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60TH AIR MOBILITY WING (AMC)

11 SEP 1996

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SUBJECT: Final Feasibility Study for the North East West Industrial Operable Unit

1. Attached is the Final Feasibility Study (FS) for the North East West Industrial Operable Unit (NEWIOU) at Travis AFB. This document is provided for your information and records.
2. If you have any questions or would like additional information, please contact Dale Malsberger at (707) 424-7520.


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Final Feasibility Study for the North East West Industrial Operable Unit

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**FEASIBILITY STUDY
NORTH/EAST/WEST INDUSTRIAL OPERABLE UNIT
TRAVIS AIR FORCE BASE**

Final

**60th Air Mobility Wing
Travis Air Force Base, California**

Prepared by:

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
Btu	British Thermal Unit
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPEC	Chemicals of Potential Ecological Concern
CTV	Critical Toxicity Values
DAA	Detailed Analysis of Alternatives
DPDO	Defense Property Disposal Office
DTSC	Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EIOU	East Industrial Operable Unit
ERA	Ecological Risk Assessment
FFA	Federal Facility Agreement
FS	Feasibility Study
GAC	Granular Activated Carbon
HI	Hazard Index
HQ	Hazard Quotient

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

HRA	Health Risk Assessment
IRG	Interim Remediation Goal
IRP	Installation Restoration Program
ISA	Initial Screening of Alternatives
LDR	Land Disposal Restrictions
LNAPL	Light Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
μg/kg	Micrograms per Kilogram
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
μg/L	Micrograms per Liter
MW	Monitoring Well
NEWIOU	North/East/West Industrial Operable Unit
NFA	No Further Action
NOU	North Operable Unit
NPL	National Priority List
O&M	Operation & Maintenance
OPS	Oxidation Pond Sites
OSA	Oil Spill Area
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbons

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

PERG	Preliminary Ecological Remedial Goal
POTW	Publicly Owned Treatment Works
PP	Proposed Plan
ppbv	parts per billion volume
PCB	Polychlorinated Biphenyl
PRG	Preliminary Remediation Goal
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
RO	Reverse Osmosis
ROD	Record of Decision
RPM	Remedial Program Manager
SDWA	Safe Drinking Water Act
SSA	Solvent Spill Area
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
TARA	Tower Area Removal Action
TBD	To Be Determined
TCA	Trichloroethane
TCE	Trichloroethene

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

TDS	Total Dissolved Solid
TPH	Total Petroleum Hydrocarbon
TPH-E	TPH Extractable
TSD	Treatment, Storage, and Disposal
U.S. EPA	United States Environmental Protection Agency
UV-OX	Ultraviolet Oxidation
VOC	Volatile Organic Compound
WABOU	West, Annexes, and Basewide Operable Unit
WIOU	West Industrial Operable Unit

EXECUTIVE SUMMARY

Background

Remedial investigations (RIs) have been conducted for three of the OUs at Travis AFB (the North OU [NOU], East Industrial OU [EIOU], and West Industrial OU [WIOU]) (Figure ES-1). The three OUs were found to contain similar contaminants of concern (COC): solvents, metals, and fuels in soil, surface water, and groundwater, and polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) in soil. Within the three OUs, 20 sites are expected to require remediation (two from the NOU, 13 from the EIOU, and 5 in the WIOU). Due to the similarities between these twenty sites, their reporting requirements and schedules were combined and a new OU was formed: the North/East/West Industrial OU, or NEWIOU (pronounced "New I-O-U"). Figures ES-2 and ES-3 display these contaminated groundwater and soils sites within the NEWIOU, and Figure ES-4 displays the hydrologic boundaries.

The Feasibility Study Process

This feasibility study (FS) identifies, evaluates, and ranks cleanup methods (termed "remedial alternatives") for each contaminated environmental medium--soil, surface water, and groundwater--at the sites in the NEWIOU. Each groundwater

alternative includes some method of removing the contaminants, treatment, and discharge of treated water. The surface water alternatives include collecting contaminated water, treatment and discharge—or means of preventing contaminants from reaching the creeks. Soil alternatives generally involve either removal and disposal of soil, containing the contamination, or treating it in place. In addition, for all media, the effectiveness of no action and of institutional controls, such as access restrictions, have been evaluated.

The FS also designs a plan to integrate the soil-, surface water-, and groundwater-specific (i.e., "medium-specific") remedial alternatives into comprehensive "site-specific" alternatives. Doing so will reduce cost while increasing both effectiveness and the ease of implementing the alternative. However, the FS does not identify a preferred alternative. That is the job of the Proposed Plan (PP), the document following the FS, for which Travis AFB will hold a public comment period. The PP in turn is followed by the Record of Decision (ROD), a legal document that will incorporate public comment in the selection of a remedial alternative. The ROD is signed by all parties to the cleanup. Single or multiple PP(s) and ROD(s) could be based on this FS.

The FS accomplishes its tasks in several steps:

1. **The Initial Screening of Alternatives.** The FS evaluates the widest range of alternatives by asking the primary question: "Will the alternative protect human health and the environment from potential risks associated with contaminated soil, surface water, and groundwater in the NEWIOU?" For the three environmental media in each site, 22 alternatives were selected for further analysis: 8 for groundwater, 6 for surface water, and 6 for soil. Two more (bioslurping for groundwater and bioventing for soil) were added later based on comments from the regulatory agencies.
2. **The Detailed Analysis of Alternatives (DAA).** Those 22 alternatives were next evaluated according to criteria specified in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) also known as Superfund. The criteria attempt to answer such questions as: how effective is the alternative? Is it easily implemented? What is its probable cost? Will it be in compliance with all applicable regulations?
3. **Results and Integration.** Finally, the various alternatives and their level of performance are compared and contrasted. In addition, a plan has been developed to integrate the "medium-specific" alternatives into comprehensive "site-specific" alternatives.

Conducting such an evaluation is difficult at an area as large and complex as the NEWIOU. Analyzing 20 sites by 22 alternatives would result in over 200 detailed analyses, which would be both repetitive and obtuse. Consequently, the FS took two steps to reduce this complexity: First, the 20 sites were combined into 18 groups. The groups were made on the basis of the site's location and contaminant type. Also, the groups were formed by environmental medium—so, a site with both soil and groundwater contamination could be placed in two groups. Second, a representative site was then chosen from each group. This representative site was then ranked according to the CERCLA criteria. This approach eliminates repetition without compromising the conclusions of the DAA.

The key elements and results of the FS have been summarized in a series of tables and figures:

- The 20 sites, their names, and the media impacted (Table ES-1);
- The 18 site groupings (Groups A through R) and the rationale for each group (Table ES-2);
- The remedial alternatives (the bottom of Figures ES-5, ES-6, ES-7, and ES-8). Detailed descriptions of the alternatives are found in Section 3.0 of this report.

- The nine CERCLA evaluation criteria by which each group was evaluated (Table ES-3). The eighth and ninth criteria will be included after the PP.
- A sample "conceptual design" (Figure ES-9). Conceptual designs were developed for the representative site in each group. The conceptual designs show treatment alternatives, site characteristics, and design assumptions.

How Remedial Alternatives Are Evaluated

Each alternative is evaluated against each criterion, using a rating of 0, 3, or 5 (0 does not meet the criterion, 3 partially meets the criterion, 5 completely meets the criterion). Take, for example, the CERCLA criterion "Reduction in Toxicity, Mobility, and Volume Through Treatment," (Table ES-3). An alternative would be rated 5 if it eliminated the problem, 3 if it only reduced the problem, and 0 if it would have no effect.

One criterion, cost, is different from the other six CERCLA criteria evaluated during the FS. Alone, these other six cannot determine the "best" alternative. Cost adds an important quantitative element because funding is often a limiting factor in selecting an alternative. As such, cost is evaluated differently, using 5, 3, 1, and -1 ratings, for costs ranging from less than \$1.5 million (a score of 5) to over \$10 million (a score of -1).

Once all the alternatives have been scored for each criterion, two methods are used to compare the results (Figures ES-5, ES-6, ES-7, and ES-8). One is the "Total Score" (the right side of the figures). Here, the seven criteria scores are summed. The other is the "Benefit/Cost Ratio" (the left side of the figures), which sums the first five criteria, (i.e., all of the seven criteria excluding implementability and cost) then divides by the estimated cost in millions of dollars. Hence, an alternative costing \$6.4 million dollars can have a total score of 29, and a benefit/cost ratio of 3.9 (the sum of its first five criteria is only 25; 25 divided by \$6.4 equals 3.9). In effect, the total score measures overall compliance with the CERCLA criteria. The benefit/cost ratio (also termed "cost-effectiveness") better quantifies the degree to which the criteria are satisfied per unit cost expenditure. "Effectiveness" is the sum of the first five criteria.

Results of the Evaluation of Remedial Alternatives

Employing the methods described has resulted in the following alternatives receiving the highest scores and ratios for each medium (see Figures ES-5, ES-6, ES-7, and ES-8). It should be noted that the highest ranking alternative does not necessarily result in the "best" alternative, in consideration of the assumptions used in the analysis. Groundwater sites include

Groups A through I, surface water includes Group J, and soil sites include Groups K through R (see Tables ES-1 and ES-2).

- **Groundwater.** All applicable treatment alternatives were rated equally effective. Cost-effectiveness (the benefit/cost ratio) was the distinguishing factor.
 - For Groups A, B, C, D, and I, Alternative 3 was rated the most cost-effective.
 - For Group F, Alternative 7 was rated the most cost-effective.
 - For Group G, Alternatives 7 and 9 were rated the most cost-effective. (Two alternatives are included here to address both a floating product layer and groundwater contamination.)
 - For Group E, Alternative 4 was rated the most cost-effective.
 - For Group H, Alternative 8 was rated the most cost-effective.
- **Surface Water.** For Group J, Alternative 14 was the most cost-effective.
- **Soils.** For all soil groups, except Group O, Alternative 20 was rated the most effective. For Group O, Alternatives 21 and 22 were rated equally effective. Among the seven groups for which Alternative 20 was the most effective, cost-effectiveness was again a distinguishing factor:

- For Groups K, L, M, N, O, P, and Q, Alternative 17 was rated the most cost-effective.
- For Group R, Alternative 18 was rated the most cost-effective.

