations of soil and groundwater samples consistent with depth of soil gas concentrations?

Response: Soil gas samples collected from shallow depths and from the SVE treatability study generally indicated much higher concentrations than the concentration of contaminants in soil samples. No direct correlation between soil gas and groundwater concentrations can be made with the existing data.

13. *Comment:* Is the soil cover at Site 2 adequate to prevent infiltration? Explain the reasoning.

Response: All but one of the proposed extraction wells at Site 2 are sufficiently deep that vertical short-circuiting of air from the surface is unlikely. This well, and the shallow Site 1 wells require a liner on the ground surface to prevent vertical infiltration.

14. *Comment:* Will Pima County DEQ be actively involved in reviewing the quality data for emissions from the individual sites?

Response: This remedial action must meet the substantive requirements of the Pima County air emissions standards. Air emissions data will be maintained on site and is subject to review by Pima County DEQ, which has the authority to make unannounced inspections. The USEPA and ADEQ also have authority to inspect and review data.

15. *Comment:* Is the 1 year period to verify cleanup goals adequate?
Response: See comment 4b above.

16. *Comment:* How can we be sure that the intent of our statements from the UCAB are understood and implemented into the ROD?
Response: All comments received are addressed in this Responsiveness Summary. If the public feels the response to the comment is not appropriate, individuals or the UCAB can contact the Air Force Remedial Project Manager.

17. *Comment:* Have the USEPA and ADEQ formally accepted the No Further Action Reports at the AFP 44?
Response: Draft versions of the No Further Action reports for Sites 7, 8, 9, and 15 were submitted to the USEPA and ADEQ for their review. Approval of these reports is anticipated following incorporation of their review comments. The Site 6 No Further Action report has been put on hold pending removal of the Site 6 hotspots.

18. *Comment:* Have any tests been made for radiation at AFP 44? What were the results? If AFP 44 has never been used for storage of radioactive materials can independent testing be performed to assure the citizens of this? What steps can be taken to inform the community of a status for concerns now or in the future?
Response: To date, no radioactive materials have been used as a component of a missile at AFP 44. The explosive storage bunkers located within the Final Assembly and Check Out area store conventional explosives only.

Some soils and groundwater in the Tucson Basin contain naturally occurring radioactive nuclides. Radioactive nuclide tests in groundwater were conducted as part of the normal characterization of the RCRA groundwater monitoring wells. One perched zone well (Well No. S-10) showed the presence of radioactive nuclides exceeding drinking water standards one time in August 1987. However, that well was almost completely dry and the only samples that could be obtained were murky (muddy). This well remained dry for several years. It became wet again in 1994 as a result of AFP 44 Groundwater Remediation efforts. Water samples were immediately obtained and re-tested for radioactive nuclides and results were below drinking water standards. An additional sample has recently been taken and submitted for radioactive nuclide analyses. Results have not been received to date.

AFP 44 currently has a license from the Arizona Radiation Regulatory Agency which permits them to use very small quantities (microcurie to millicurie range) of radioactive sources in areas as equipment calibration and test positions for use in checking electronic circuitry. The calibration equipment and test positions use Krypton and Tritium gases. The license

requires AFP 44 to properly store, conduct leak tests, and perform inventories of all radioactive sources identified on the license. Storage of minimal quantities of radioactive sealed sources (microcurie range) are currently being conducted onsite (Building 815 - Drum Storage Area) because of the unavailability of approved waste disposal sites across the country. Some of these items will be returned to the vendor for reuse. This storage is being conducted in accordance with AFP 44's license.

19. *Comment:* The Air Force has indicated its intent to sell AFP 44. If land use changes to residential how can the community be assured that the No Further Action sites will be cleaned up?

Response: These sites are being recommended for No Further Action because the risk assessment concluded that the risk to onsite workers was well within the standard for acceptable risk. If the property is sold, notification or deed restrictions may be a condition of the property transfer to ensure the land use remains as an industrial area.

20. *Comment:* Will the wells at AFP 44 ever be used to deliver water to the community?

Response: The Air Force is not aware of any such plans. Future decisions on municipal water wells located off the AFP 44 property will be made by the City of Tucson or other authorities.

21. *Comment:* Who has confirmed the capacity of the out of state sites to handle the hazardous waste from the soil cleanup? How has the capacity of the receiving facility been determined?

Response: The State of Colorado regulatory agencies have permitted the disposal facility to accept the types and volumes of hazardous waste sent there.

22. *Comment:* How will the final soils clean up be tied to the ongoing water cleanup? The ROD seems to be the important link. What agency is responsible for ensuring that the ROD is written to reflect the community concerns?

Response: The soils cleanup will remove the ongoing source of groundwater contamination at Sites 1, 2, and 3. Final cleanup levels and the method of shutting down the remedial systems will be established in the ROD. The Air Force, USEPA, and ADEQ share responsibility to ensure the community's concerns are addressed.

GENERAL COMMENTS (attached to UCAB Comments)

23. *Comment:* The remedial action objectives should be stated in the plan.

Response: The second sentence on page ES-1 and the second sentence on page 1-1 will be changed to "The remedial action objectives addressed in this Proposed Plan are cleanup of five sites to address potential risks to human health and the environment, which includes removing continuing sources of groundwater contamination."

24. *Comment:* Please define "resident children." More importantly, has there been any analysis or discussion of why a future residential scenario was not used? How would the remediation strategy change if a future residential scenario were assumed?

Response: Because the Pima County zoning plans indicate the Tohono O'odham land as being residential, the risk assessment considered the health effects on those resident children playing in the drainage ditch downstream of AFP 44. The risk assessment assumed no future changes to the AFP 44 site--it would remain as an industrial facility. The assessment included calculations for potential effects of contaminants on current workers and current offsite resident children assuming no cleanup was performed, and the potential effects on future excavation workers during site cleanup. Other off-site residential receptors were not considered because modeling indicated that workers on AFP 44 would receive greater exposures (maximum impacted receptors). Should the property be sold, a deed restriction may be included to ensure future land use is limited to industrial facilities. (See response to UCAB Comment Number 6.)

25. *Comment:* The plan nor the EE/CAs state the soil cleanup standards for organic compounds.

Response: The Arizona Health-Based Guidance Levels are the cleanup standards for Sites 4, 5, and Site 6 Hotspots. ADEQ and ADHS considered the migration pathway to protect groundwater in approving the soil cleanup standards for metals at AFP 44. No cleanup standards exist for the deep soil. The Air Force, USEPA, and ADEQ will work together to determine the standard for cleanup of Sites 1, 2, and 3. Computer models or other means may be used to determine the point at which groundwater is no longer adversely impacted by soil contamination. Once this is determined, the standard will be formally established in the ROD. Groundwater which does not exceed the MCLs is protective of resident children.

26a. *Comment:* What is the effectiveness of the (Purus) system in capturing all contaminants found at each site?

Response: The Purus PADRE™ system demonstrated at AFP 44 removed more than 99% of the total VOCs based on gas chromatographic analyses of vapor influent and effluent.

26b. *Comment:* What are the anticipated releases to the air (in pounds per hour) from each installation?

Response: Pima County requires that air pollutant sources which emit more than 2.4 pounds of VOCs per day must be equipped with a control device to remove at least 85% of the VOCs. The Purus resin adsorption system is capable of removing up to 99% of the VOCs. A VOC detector will be permanently installed which will shut down the system if VOC emissions approach the 85% limit. The actual pounds per day emitted will depend on

the concentrations of extracted vapors and the flow rate. Adjusting the system to a lower flow rate will reduce the number of pounds emitted, but will result in a longer time to remediate the soils. Pima County DEQ has the authority to make unannounced inspections.

26c. *Comment:* There is no discussion of chemicals which may break through the resin bed when the system is first starting up (this was identified to me when I saw the demonstration facility in May, 1995).

Response: During initial startup of the Purus PADRE™ system, a break through test will be performed to determine the saturation level for the resin beds. The system's operating parameters (flow rates and cycle times) will then be adjusted to ensure the system is effectively removing contaminants. Furthermore, a VOC detector will be permanently installed on the effluent line which will shut down the system in the event of high VOC emissions. During the demonstration at AFP 44, no emissions in excess of Pima County air emission limits occurred.

26d. *Comment:* The Purus system reportedly does not perform well in conditions in which water vapors are present. Please discuss this fact, and identify how you will design the system to prevent water vapor from coming into contact with the resin beds.

Response: Water vapors are not a concern, but water droplets within the resin beds could lead to corrosion of the steel pressure vessel which holds the resin. A water-vapor separator will be used to remove any water droplets from the vapor stream. The piping between the water-vapor separator and the resin beds will be insulated to help prevent temperature fluctuations which could allow water to condense in the pipes. A lower temperature will be used in the desorption cycle to reduce hydrochloric acid formation, and metal test strips inside the resin beds will be used to monitor corrosion.

27. *Comment:* (Vapor-phase GAC) along with SVE/catalytic oxidation should be compared with the Purus PADRE™ system for cost and effectiveness in controlling air emissions.

Response: GAC was considered in the Feasibility Study, but was screened out due to the extremely high carbon usage rate experienced in the 1993 treatability study. SVE with catalytic oxidation was evaluated in the Feasibility Study, but was not selected because it would constitute a flame source within the Final Assembly and Checkout (FACO) explosives storage area.

28. *Comment:* ...Wouldn't it be prudent to begin with a few (Purus) systems at first to make sure they work under field conditions?

Response: The 1995 treatability study demonstrated the effectiveness of the Purus system by removing over 99% of the VOCs from the vapor stream at Sites 2 and 3. Installation of the remedial systems will be done in phases, such

that some systems will be installed and operating before the remainder of the systems are delivered.