Combining Remedial Alternatives to Reduce Costs

The FS also explores how Travis AFB could benefit from the economies of scale if certain sites were combined for cleanup. For example, if liquid granular activated carbon (GAC) is the selected treatment for a group of five sites, the FS assumes that a carbon treatment system is constructed at each site. By combining sites in close proximity to one another for execution, only one power source, treatment, and discharge system would be utilized, possibly reducing costs. Furthermore, centralized treatment facilities may be somewhat easier to construct and operate than a number of smaller systems.

Another benefit involves interactions of the three media (groundwater, surface water, and soil). Just as it is possible for COCs in one medium to migrate to another medium, cleanup of one medium can benefit the other. In fact, by taking action on one medium, the benefits on another may be so great that no additional action is necessary. Alternatively, an action on one media can also be detrimental to the other. Figure ES-10

provides an example of a site alternative considering media interactions.

Groundwater interaction with surface water and soil provides useful examples. Groundwater and surface water can interact when groundwater discharges into a surface water body, such as a creek, via the banks of the creek or through a ditch or culvert. Contaminated groundwater would impact not only the quality of the surface water, but COCs could adsorb to the soil of the creek bed. At Travis AFB, Sites SD001 and SD033 (Union Creek and the West Branch of Union Creek) are potential examples of this domino effect.

At such sites, an action on upgradient sources that prevents the migration of COCs to the creek would benefit the surface water and soil quality. Such actions could involve intercepting COCs in a groundwater plume before they reach the creek or removing upstream contaminated sediments.

Such actions could also involve lowering the groundwater table to a level below the invert of the storm drain. However, this is an example of an action on one medium being potentially detrimental to another. Union Creek and its West Branch rely, to an extent, on groundwater discharge for water flow. Discharge is especially important during the summer to maintain wildlife habitats. Lowering the water table could change the

surface water/groundwater balance, negatively impacting the habitat by removing an important source of water for the creek.

Selecting the Preferred Alternative

Again, the NEWIOU FS only evaluates the remedial alternatives for each group. It stops short of identifying the preferred alternative, which is the responsibility of the PP. Regulatory agency and public interests are incorporated into the integrated alternative through the review and comment process. The developed plan for each site will be documented in the PP.

Table ES-1

Summary of IRP Sites for Consideration in the NEWIOU FS

IRP Designation	Name	OU	Affected Media
SD001	Union Creek	EIOU	Soil*, Surface Water
FT002	Fire Training Area (FTA)-1	EIOU	Soil
FT003	FTA-2	EIOU	Soil
FT004	FTA-3	EIOU	Soil, Groundwater
FT005	FTA-4	EIOU	Soil, Groundwater
LF006	Landfill 1	NOU	Groundwater
LF007	Landfill 2	NOU	Soil, Groundwater
OT010	Sludge Disposal Site	EIOU	Soil
SS015	Solvent Spill Area (SSA) and Facilities 808, 1832, and 552	EIOU	Soil, Groundwater
SS016	Oil Spill Area (OSA) Facilities 11, 13/14, 20, 42/1941, 139/144, and SSRW	EIOU	Soil, Groundwater
WP017	Oxidation Ponds Site (OPS)	EIOU	Soil
SS029	Monitoring Well (MW)-329 Area	EIOU	Soil, Groundwater
SS030	MW-269 Area	EIOU	Soil, Groundwater
SD031	Facility 1205	EIOU	Groundwater
ST032	MW-246/MW-107 Areas	EIOU	Soil, Groundwater
SD033	Storm Sewer II, South Gate Area, Facilities 810 and 1917, and West Branch of Union Creek	WIOU	Soil*, Surface Water, Groundwater
SD034	Facility 811	WIOU	Soil, Groundwater
SS035	Facility 818/819	WIOU	Soil, Groundwater
SD036	Facility 872/873/876	WIOU	Soil, Groundwater
SD037	Sanitary Sewer System, Facilities 837/838, 919, 977, 981, Ragsdale/V Area, and Area G Ramp	WIOU	Soil, Groundwater

* Soil includes sediment

Table ES-2

Site Groupings

Media	Group	Sites ¹	Rationale for Grouping
Groundwater	A	FT004, LF006, LF007, SD031	• Similar location in northeast part of Travis AFB. • Similar COCs (chlorinated hydrocarbons and TPH). • Metals treatment required for all sites.
	B	SD036, SS015, SD033	• Similar location west of the flightline. • Similar COCs (chlorinated hydrocarbons and TPH). • Metals treatment required for all sites.
	C	FT005	• Low COC concentration (120 ppb TCE maximum) relative to other sites in the southeast area of Travis AFB. • Some off-base migration of groundwater. • Metals treatment required.
	D	SS016	• High COC concentration (32,000 ppb TCE maximum)² relative to other sites in NEWIOU. • Metals treatment required.
	E	SS029	• Unlike most other groundwater sites, no metals treatment is required. • Maximum TCE concentration of 1,300 ppb. • Geographically isolated location south of the flightline.
	F	SS030	• Small groundwater volume relative to other sites in the southeast area of Travis AFB. • Some off-base migration of groundwater. • Maximum TCE concentration of 3,860 ppm. • Metals treatment required.
	G	SD034, ST032	• Contains free product layer. • Significant TPH concentrations (maximum TPH concentrations of 10.5×10^6 and 29×10^6 ppb, respectively) relative to other sites. • Metals treatment required for both sites.

Table ES-2
(Continued)

Media	Group	Sites ¹	Rationale for Grouping
Groundwater (cont'd)	H	SS035	• Low COC concentrations (21 ppb TCE maximum and 160 ppb TPH maximum) relative to other nearby sites. • Unlike most other groundwater sites, no metals treatment is required.
	I	SD037	• Large groundwater volume relative to other sites west of the flightline. • Consists of many commingled contaminant plumes of various origins. • Maximum TCE concentration of 6,990 ppb. • Metals treatment required.
Surface Water	J	SD033, SD001	• Both surface water sites impact Union Creek. • Surface water COCs (TCE, TPH, and metals) are similar for both sites. • Groundwater source control or downstream treatment could be used for both sites.
Soil	K	FT003, FT002, FT004, FT005	• Similar COCs (PCBs, PAHs, and dioxins/furans). • Includes all former fire training areas in the NEWIOU.
	L	LF007	• Geographically isolated location in northeast corner of Travis AFB. • Subject to remediation to mitigate ecological risk. • COCs (PCBs, PAHs, and metals) derived from landfill operations. • Unique heterogeneous nature of subsurface soil.
	M	WP017, OT010, SS029, SS030	• Sites located close together southeast of the runway. • Similar COCs (PAHs and metals). • Soil volumes are similar for both sites.

Table ES-2
(Continued)

Media	Group	Sites ¹	Rationale for Grouping
Soil (cont'd)	N	SS035, SS015, SS016	• Similar COCs (PAHs). • Sites located close to each other near center of Travis AFB.
	O	SD036	• Soil gas COCs (TPH, chlorinated organics) are a primary concern. • Major soil contaminant is TPH.
	P	SD037, SD033	• Much of contamination is associated with storm and sanitary sewers. • Contains isolated pockets of soil gas (contaminated with TPH, benzene, and TCE) and TPH. • Site contains PAHs in surface soils and TPH and SVOCs in subsurface soils.
	Q	SD034, ST032	• Free product above water table. • Major soil contaminant is TPH. • Soil gas contaminated with TPH and TCE.
	R	SD001, SD033	• Sediments associated with surface water are media of concern, rather than soils. • Similar COCs (metals and PAHs).

¹ The representative site for each group is listed first and bolded.

² Recent testing has documented higher concentrations of TCE, up to a maximum of approximately 180,000 ppb. However, these results were derived from Cone Penetrometer Testing (CPT) data, which may not accurately represent TCE contaminant levels since well purging is not an element of CPT analysis.

COC = Contaminant of Concern
 NEWIOU = North/East/West Industrial Operable Unit
 PAHs = Polycyclic Aromatic Hydrocarbons
 PCB = Polychlorinated Biphenyl
 ppb = parts per billion
 pg = picogram
 SVOCs = Semi-volatile Organic Compounds
 TCE = Trichloroethene
 TPH = Total Petroleum Hydrocarbon

Table ES-3

Remedial Alternative Evaluation Criteria

Criterion Type	Evaluation Criterion	Definition
Threshold Factors	Protective of human health and the environment ^a	Protects human health and the environment through the elimination, reduction, or control of contaminated media. All migration pathways must be addressed.
	Compliance with appropriate ARARs ^a	Complies with applicable or relevant and appropriate requirements of RCRA, CWA, SDWA, TSCA, state and local regulations and codes, and TBCs.
Balancing Factors	Long-term effectiveness and permanence ^a	Protects human health and the environment after the remedial objectives have been met.
	Reduction in toxicity, mobility, and volume through treatment ^a	Treats the media and reduces the toxicity, mobility, and/or volume of the contaminated media.
	Short-term effectiveness ^a	Protects human health and the environment during construction and implementation. Degree of threat and the time period to achieve remedial action objectives are also considered.
	Implementability	There are no administrative barriers (no permits, zoning limitations). The availability of materials and personnel, site features such as available space and topography, and impacts upon on-going operations are considered. The technical status of alternatives is also considered; theoretical technologies with only limited bench-scale evaluation are considered less implementable than fully proven processes.
Modifying Considerations	Cost	Costs include design, construction, start-up, monitoring, and maintenance. Accuracy to within -30% and +50%.
	State acceptance	The state's (or other regulatory agency's) preference among or concern about alternatives.
	Community acceptance	The community's apparent preferences among or concerns about alternatives.

^a Effectiveness criterion used to determine the benefit/cost ratio.