29. *Comment:* What contingency would be implemented should the Purus systems fail to operate as specified?

Response: A contingent alternative is not included in the Proposed Plan. If an alternative technology is required the Air Force would make this selection in cooperation with the public and regulatory agencies.

30. *Comment:* How (do) you anticipate monitoring performance of the Purus system, and what would trigger a shutdown of the system?

Response: A VOC detector permanently installed on the effluent line would shut down the system if emissions approach allowable limits established by Pima County. Periodic sampling of the vapor stream will provide data for evaluating the system's operations and removal efficiency. Any changes in the flow rates and volume of condensate produced would give the operator an indication of fluctuations in the vapor stream or system performance. Any other faults within the computer-controlled system would immediately shut down the system, including the blower.

31. *Comment:* There is no analysis in the plan or in the EE/CAs of why soil stabilization was selected as opposed to soil washing for Sites 4 and 5. Please provide a detailed explanation.

Response: Section 4.0 of the Overall EE/CA presents an analysis of alternatives (including soil washing) based on USEPA and AFCEE criteria. The remedial technology selection for Sites 4, 5, and Site 6 Hotspots was intended to match that method selected for RCRA closure of the surface impoundments at AFP 44, thereby resulting in an economy of scale. On site soil washing was not selected due to capital costs and concerns over the potential exposure to harsh chemicals used in the soil washing process.

32. *Comment:* The Air Force should develop a program to monitor the development and migration of vinyl chloride at those sites where TCE and petroleum products are found together.

Response: Vinyl chloride, which is a potential break down product of TCE, was not detected in any of the soil vapor samples collected during the Feasibility Study. Periodic sampling of soil vapors at Sites 1, 2, and 3 will include analysis for vinyl chloride.

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RESPONSE TO COMMENTS FROM THE SAN XAVIER DISTRICT OF THE TOHONO O'ODHAM NATION

ON PROPOSED PLAN FOR SOIL CLEANUP (JULY 1995)

1. *Comment:* If the Air Force begins remediation as stated in the Proposed Plan they will do so lacking some degree of information (such as cleanup standards) and some degree of oversight (from the regulatory agencies and the public) which would normally be reflected in the ROD.

   Response: SVE will be used to cleanup TCE contaminated soil. The cleanup of metals contaminated soil will be by excavation and offsite disposal at a RCRA licensed landfill. The proposed cleanup standards are the same as those already approved by ADEQ for the surface impoundment closure project. Achieving the cleanup standard for TCE is primarily a function of how long the SVE systems operate, so an early start on cleanup will not be adversely affected by the outcome of the standards established in the ROD. The USEPA and ADEQ are both actively providing project review and oversight to the extent that work will not begin until their approval is received. The Proposed Plan and EE/CAs were all available for public review, a public hearing was held, and this responsiveness summary is the result of all comments received.

2. *Comment:* The Draft Feasibility Study warranted No Further Action for Site 6, but the Proposed Plan includes remediation for portions of Site 6. We request that more information be provided on this decision to remediate Site 6 hotspots.

   Response: Sites 4 and 6 overlap in some areas. The Site 6 hotspots which will be cleaned up are actually portions of Site 4 and exhibit metals contamination found elsewhere in Site 4. ADEQ agreed to no further action at Site 6 provided the hotspots were cleaned up. The No Further Action report for Site 6 is on hold, and will be completed after the hotspots removal. The removal will provide verification that these hotspots have been fully investigated and remediated.

3. *Comment:* The District remains concerned with the failure of the Air Force to properly determine if any activities at Plant 44 have contaminated soils on District land... The San Xavier District's Land Use Plan was never consulted when analyzing health risks.

Response: The investigation of Site 6 included extensive soil sampling along the drainage channels at AFP 44. These channels merged into a single wash at the northwest corner of the facility, which then exited westward through a culvert under the Old Nogales Highway. The wash resumes on the west side of the highway, and crosses District land. Soil samples were taken along the wash bottom inside the AFP 44 boundary, and across the highway on privately owned land immediately adjoining District land. The surface and subsurface soil samples indicated no significant contamination was present in the wash. The risk assessment considered the Tohono O'odham land as being a residential area as identified in the Pima County zoning plans. A residential land use assumption would result in the most stringent, conservative conclusions. The risk assessment calculated the potential exposure of resident children temporarily playing in the drainage channel located to the west of Old Nogales highway. Standard risk assessment assumptions were made for residential children exposed through incidental ingestion of surface water and dermal adsorption of contaminants in surface soils. The risk assessment concluded that no significant risk was present at Site 6. In 1994, the Tohono O'odham Nation and San Xavier District representatives, Bureau of Indian Affairs, the USEPA, Hughes and Air Force all agreed that USEPA would conduct sampling in the wash on district lands. The USEPA was to prepare a sampling plan acceptable to the San Xavier District and Tohono O'odham Nation.

RESPONSE TO SUNNYSIDE UNIFIED SCHOOL DISTRICT NO. 12 COMMENTS

ON PROPOSED PLAN FOR SOIL CLEANUP (JULY 1995)

1. *Comment:* ...All precautionary safety measures (should) be taken in moving hazardous waste via rail to a disposal facility...

Response: The cleanup at Site 4 will be accomplished as part of the ongoing Pond Closure project at AFP 44. This involves excavating and shipping approximately 63,000 tons of contaminated soils. These soils are contaminated with metals left from the industrial wastewaters that were once put into the holding ponds in this area. The soil will be excavated, placed in railroad gondola cars, and shipped via Southern Pacific Railroad to a disposal site in Colorado. Many safety measures are taken during this process to protect both the community and the workers at AFP 44.

During excavation and loading, the soils are kept moist at all times to prevent any dust from entering the air. Pima County DEQ does periodic inspections, as does the Arizona DEQ. The soils are placed in the gondola cars through a chute that has sides on it, as well as water misters, to control dust.

The gondola cars have been reconditioned and inspected for safety and are lined with a heavy liner that covers the soil once it is loaded. Then the entire gondola car is covered with a heavy tarp. The cars are labeled as hazardous waste and are tracked 24 hours a day by a computer system that links the railroad and the disposal facility in Colorado.

The Department of Transportation heavily regulates the transport of hazardous waste and all procedures are being carefully followed. The waste is also registered with CHEMTREC, a national registry that has a 24-hour hotline available to give information to emergency crews in case of a problem. Each local area through which the waste will pass has an emergency response team on call, as does the railroad.

Every effort has been made to ensure safe transport of these soils to the disposal facility. There is no exposure to residents from this transport. Should an accident occur, the soils are doubly contained in wraps and tarps. Even if the tarp or wrap should rupture in an accident, the soil is shipped damp and would create a minimum of dust. There is no liquid or gas to

escape. Any spilled dirt can easily be recontainerized if an accident occurred.

On October 17, 1995, a presentation was given to the Sunnyside Unified School District by AFP 44 environmental managers on the transport of soils. Those present were invited to tour the pond closure and loading area at their convenience to view the safety procedures first hand.

2. *Comment:* The burden of cost should be shared by the responsible parties and the U.S. Department of Defense (DOD).

Response: This project is being initially funded by the DOD. Liability of potentially responsible parties may be established at a later date.

RESPONSE TO COMMENTS AT THE 18 JULY 1995 PUBLIC HEARING

ON PROPOSED PLAN FOR SOIL CLEANUP (JULY 1995)

1. *Comment:* What's the average depth of those (SVE) wells?
   Response: The average drilled depth for SVE wells will be 40 feet in Site 1, 130 feet in Site 2, and 110 feet in Site 3.

2, 5, 11

Comment: To what degree will the contaminated area be cleaned related to parts per billion? In other words, when you have accomplished your major goal for cleanup, how many parts per billion of TCE will remain in that area?

Comment: How do you determine (when the site is sufficiently clean) with no measure in place as to what is safe?

Comment: I am concerned that (the cleanup level) to prevent further contamination in the water table is not known.

Response: There is no numerical regulatory standard for cleaning up deep soils for volatile organic compounds. For the metals, we do have standards. The State of Arizona has standards for surface soils, and there are federal standards for groundwater, but none exist for the deep soils. The SVE system will mitigate the contamination in the deep soils that is migrating down to the groundwater. The risk assessment or perhaps other models will be used to determine if there is a continued risk to human health and the environment. The final cleanup standard and the process to determine when cleanup is complete must be established in the ROD and will be protective of human health and the environment.

3. *Comment:* Will you allow some statement or provision to state that if these methods do not remove as much of the volatiles as you think should be removed, that you will alter the plan so as to do so.
   Response: The Air Force made a commitment that if the SVE process does not meet our cleanup standards, then we will look at other technologies and either supplement or replace it.

4. *Comment:* What happens if the Superfund runs out of money?
   Response: The Air Force does not use Superfund money to clean up historical hazardous waste sites at facilities it owns. It uses the Defense Environmental Restoration Account, which comes directly out of the DOD budget.

5. *Comment:* How do you determine (when the site is sufficiently clean) with no measure in place as to what is safe?

Response: See comment 2 above.

6. *Comment:* (What) modifications to the (Purus) systems (will be made to make it) appropriate to the site being cleaned up?

Response: The types and concentrations of contaminants is slightly different at each of the three sites. We will provide the Purus vendor with the site conditions and contaminant levels, and they make a recommendation as to the type resin we use.

7. *Comment:* How safe are the vapors going out into the air? How safe is the storage and transport of the tanks of waste?

Response: The Purus system works at almost 99% efficiency, removing the vast majority of TCE out of the vapor stream. What is discharged to the atmosphere is not 100% pure, but it's pretty close. Drums or tanks for collecting the waste will be stored in a secondary containment system to capture any spilled fluids. Transport of the wastes will be conducted in accordance with Department of Transportation regulations.