ARARs = Applicable or Relevant and Appropriate Requirements

CWA = Clean Water Act

RCRA = Resource Conservation and Recovery Act

SDWA = Safe Drinking Water Act

TBC = To Be Considered

TSCA = Toxic Substance Control Act

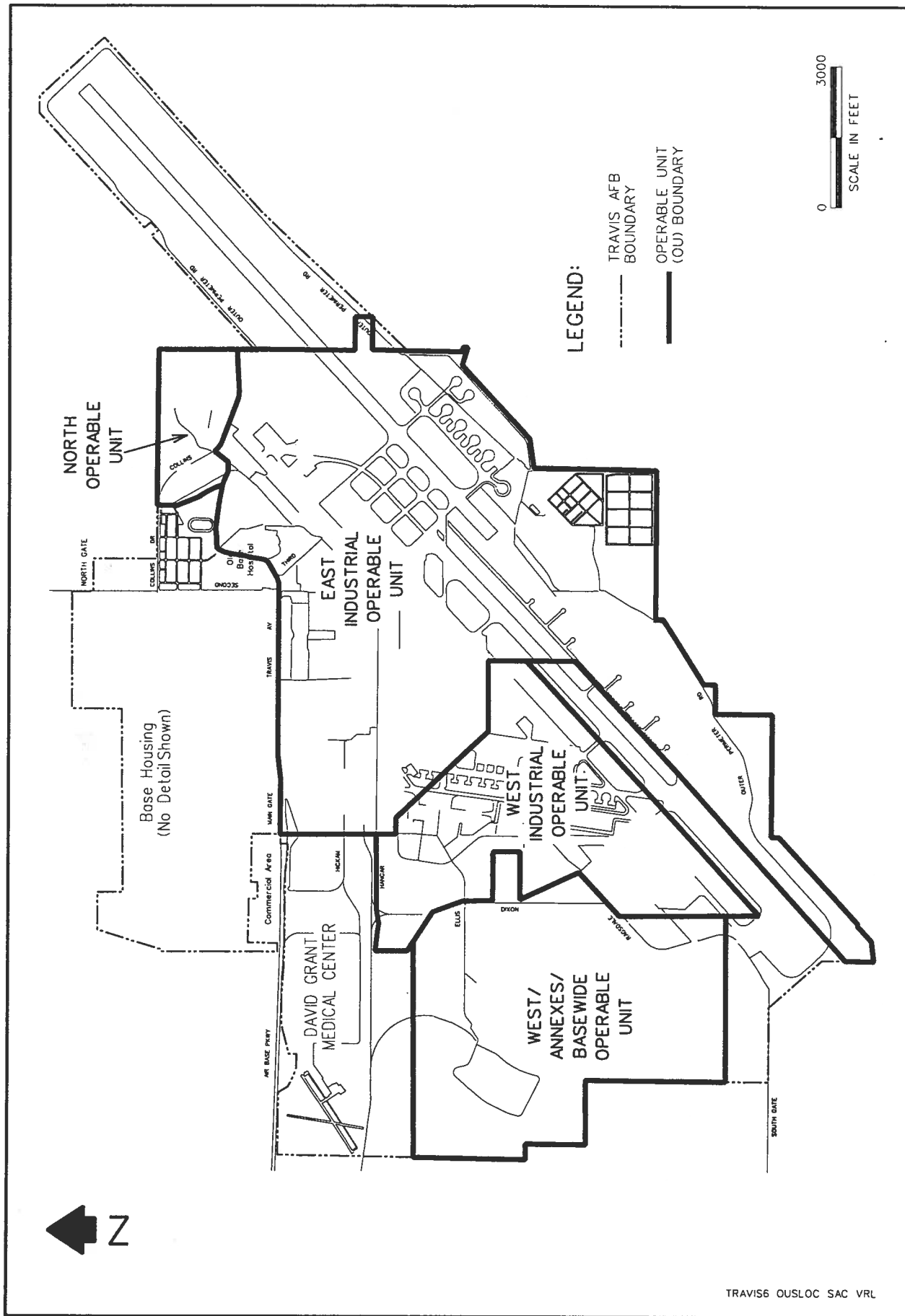
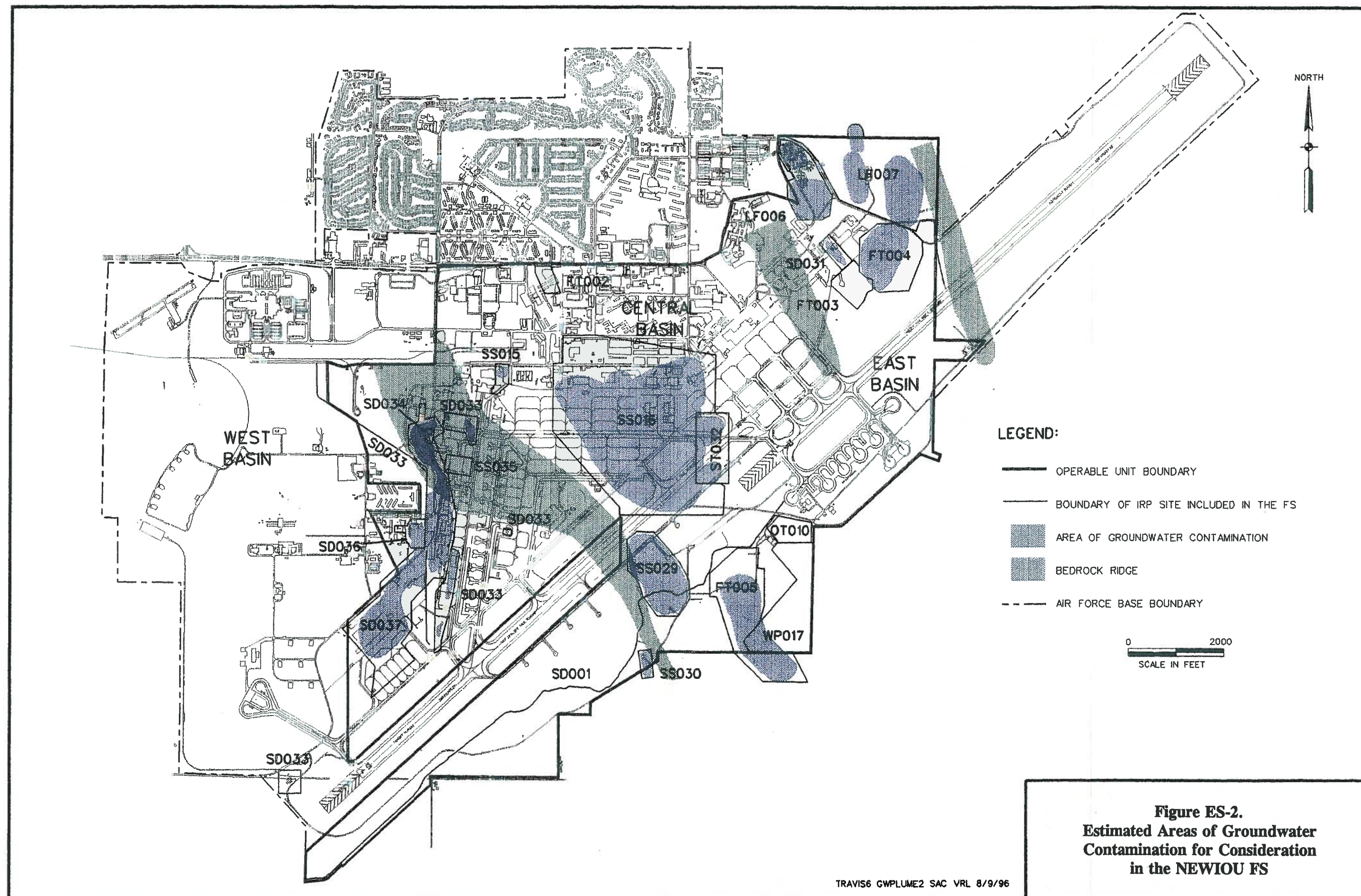
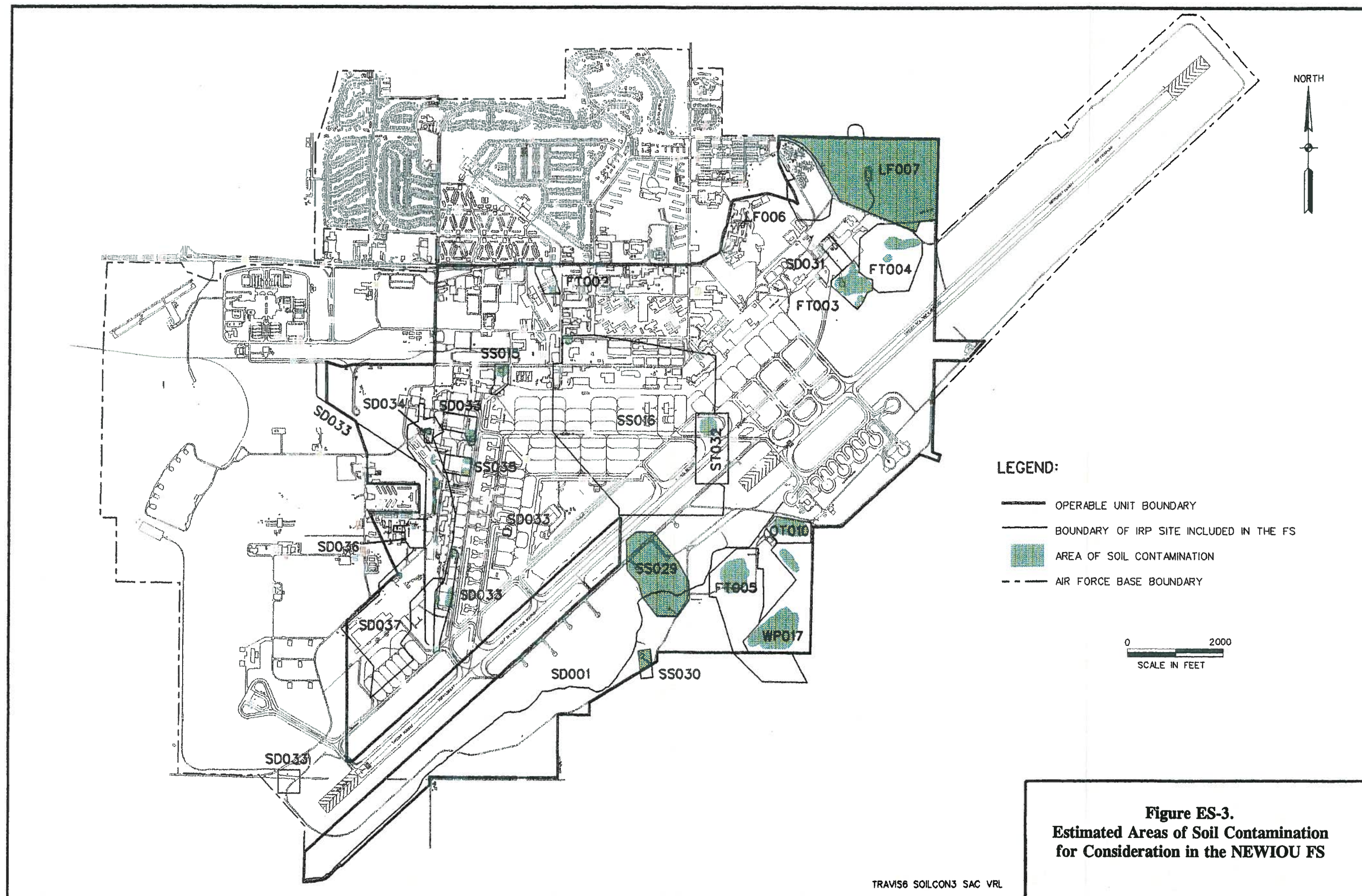


Figure ES-1. Travis AFB and Operable Units





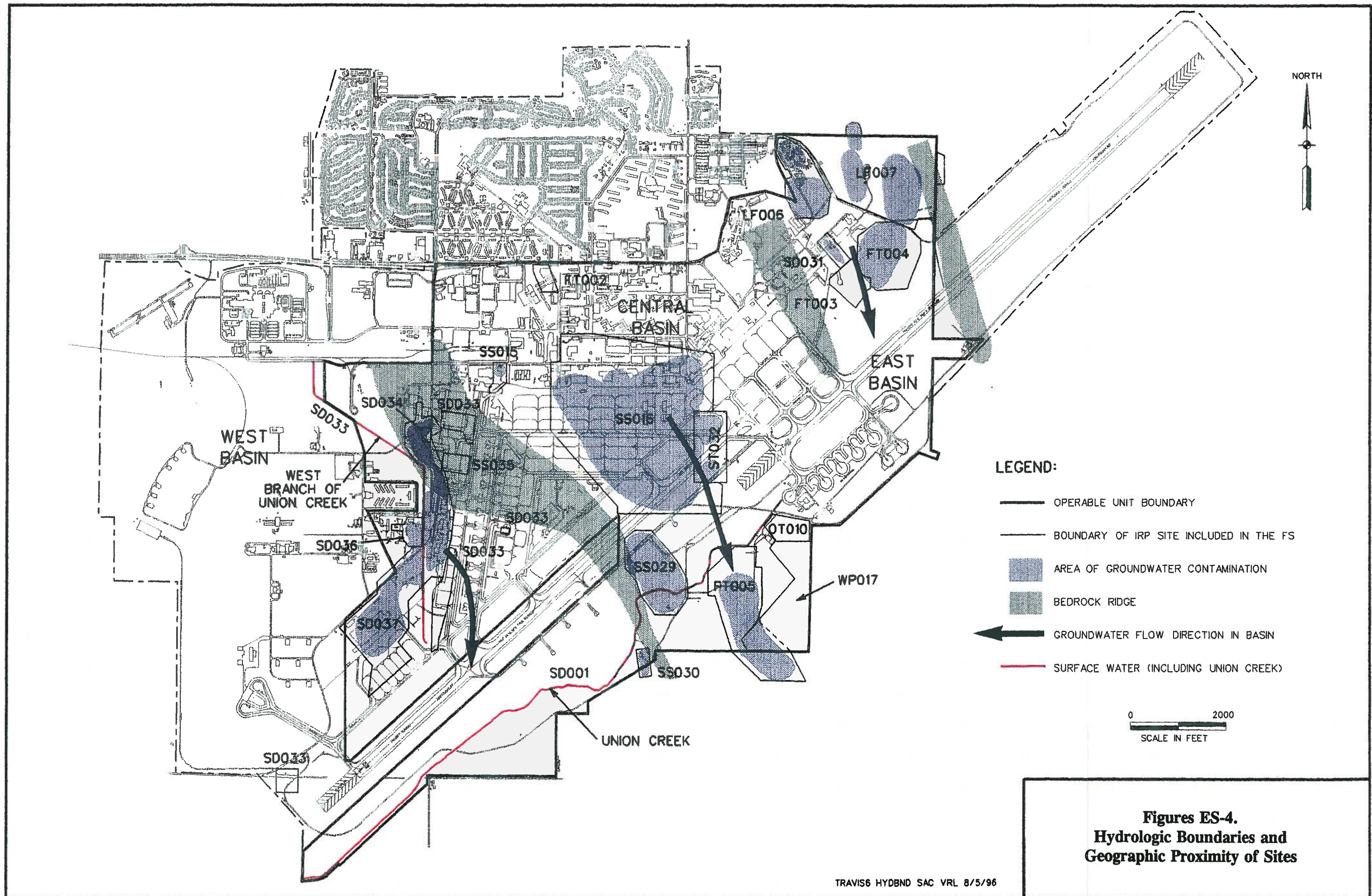


Figure ES-5.
Alternatives for Groundwater Groups Requiring Metals Treatment (A, B, C, D, F, G and I)