8. *Comment:* Where is the disposal facility (for the TCE wastes)?

Response: Different facilities are available, including but not limited to, California or Utah. The shipments are bulked together, then run through an incineration process at the offsite disposal facility which destroys the TCE and leaves non-hazardous residuals.

9. *Comment:* Have (the regulators) signed off as to the vapors (being released) into the air? (You have not signed off on transport of wastes.) They can't start until you all sign off?

Response: Air emissions have to meet Pima County requirements. Work will not start until the regulatory agencies approve the work plans, which provides detailed information on operation and safety issues.

10. *Comment:* Will the wastes be hauled out of state? Do you have unit costs for disposal?

Response: Yes, wastes will be disposed out of state. Soils with metals contamination will be excavated and shipped off site, costing approximately $152 a ton if it is shipped by rail. Recovered liquid VOCs will be disposed off-site at an estimated cost of $400 per drum.

11. *Comment:* I am concerned that (the cleanup level) to prevent further contamination in the water table is not known.

Response: See comment 2 above.

12. *Comment:* What is the projected cost of the cleanup?
Response: Our estimate for the SVE at three sites is $17 million. The excavation and disposal for Sites 4, 5, and 6 hotspots is approximately $4 million, totaling about $20 million. Add to that the $60 million expenditures for investigating, building, and operating the groundwater treatment plant, and the total will be over $80 million.

13. *Comment:* Anything the Air Force does or proposes to do has to meet the approval of the USEPA and the ADEQ; it this correct?
Response: Yes.

14. *Comment:* Does the no further action at Site 6 refer to all of it or just parts of it?
Response: The no further action at Site 6 refers to the drainage channels excluding the areas referred to as Site 6 hotspots. The hotspots will be addressed as part of the Site 4 removal action in conjunction with the ongoing surface impoundment closure efforts. Site 6 requires no further action because the drainage channels do not pose a risk. ADEQ agreed with the no further action finding so long as the hotspots were cleaned up. The Site 6 No Further Action report is on hold until completion of the hotspots cleanup.

15. *Comment:* Does Site 6 include the Three Hangars area?
Response: The Three Hangars area is part of the airport property. It is not part of AFP 44.

16. *Comment:* When will the public know the transportation routes for removal of soils?
Response: This information is in the EE/CAs which were released for public review and comment on 10 July 1995. The primary transportation mode will be by rail car through Dalhart, Texas, then north to outside of Denver. At that point they would be transferred to trucks, then hauled by truck to the disposal facility about 80 miles northeast of Denver, Colorado area.

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RESPONSE TO COMMENT CARDS

ON PROPOSED PLAN FOR SOIL CLEANUP (JULY 1995)

1. *Comment:* Just how minimized is the exposure to residents when the procedure (cleanup activities at Site 4) is happening?

Response: The cleanup at Site 4 will be accomplished as part of the ongoing Pond Closure project at AFP 44. This involves excavating and shipping approximately 63,000 tons of contaminated soils. These soils are contaminated with heavy metals left from the industrial wastewaters that were once put into the holding ponds in this area. The soil will be excavated, placed in railroad gondola cars, and shipped via Southern Pacific Railroad to a disposal site in Colorado. Many safety measures are taken during this process to protect both the community and the workers at AFP 44.

During excavation and loading, the soils are kept moist at all times to prevent any dust from entering the air. Pima County DEQ does periodic inspections, as does the Arizona DEQ. The soils are placed in the gondola cars through a chute that has sides on it, as well as water misters, to control dust.

The gondola cars have been reconditioned and inspected for safety and are lined with a heavy liner that covers the soil once it is loaded. Then the entire gondola car is covered with a heavy tarp. The cars are labeled as hazardous waste and are tracked 24 hours a day by a computer system that links the railroad and the disposal facility in Colorado.

The Department of Transportation heavily regulates the transport of hazardous waste and all procedures are being carefully followed. The waste is also registered with CHEMTREC, a national registry that has a 24-hour hotline available to give information to emergency crews in case of a problem. Each local area through which the waste will pass has an emergency response team on call, as does the railroad.

Every effort has been made to ensure safe transport of these soils to the disposal facility. There is no exposure to residents from this transport. Should an accident occur, the soils are doubly contained in wraps and tarps. Even if the tarp or wrap should rupture in an accident, the soil is shipped damp and would create a minimum of dust. There is no liquid or gas to escape. Any spilled dirt can easily be recontainerized if an accident occurred.

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RESPONSE TO USEPA COMMENTS

ON ENGINEERING EVALUATION/COST ANALYSIS SITES 1, 2, 3, 4, AND 5 (JULY 1995)

1. **General Comments:**

Comment: USEPA strongly recommends adding either GAC or a second set of resin beds in series to the two parallel resin beds of a Purus treatment system. This second tier of vapor treatment would significantly reduce VOC levels in the off-gas and practically eliminate the potential of an unwanted air release.