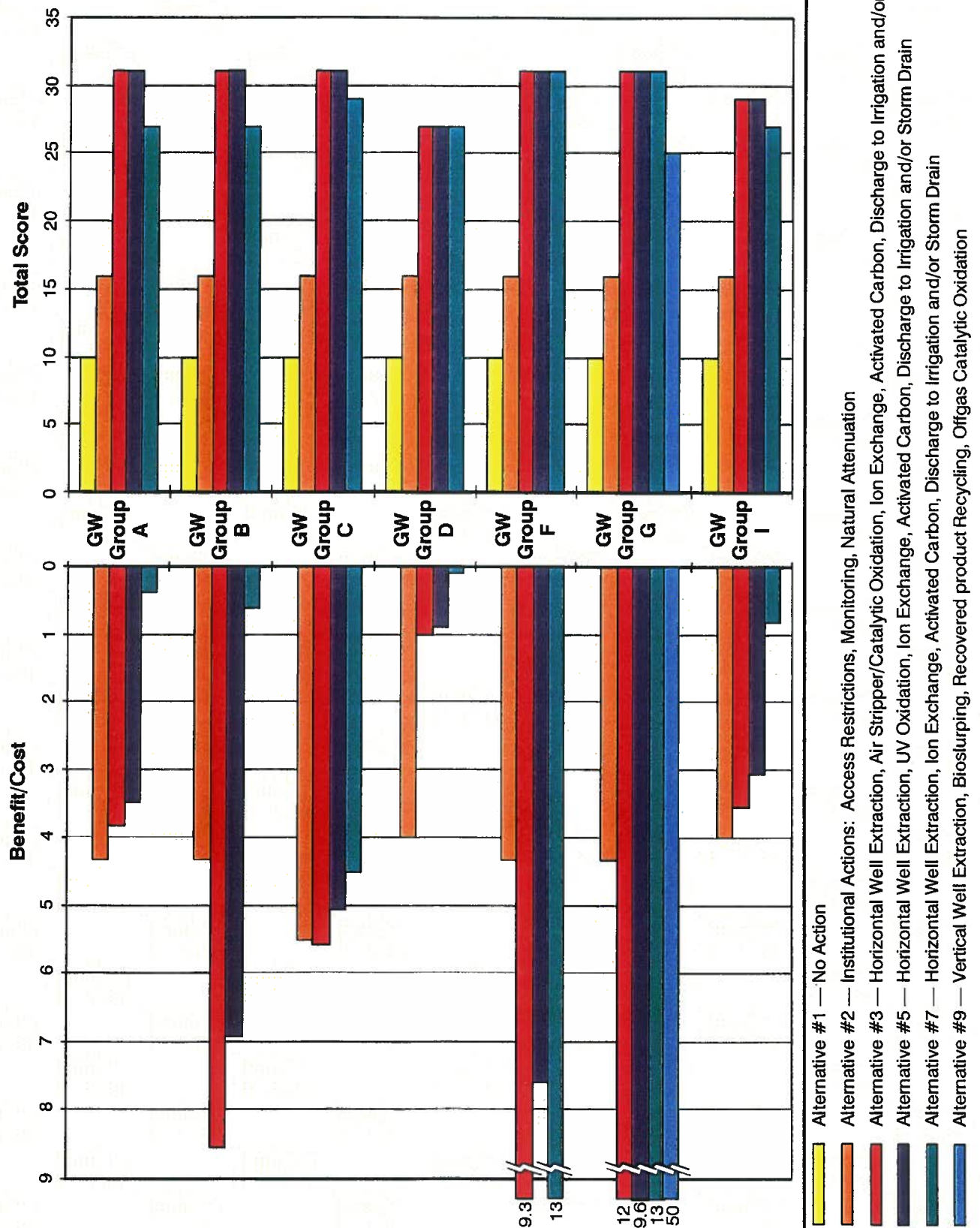
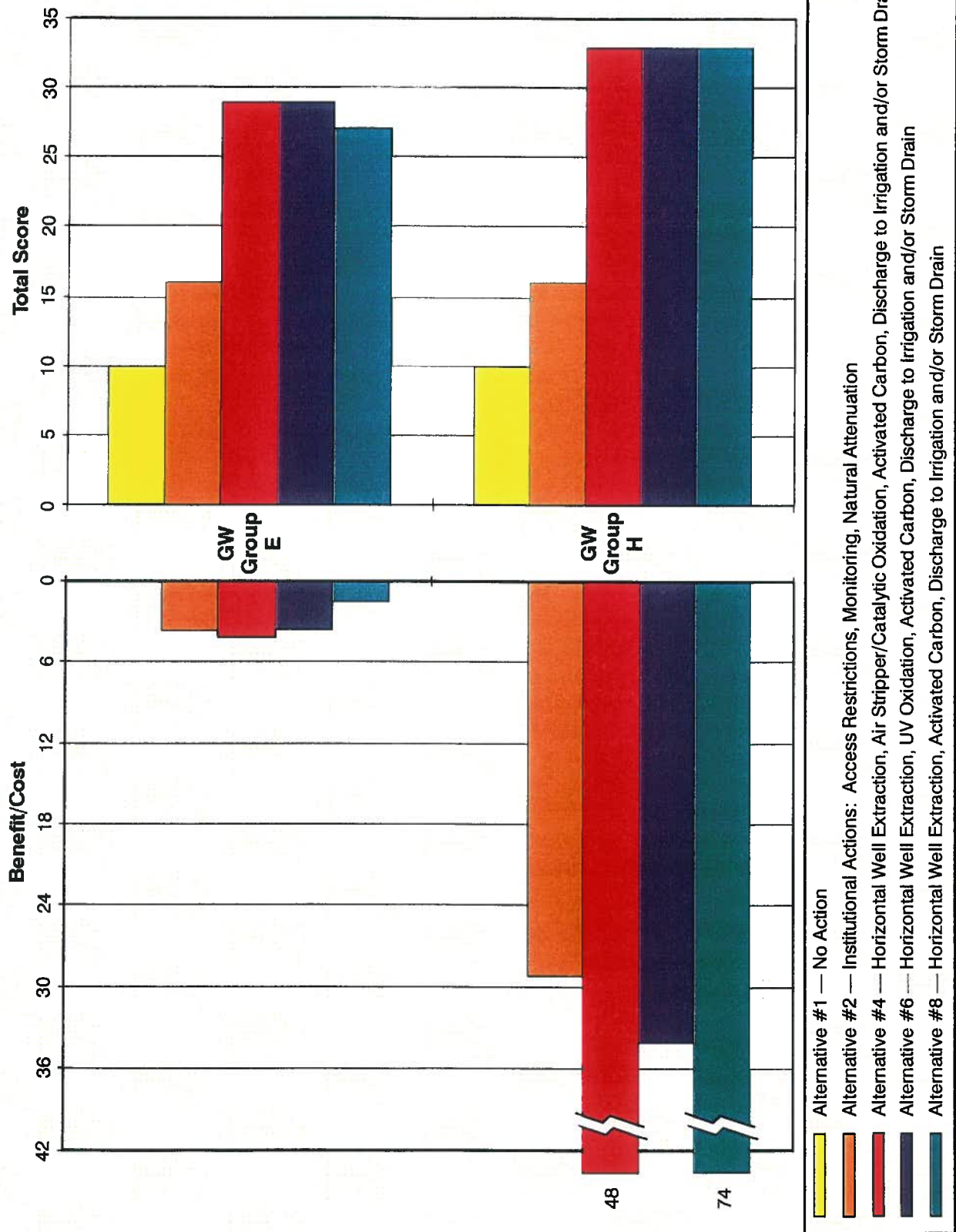
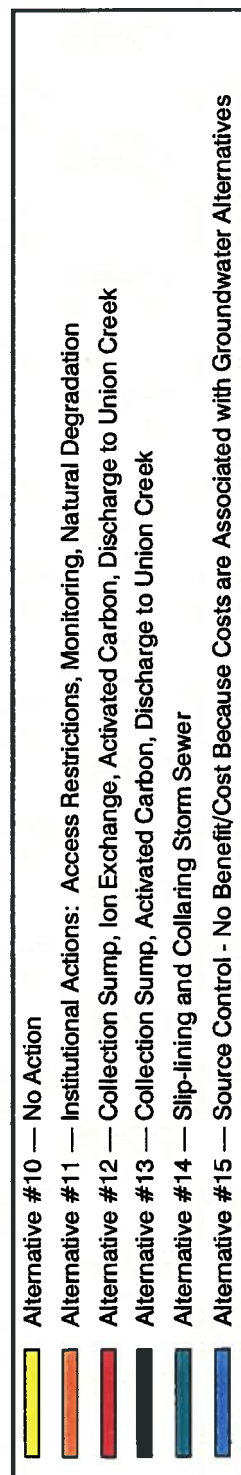
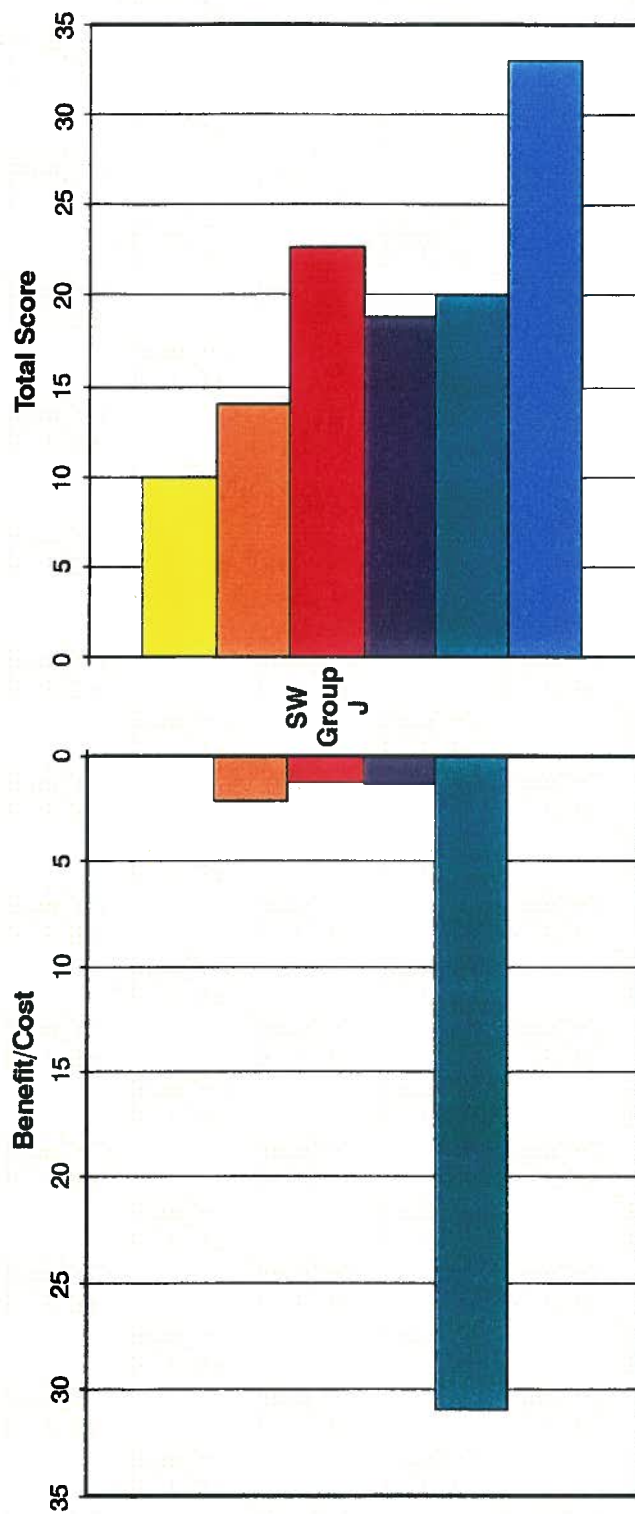


Figure ES-6.
Alternatives for Groundwater Groups Not Requiring Metals Treatment(E and H)