Response: Results from treatability studies conducted at AFP 44 in 1995 indicate this extra safeguard is not necessary (Site 2 and Site 3 Purus Demonstration Letter Report, September 1995). Pima County air emission regulations (Pima County Code 17.20.090 (E)) require 85 percent removal of contaminants prior to venting the off gas to the atmosphere. Sampling during the startup period will be performed to optimize the adsorption/desorption process. A VOC detector permanently installed on the effluent line will shut down the system in the event effluent VOC concentrations that would result in an exceedance of Pima County air emission standards, are encountered. The Purus system parameters will be sent to ensure emissions are within this standard.

2. *Comment:* USEPA has published guidance on the preparation of Superfund decision documents (PB91-921265). These guidance documents are available from the National Technical Information Service. USEPA strongly recommends using these documents as a resource in preparation of the upcoming ROD for the AFP 44 Site.

Response: This guidance will be considered during development of the ROD.

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RESPONSE TO ADEQ COMMENTS

ON ENGINEERING EVALUATION/COST ANALYSIS SITES 1, 2, 3, 4, AND 5 (JULY 1995)

Overall Engineering Evaluation/Cost Analysis (EE/CA)

1. **Page 2-5:**

   Comment: Should the heading of 2.1.3 be Geographic or Geologic to be consistent with the text.

   Response: The title will be changed to Installation Description, and the sentence changed to read "A brief overview of the environmental setting..." This is consistent with the corresponding section in the Remedial Investigation Report.

2. **Overall EE/CA, Page 2-7: See Comment 2 above** (Page 1-2 of Proposed Plan):

   Comment: Correct the apparent typo in the last sentence of the Public Hearing paragraph. Also, review all documents for editorial correctness. Neither Kitt Peak nor Mt. Hopkins is in Tucson. If the U.S. Air Force has prepared these documents within an Quality Assurance/Quality Control (QA/QC) program, then accurate information concerning local interests must be supplied.

   Response: The fifth sentence of the third paragraph on page 1-2 of the proposed plan will be changed to "a transcript of the hearing...". The second sentence on page 2-7 of the Overall EE/CA will be rephrased to read "...made their home in the Tucson area." All documents are reviewed for editorial correctness.

3. **Overall EE/CA, Page 2-14:**

   Comment: The April/May 1995 groundwater pumpage data supplied by AFP 44 indicates a daily rate of 5.2 million gallons per day (mgd). Which amount is correct? That same report shows that well E-06 does not exist and wells E-23 and E-24 do exist.

   Response: The pumping rate and wells in use will be updated using the latest information obtained from Hughes Missile Systems Company: "In July 1995, 165.7 million gallons of groundwater was treated over 706 hours, resulting in an average daily treatment rate of approximately 5.6 mgd. In July 1995 the system consisted of 20 extraction wells in the upper aquifer (E-01 through E-05, E-07, E-08, E-10, E-12 through E-21, E-23, and E-24) and 4 extraction wells in the lower aquifer (EL-01 through EL-04)."

SITE 2 EE/CA COMMENTS

1. **Page 2-1:**

Comment: How does the 7000 gallons per week for 11 years relate to the material in the ground?

Response: This information summarizes past waste disposal practices. As explained on Page 2-1, the flammable liquids were burned. The amount of material entering the ground is unknown.

2. **Page 2-3:**

Comment: Is 1,12-trichloro a typo? Also, please provide the data source to substantiate TCE concentrations of 1,100,000 milligrams per cubic meter (mg/m^3).

Response: The first name on page 2-3 will be changed to 1,1,2-trichloro-1,2,2-trifluoroethane. An influent vapor sample analyzed using Method TO-14 during the 1993 SVE treatability study at Site 2 resulted in a concentration of 1,100,000 mg/m^3 (Feasibility Study Report, Table 4-20).

3. **Page 2-10:**

Comment: Was nonaqueous phase liquid (NAPL) removed from the wells prior to SVE? If NAPL were present, the data could be skewed. Was there a subsequent confirmation of the absence or presence of NAPL in the SVE wells?

Response: An interface probe was used to check for NAPL approximately 2 months after completing the Purus/SVE treatability study at Site 2. NAPL was not detected.

4. **Page 3-1:**

Comment: Why is the spill mass unknown, when it was described in the previous chapter? Also, how does the 250,222 pounds relate to the 626 drums per year for seven years shown in Table 5-1 (Approx. 3,000,000 lbs.)?

Response: No spill mass is estimated in Chapter 2; it describes past disposal practices. These practices included burning of flammable liquids. The amount of material entering the ground is unknown. The estimated spill mass of 113,500 kg (250,222 pounds) presented on Page 3-1 is a very rough estimate of the amount of material in the ground. This quantity of material would fill approximately 626 55-gallon drums. Table 5-1 shows the total number of drums over the lifetime of the project. It is anticipated that large amounts of VOCs will be recovered from Site 2 initially, and that the amount of VOCs removed will decrease over time as the site is cleaned up. For costing purposes, the number of drums in Table 5-1 will be changed to 90 drums annually. This is an average obtained by dividing 626 (the estimated total number of drums) by the estimated project duration (7 years).