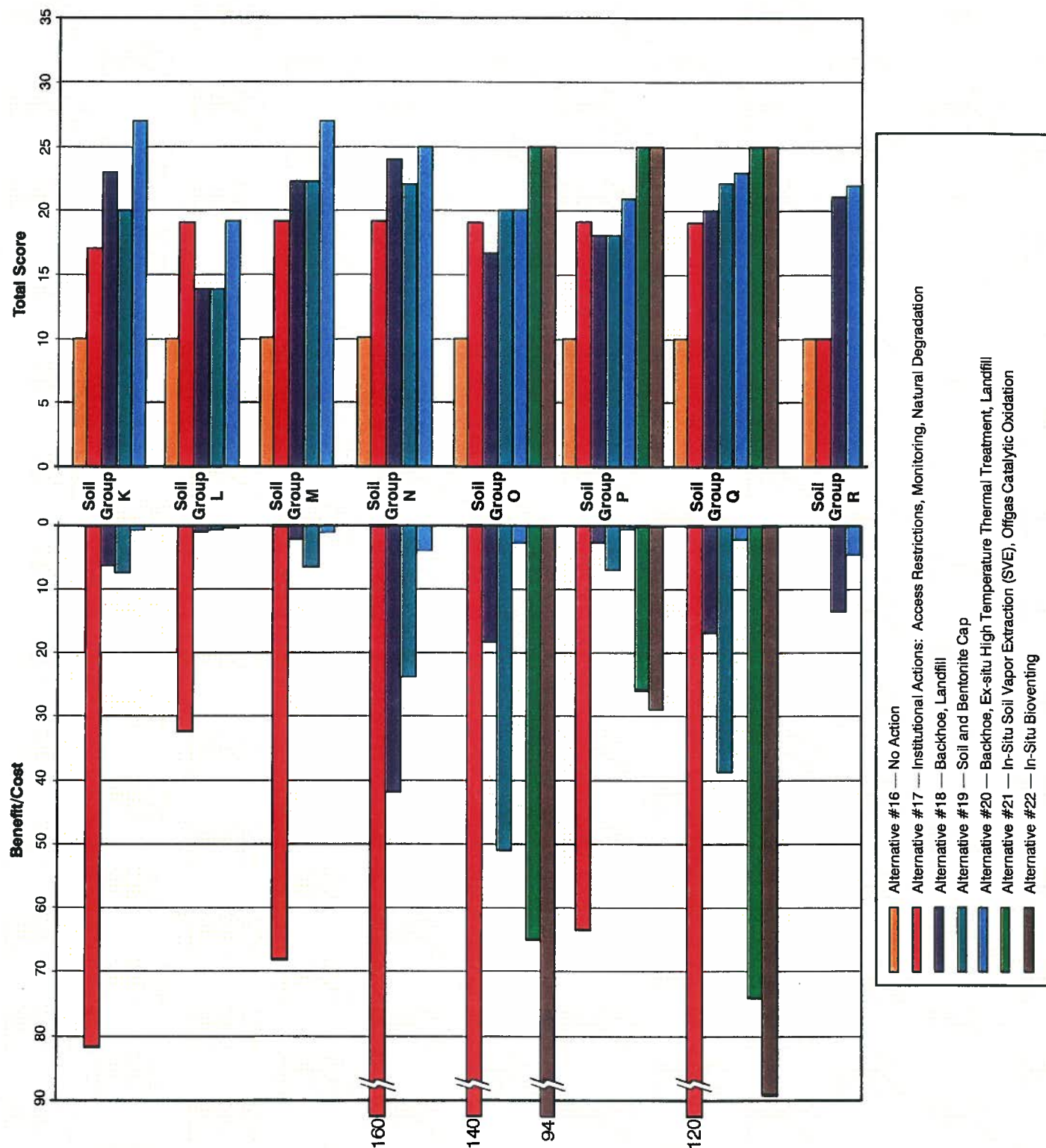
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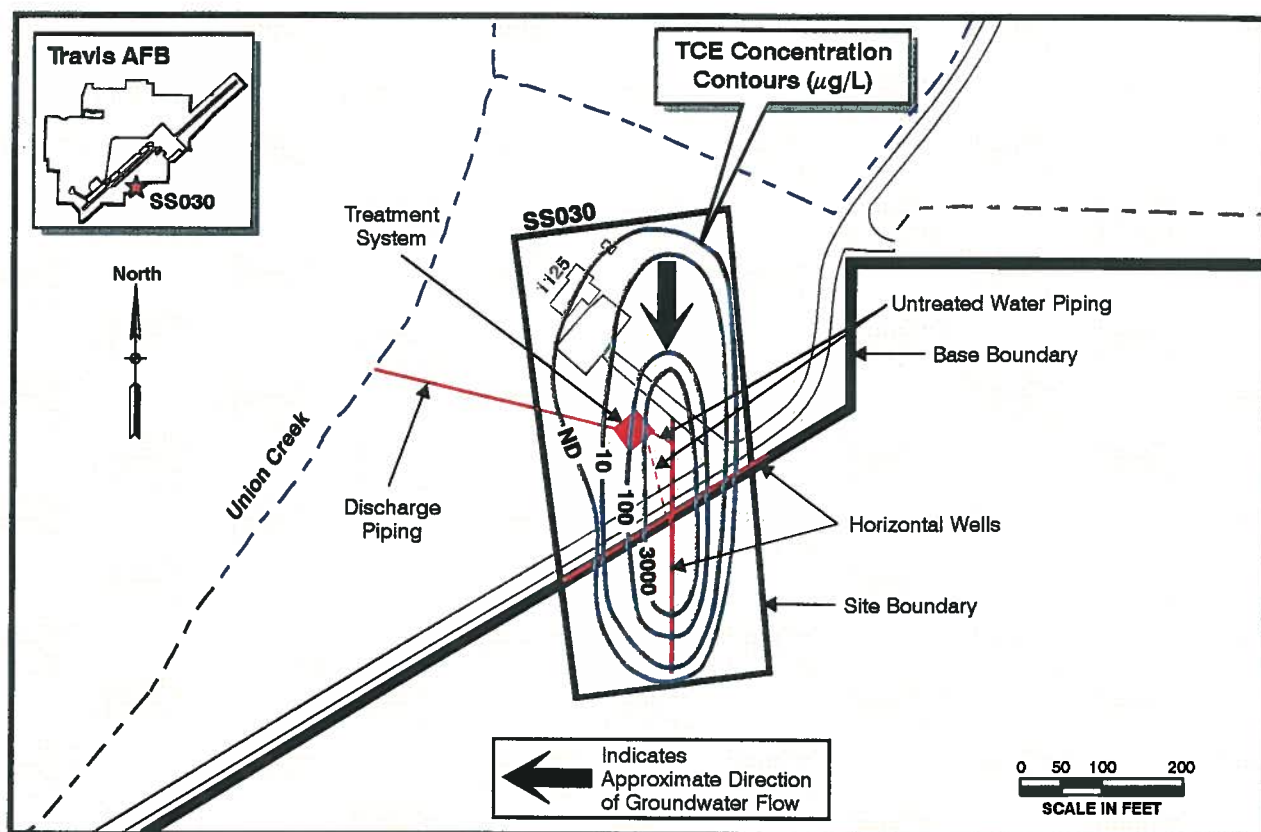
**Figure ES-7.
Alternatives for Surface Water Group J**



FSGRAPHS CDR - VMG 9/10/86 SAC 4

Figure ES-8. Alternatives for Soil Groups (K, L, M, N, O, P, Q and R)





SS030ALT.CDR - VMG 8/5/96 SAC 1

Site Characteristics

- Approximately 25% of the area is covered by pavement or buildings
- TCE in groundwater — 958 µg/L average, 3,860 µg/L maximum
- Estimated mass of dissolved VOCs equals 18 lb; DNAPL may be present
- Nickel in groundwater — 903 µg/L maximum
- Se and Ag were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Low permeability soils (clay and silt) to a depth of between 15 and 25 feet bgs
- More permeable materials (sands and silts) below 15 to 25 feet bgs
- Depth to groundwater — 10 feet
- Depth to bedrock — 25 feet
- Well pumping rates — MW-269 conventional pumping at 0.8 gpm, Two Phase Extraction at 3.7 gpm
- Site also included in Group M for soil contamination

Treatment Alternatives

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

Design Assumptions

- Two horizontal wells, 300 feet in screened length each
- Extraction rate 30 gpm total, 15 gpm from each well
- 150 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 350 feet of discharge piping (to Union Creek) — 1-½ inch ID, sch 80 PVC
- 100 feet from treatment system to existing power line
- 77 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.

Figure ES-9. Sample Conceptual Design

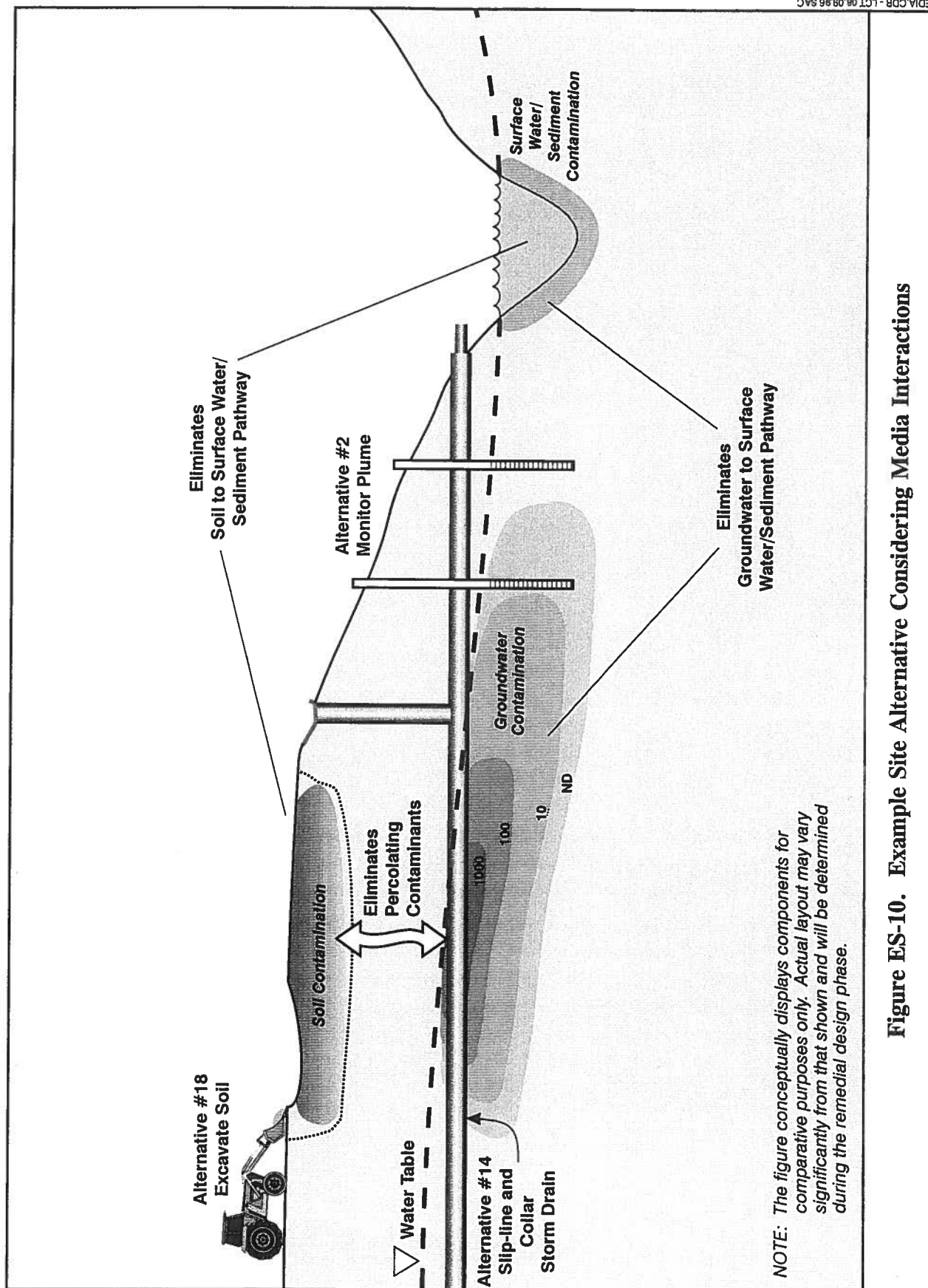


Figure ES-10. Example Site Alternative Considering Media Interactions

1.0 REMEDIAL INVESTIGATION SUMMARIES FOR THE NOU, EIOU, AND WIOU

The Air Force, under the Installation Restoration Program (IRP), began an effort to identify contaminated sites at Travis Air Force Base (AFB) in 1983. After completing the Records Search and a Phase II study to confirm problem areas, Travis AFB developed an integrated IRP Work Plan in 1986. The U.S. Environmental Protection Agency (U.S. EPA) placed Travis AFB on the National Priority List in 1989. In 1993, the Federal Facilities Agreement (FFA) was amended to identify four specific operable units (OUs) and a corresponding schedule for each OU.

The Base was divided into the North OU (NOU), the East Industrial OU (EIOU), the West Industrial OU (WIOU), and the West/Annexes/Basewide OU (WABOU) to focus the remedial investigations (RIs) (Figure 1-1). Individual OU-specific RIs have been completed for three of the OUs (NOU, EIOU and WIOU). The findings of the three RIs indicate similar types of soil, groundwater, surface water, and sediment contamination in the three OUs. These are solvents (volatile organic compounds ([VOCs]), fuels (total petroleum hydrocarbons [TPH]), and dissolved nickel in groundwater, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals contamination in the soil, metals and pesticides in surface water, and metals, VOCs, and semivolatile organic compounds (SVOCs) in sediment. Because of the similar contaminants and concentrations affecting soil, groundwater, surface water and sediments, the FFA reporting requirements for these three OUs have been combined to allow basewide planning for the remediation of these media. Combining the three OUs also creates a more efficient Feasibility Study (FS)/Record of Decision (ROD) process and minimizes costs associated with generating separate documents. The three OUs are now referred to as the North/East/West Industrial OU or NEWIOU. Following completion of the WABOU RI, identified sites in the WABOU, particularly with associated groundwater contamination, may be brought into the NEWIOU FS.

The FS conceptually incorporates the Draft Initial Screening of Alternatives (ISA) (Sections 1.0 through 3.0) and the Draft Detailed Analysis of Alternatives (DAA) (Sections 4.0 through 9.0) and includes an additional section on developing integrated alternatives for sites at Travis AFB (Radian, 1995a; Radian, 1996a). The ISA evaluates a range of remedial alternatives that will protect human health and the environment from potential risks associated with contaminated soil, sediments, surface water, and groundwater in the NEWIOU. The remedial alternatives identified in the ISA are subjected to the DAA, containing the nine criteria of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). Specifically, the DAA evaluation includes the categories of effectiveness, compliance, implementability, and cost. A comparative analysis is then performed to assess the relative performance of each alternative with respect to each evaluation criterion. The NEWIOU FS presents the remedial alternatives for each site, but stops short of identifying the preferred alternative.

Following acceptance of the FS, the Proposed Plan(s) (PP) and the ROD(s) are prepared. The PP will outline the preferred alternative for each site in concise easy-to-understand terms for public comment. The ROD is a legal document which incorporates public comment and concern, and specifies exactly what action is to be taken. The ROD(s) is signed by all parties to the cleanup.

To begin planning and implementing remedies, the FS:

- Identifies the media and contaminants that may require remediation;
- Identifies potential Applicable or Relevant and Appropriate Requirements (ARARs);
- Describes remedial action objectives (RAOs);
- Identifies and screens remedial technologies;
- Assembles technologies into remedial alternatives;

- Evaluates remedial alternatives for specific media (groundwater, surface water, and soil);
- Evaluates remedial alternatives for representative sites for each medium;
- Considers interactions between media and between sites; and
- Presents a process to combine media-specific alternatives into site-wide alternatives.

1.1 Summary of the Remedial Investigations

The objectives for the RIs conducted for the three OUs were to define:

- OU-specific hydrogeology and a complete conceptual model;
- Approximate nature and extent of contamination;
- Risks to human health and the environment; and
- Sites, contaminants, and affected media to be considered in the FS.

Following the RI field activities, the data were compiled and evaluated for the presence of contaminants and their potential effects on human health and the environment for each site. Contaminants of concern (COCs) were identified based on potential human health risks, ecological risks, and potential regulatory limits. Interim remedial goals (IRGs) were established based on potential Applicable or Relevant and Appropriate Requirements (ARARs), site-specific health risk assessment (HRA), Preliminary Remediation Goals (PRGs), and ecological risks. In conjunction with the risk assessment, the IRGs were used to identify concentrations, COCs, and media which may require remediation. The IRGs are not cleanup levels, but provide a basis to compare results. When final cleanup levels are determined, they will take into account the potential for soil contamination to leach to groundwater.

The human health risk values were calculated for a future residential scenario (adult reasonable maximum exposure [RME]) for cancer risks and child RME for noncancer risks. In industrial areas, the HRA considered workers and exposures while working in an excavation. The future residential scenarios were the most conservative approach; although future use of groundwater by residences was evaluated for the HRA, future water is likely to continue to be supplied basewide from sources outside Travis AFB. In addition, the planned future use of most sites is industrial, not residential.

Ecological risk assessments (ERA) were also completed for the OUs. Each of the OU ERAs evaluates specific sites for completed exposure pathways, defines contaminants of potential ecological concern (COPECs), defines assessment and measurement endpoints, defines critical toxicity values (CTVs) and compares analytical sample data to the site specific CTVs. Depending on the risk analysis, routes of exposure and selected indicator species, CTVs may be expressed as doses or as environmental concentrations. The comparison of modeled doses or analytical concentrations to CTVs results in a hazard quotient (HQ). HQs exceeding 1 indicate a potential for adverse ecological effects. Specific OU ERAs also include additional analyses to assess ecological impact of contaminants. These include, gross pathology of organisms, site specific bioassays, biomass analysis, biological sampling and analysis. These ERA analyses other than the HQ analysis may not be chemical end point specific but assume all chemical concentrations identified at a site are responsible for the observed toxic endpoint (i.e., skin lesions on fish at the site).

Following the completion of the OU-specific ERAs, a document entitled, "Final Comprehensive Basewide Ecological Risk Assessment - Tier 2: Screening Assessment" (CH2M Hill, 1996), designed to quantify the potential ecological risks to plants and animals on the Base using a basewide perspective, was completed. This provides further information on ecological risk to help guide potential remedial actions. This report focused on Union Creek and its east and west branches. One of the objectives of the report was to establish preliminary ecological remedial goals (PERGs) for COPECs from a basewide perspective in surface water and sediment. Surface water PERGs were based on background

concentrations, regulatory values, and literature values. Sediment PERGs were based on background values, literature effects levels, regulatory values, and EIOU bioassay results. A defined hierarchy for selecting PERGs from these inputs was used, and background concentrations were used as PERGs when those concentrations were higher than calculated levels, for both surface water and sediment. The PERGs from the Tier 2 report are used as surface water and sediment IRGs in this section for COCs indentified at SD001 and SD033, i.e., the two NEWIOU sites that include Union Creek and its branches.

Since the Tier 2 report only presents surface water and sediment PERGs for Union Creek, a supplemental approach was required to establish ecological IRGs in this FS for soil at the NEWIOU sites. These IRGs were estimated by back-calculating media-specific concentrations to yield an $HQ = 1$, using the algorithms developed in the previous ERAs. The methodology involved selecting a "most sensitive receptor" for each site or habitat type, again based on the ERAs, to represent all ecological receptors. These receptors were selected to represent species that are likely to utilize the site, have a high level of contact with the contaminated media, and have available toxicity data. Exposure pathways, bioaccumulation/bioconcentration parameters, uncertainty factors, and toxicity data were all reviewed and factored into the analysis. The individual IRGs for each COC at each site were then back-calculated, so that the IRG concentration would result in a theoretical $HQ = 1$. These IRGs are not likely to be able to be directly applied as cleanup levels, considering the assumptions involved and the fact that calculated media concentrations may not be measurable or attainable with remediation technologies. These ecological IRGs should also not be applied to subsurface soils since such soils are not likely to be accessible to ecological receptors.

Based on the recommendations from the RIs for the NOU, EIOU, and WIOU, 20 sites are evaluated for treatment in the NEWIOU FS (see Table 1-1). The primary COC is trichloroethene (TCE); other COCs include TPH, nickel, PAH, and PCBs. The media affected by the COCs include groundwater, soils, surface water, and sediments. The estimated contaminated groundwater areas to be considered for remedial action are shown on

Table 1-1

Summary of IRP Sites for Consideration in the NEWIOU FS

IRP Designation	Name	OU	Affected Media
SD001	Union Creek	EIOU	Soil*, Surface Water
FT002	Fire Training Area (FTA)-1	EIOU	Soil
FT003	FTA-2	EIOU	Soil
FT004	FTA-3	EIOU	Soil, Groundwater
FT005	FTA-4	EIOU	Soil, Groundwater
LF006	Landfill 1	NOU	Groundwater
LF007	Landfill 2	NOU	Soil, Groundwater
OT010	Sludge Disposal Site	EIOU	Soil
SS015	Solvent Spill Area (SSA) and Facilities 808, 1832, and 552	EIOU	Soil, Groundwater
SS016	Oil Spill Area (OSA) Facilities 11, 13/14, 20, 42/1941, 139/144, and SSRW	EIOU	Soil, Groundwater
WP017	Oxidation Ponds Site (OPS)	EIOU	Soil
SS029	Monitoring Well (MW)-329 Area	EIOU	Soil, Groundwater
SS030	MW-269 Area	EIOU	Soil, Groundwater
SD031	Facility 1205	EIOU	Groundwater
ST032	MW-246/MW-107 Areas	EIOU	Soil, Groundwater
SD033	Storm Sewer II, South Gate Area, Facilities 810 and 1917, and West Branch of Union Creek	WIOU	Soil*, Surface Water, Groundwater
SD034	Facility 811	WIOU	Soil, Groundwater
SS035	Facility 818/819	WIOU	Soil, Groundwater
SD036	Facility 872/873/876	WIOU	Soil, Groundwater
SD037	Sanitary Sewer System, Facilities 837/838, 919, 977, 981, Ragsdale/V Area, and Area G Ramp	WIOU	Soil, Groundwater

* Soil includes sediment

Figure 1-2. Figure 1-3 presents the estimated areas of contaminated soil to be considered for remedial action in this FS. In addition to groundwater and soils, contaminated media in Union Creek (SD001) include sediment and surface water. COCs for surface water include metals and pesticides, while COCs for sediment include metals, VOCs, and SVOCs. Though SD001 is a site, it is not a source, but a receptor of contaminants from sources. Additional surface water exists at Travis AFB in the form of seasonally inundated depressions and vernal pools.