5. **Page 5-1:**

Comment: Providing a number of wells (69) is inconsistent with the fourth sentence in that same paragraph. Is the number of wells predetermined? They should be based upon the field findings.

Response: The first sentence in Section 5.1.1 on page 5-1 will be changed to "This SVE alternative requires installation of an estimated 69 SVE piezometer nests."

6. *Comment:* Is the TCE disposal cost a typo? How does this relate to the spill mass estimate?

Response: The disposal cost will be recalculated based on the revised number of drums being generated as discussed in the response to ADEQ Comment 4.

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APPENDIX A

REFERENCES

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APPENDIX A

REFERENCES

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2. Tischler/Kocurek, Historic Waste Management Sites Potential Effects of Soil Contamination on Groundwater, July 1994.

3. USEPA, Tucson International Airport Area Superfund Site Record of Decision (ROD), September 1997.

4. EARTH TECH, No Further Action Report for Site 7, U.S. Air Force Plant 44, Tucson, Arizona, September 1994.

5. EARTH TECH, No Further Action Report for Site 8, U.S. Air Force Plant 44, Tucson, Arizona, September 1994.

6. EARTH TECH, No Further Action Report for Site 9, U.S. Air Force Plant 44, Tucson, Arizona, September 1994.

7. EARTH TECH, No Further Action Report for Site 15, U.S. Air Force Plant 44, Tucson, Arizona, September 1994.

8. U.S. Environmental Protection Agency, Record of Decision, Air Force Plant 44, 1986.

9. IT Corporation, Management Action Plan, Air Force Plant 44, December 1995.

10. Flood Insurance Rate Map prepared by the Federal Emergency Management Agency for Pima County, Arizona (unincorporated areas).

11. EARTH TECH, Remedial Investigation Report, U.S. Air Force Plant 44, Tucson, Arizona, January 1994.

12. EARTH TECH, Investigation of Geophysical Anomalies Report, U.S. Air Force Plant 44, Tucson, Arizona, September 1995.

13. The Earth Technology Corporation, Risk Assessment Report, Air Force Plant 44, Tucson, Arizona, August 1993.

14. EARTH TECH, Proposed Plan for Soil Cleanup, Air Force Plant 44, Tucson, Arizona, November 1995.

15. EARTH TECH, Engineering Evaluation/Cost Assessments (Overall), Air Force Plant 44, Tucson, Arizona, November 1995.

16. EARTH TECH, Engineering Evaluation/Cost Assessments (Site 1), Air Force Plant 44, Tucson, Arizona, November 1995.

17. EARTH TECH, Engineering Evaluation/Cost Assessments (Site 2), Air Force Plant 44, Tucson, Arizona, November 1995.

18. EARTH TECH, Engineering Evaluation/Cost Assessments (Site 3), Air Force Plant 44, Tucson, Arizona, November 1995.

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20. EARTH TECH, Engineering Evaluation/Cost Assessments (Site 5), Air Force Plant 44, Tucson, Arizona, November 1995.

21. EARTH TECH, Sites 4 and 5, and Site 6 Hotspots Non-time Critical Removal Action Work Plan, October 1995.

22. EARTH TECH, Record of Decision, Sites 1, 2, and 3, Air Force Plant 44, Tucson, Arizona, April 1997.

23. Holmes and Narver, Documentation of Removal Action at IRP Site 4 East, USAF Plant No. 44, Tucson, Arizona, October 1996.

24. EARTH TECH, No Further Action Report for Site 6, U.S. Air Force Plant 44, Tucson, Arizona, October 1995.

25. U.S. Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual Part B Development of Risk-based Preliminary Remediation Goals, December 1991.

26. Hargis & Associates, Inc., Draft Results of Shallow Soil Gas Survey, Installation Program Site 5 Former Sludge Drying Beds, U.S. Air Force Plant 44, Hughes Missile Systems Company, Tucson, Arizona, June 1997.

27. Holmes and Narver, Removal Action Completion Report, IRP Site 5, U.S. Air Force Plant No. 44, Tucson, Arizona, August 1997.

28. Earth Tech, Draft Supplemental Investigation Report for Activities West of IRP Site 5, Air Force Plant 44, Tucson, Arizona, April 1998.

29. Operation and Maintenance Manual for SVE Systems at IRP Sites 1, 2, and 3, Air Force Plant 44, Tucson, Arizona, January 1998.

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APPENDIX B

GROUNDWATER CONTAMINANT CONTOURS

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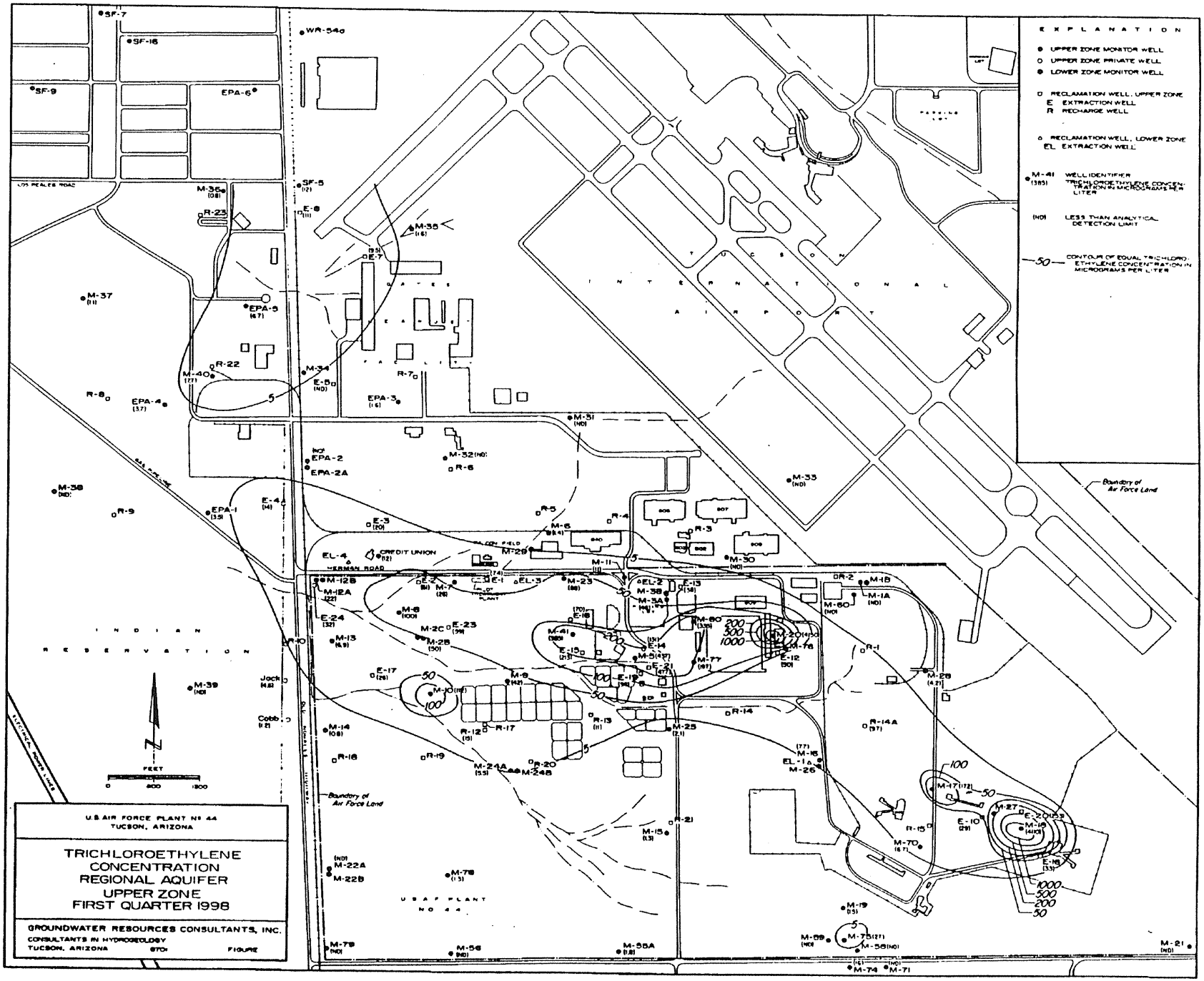
EXPLANATION
UPPER ZONE MONITOR WELL
UPPER ZONE PRIVATE WELL
LOWER ZONE MONITOR WELL
RECLAMATION WELL, UPPER ZONE
E EXTRACTION WELL
R RECHARGE WELL
RECLAMATION WELL, LOWER ZONE
EL EXTRACTION WELL
M-41 WELL IDENTIFIER
(385) TRICHLOROETHYLENE CONCENTRATION IN MICROGRAMS PER LITER
(ND) LESS THAN ANALYTICAL DETECTION LIMIT
50 CONTOUR OF EQUAL TRICHLOROETHYLENE CONCENTRATION IN MICROGRAMS PER LITER
INTERNATIONAL AIRPORT
INDIAN RESERVATION
Boundary of Air Force Land
CREDIT UNION
HERMAN ROAD
Los Reales Road
Valencia Road
Cobb
Jack
FEET
0 600 1200
U.S AIR FORCE PLANT Nº 44
TUCSON, ARIZONA
TRICHLOROETHYLENE CONCENTRATION REGIONAL AQUIFER UPPER ZONE FIRST QUARTER 1998
GROUNDWATER RESOURCES CONSULTANTS, INC.
CONSULTANTS IN HYDROGEOLOGY
TUCSON, ARIZONA
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