Specific details of the RIs for the three OUs that compose the NEWIOU are provided in the following three subsections (1.2, 1.3, and 1.4). These subsections only discuss those media and COCs that were recommended in each of the individual RIs for analysis in the FS.

1.2 NOU RI Summary and Conclusions

The NOU includes two inactive landfills (Landfills 1 and 2), (see Figure 1-4). Landfill 1 (LF006) was in use from 1943 until the early 1950s when operation of Landfill 2 (LF007) was begun (Radian, 1995b). Landfill 1 was used as a burn-and-fill landfill for primarily disposing of general refuse. Landfill 2, which was operated from the early 1950s until 1974, was also used for general refuse disposal using a trench and fill method.

The NOU includes two sites for consideration in the FS:

- LF006 (Landfill 1); and
- LF007 (Landfill 2).

The results of the NOU RI indicate that contaminants from Landfills 1 and 2 have reached the groundwater. The groundwater beneath the landfills is contaminated with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), PCBs, and dioxins. These constituents were also detected in samples of surface and subsurface soils.

Although COCs are present throughout the NOU, the higher COC concentrations are generally located in the central portions of Landfill 2.

The NOU was divided into several areas (see Figure 1-4) by levels of contaminants; in Areas A through E, COC concentrations were generally higher than in Areas F and G (not shown). Each of Areas A through E are evaluated separately in the FS due to varying levels of contaminants.

A summary of the NOU contaminated areas within LF006 and LF007, the COCs, and the media recommended for evaluation in the FS is presented in Table 1-2. This table differs from the summary table in the NOU RI in that pesticides are not included in the FS. Pesticides in the NOU are probably present as the result of past pest control practices at Travis AFB, and although pesticides occur in surface water, sediment, surface soil, subsurface soil, and groundwater in the NOU, no point sources of pesticides have been identified. The concentrations of pesticides in surface water, sediments, and surface soils are uniformly distributed throughout the NOU. A statistical evaluation of the pesticides detected basewide in surface soil has been performed (CH2M Hill, 1995). The results of the evaluation indicate that the concentrations of pesticides observed in the NOU are similar to those in other operable units where no sources of pesticides were identified. The conclusion of the evaluation was that the concentrations of pesticides observed in the NOU are the result of historical, widespread, and routine pest control, not a result of historical landfill activities. Therefore, pesticides will not be included in this FS.

Figures 1-5 through 1-10 summarize the media and primary contaminants that have been identified in the RI for evaluation in the FS. The summary figures for all sites include estimated areas of contamination for use in comparing technologies in this FS; a complete description of the nature and extent of contamination is contained in the specific RIs. Compounds that do not drive risk or do not exceed regulatory standards are not shown on these figures.

Table 1-2

**Summary of NOU Areas, Media, and Contaminants
Recommended for Evaluation in the Feasibility Study**

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk ^a	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
LF006	Landfill 1 Area A	Groundwater	Human (Total Risk = 8×10^{-6})	VOCs	6.3×10^{-6}	TCE	20 µg/L	5 µg/L
					1.7×10^{-6}	1,1-dichloroethene	0.64 µg/L	6 µg/L
						TPH	140 µg/L	TBD
LF007	Landfill 2 Area B	Groundwater	Human (Total Risk = 7.8×10^{-6})	VOCs	3.9×10^{-5}	Benzene	59.3 µg/L	1 µg/L
					1.9×10^{-5}	1,4-dichlorobenzene	30.8 µg/L	5 µg/L
					HI = 1.3	Chlorobenzene	161 µg/L	39 µg/L
					4.1×10^{-6}	Bis(2-ethylhexyl)phthalate	14.3 µg/L	4.0 µg/L
					7.0×10^{-4}	PCBs ^b	13.5 µg/L (PCB-1248)	0.50 µg/L
		Surface Soil	Human (Total Risk = 2.5×10^{-4})	Pesticides*/PCBs				
				Dioxins	1.3×10^{-6}	2,3,7,8-TCDDeq	0.55 pg/L	0.45 pg/L
				SVOCs	1.8×10^{-5}	Benzo(a)anthracene	7.73 mg/kg	0.610 mg/kg
					1.6×10^{-4}	Benzo(a)pyrene	7.0 mg/kg	0.061 mg/kg
					2.9×10^{-5}	Benzo(b)fluoranthene	12.6 mg/kg	0.610 mg/kg
					2.9×10^{-6}	Benzo(k)fluoranthene	12.6 mg/kg	6.0 mg/kg
					2.4×10^{-5}	Dibenzo(a,h)anthracene	1.02 mg/kg	0.061 mg/kg
					3.2×10^{-6}	Indeno(1,2,3-cd)pyrene	1.37 mg/kg	TBD

Table 1-2

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk ^a	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
LF007	Landfill 2 Area C	Groundwater	Human (Total Risk = 3.6×10^{-5})	VOCs	1.6×10^{-3}	TCE	49.1 µg/L	5 µg/L
					5.6×10^{-6}	Vinyl Chloride	0.198 µg/L	0.5 µg/L
					3.5×10^{-6}	1,1-dichloroethene	0.297 µg/L	6 µg/L
					1.3×10^{-6}	1,2-dichloroethane	0.314 µg/L	0.5 µg/L
					1.0×10^{-5}	1,2-dichloropropane	3.38 µg/L	5.0 µg/L
LF007	Landfill 2 Area D	Groundwater	Human (Total Risk = 5.4×10^{-4})	VOCs	1.4×10^{-5}	Benzene	25.8 µg/L	1 µg/L
					2.9×10^{-6}	Vinyl Chloride	1.78 µg/L	0.5 µg/L
					2.5×10^{-5}	1,4-dichlorobenzene	43.8 µg/L	5 µg/L
					1.1×10^{-6}	1,1-dichloroethene	0.96 µg/L	6 µg/L
					HI = 15.5	Chlorobenzene	282 µg/L	39.0 µg/L
				Dioxins	2.4×10^{-4}	2,3,7,8-TCDDeq	16.99 pg/L	0.45 pg/L
				Pesticides*/PCBs	2.2×10^{-4}	PCBs ^b	14.1 µg/L (PCB-1242)	0.50 µg/L
				SVOCs	8.2×10^{-6}	Bis(2-ethylhexyl)phthalate	124 µg/L	4.0 µg/L
		Surface Soil	Human (Total Risk = 6.0×10^{-5})	PCBs	4.0×10^{-5}	PCB-1260	0.986 mg/kg	0.066 mg/kg
				SVOCs	8.8×10^{-6}	Benzo(a)pyrene	0.55 mg/kg	0.061 mg/kg
					1.2×10^{-6}	Benzo(b)fluoranthene	1.12 mg/kg	0.610 mg/kg
					4.6×10^{-6}	Dibenzo(a,h)anthracene	0.03 mg/kg	0.061 mg/kg

Table 1-2
(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk ^a	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
LF007	Landfill 2 Area E	Surface Soil	Human (Total Risk = 7.8×10^{-4})	PCBs	7.1×10^{-4}	PCB-1260	336 mg/kg	0.066 mg/kg
				Metals	7.2×10^{-5}	Arsenic	33.4 mg/kg	49.0 mg/kg
LF007	Landfill 2	Surface Soil	Ecological	Metals	HQ > 1,000	Antimony	32.5 mg/kg	0.008 mg/kg
					10 < HQ < 100	Cadmium	11.9 mg/kg	0.112 mg/kg
					10 < HQ < 100	Copper	72 mg/kg	4.75 mg/kg
					1 < HQ < 10	Mercury	0.554 mg/kg	2.26 mg/kg
					100 < HQ < 1,000	Molybdenum	21.4 mg/kg	0.041 mg/kg
					10 < HQ < 100	Lead	343 mg/kg	3.25 mg/kg
					1 < HQ < 10	Silver	39.7 mg/kg	0.20 mg/kg
					10 < HQ < 100	Vanadium	195 mg/kg	15.41 mg/kg
					100 < HQ < 1,000	Zinc	1,200 mg/kg	4.9 mg/kg
				Pesticides*/PCBs	1 < HQ < 10	PCB-1260	336 mg/kg	0.034 mg/kg

^a = Risk is for each COC contributing to total risk. Human carcinogenic health risks of greater than one-in-one million (i.e., $> 1 \times 10^{-6}$) are reported. Noncarcinogenic human health risks are reported as hazard indexes (HI); an HI greater than 1 suggests there may be a potential for adverse effects. Ecological risks are reported as maximum hazard quotients (HQ); an HQ greater than 1 suggests there may be a potential for adverse effects.

^b = PCBs include Aroclors 1242 and 1248.

* Pesticides have been deleted from consideration in the FS. See text.

Note: All metals concentrations are dissolved (filtered samples).

AOC = Area of Concern
BHC = hexachloro benzene
DDD = 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethane
DDE = 2,2-bis(p-chlorophenyl)-1,1-dichloroethylene
DDT = 2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane

HI = Hazard Index
HQ = Hazard Quotient
IRG = Interim Remediation Goal
IRP = Installation Restoration Program
PCB = Polychlorinated Biphenyls

SVOCs = Semivolatile Organic Compounds
TBD = To be determined during agency negotiations
TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
TCE = Trichloroethene
VOCs = Volatile Organic Compounds

1.3

EIOU RI Summary

The EIOU, the largest OU, covers approximately 1,726 acres (see Figure 1-11) and includes industrial shops, administration facilities, runways, taxiways, aircraft parking apron, inactive sewage treatment and associated ponds, open fields, vernal pools, and Union Creek (Weston, 1995).

The contaminants detected in soil and groundwater are primarily VOCs including TCE. Certain metals, dioxin, and PCBs were also detected in samples of sediment, soil, surface water, and groundwater.

Based on the RI, the 13 sites recommended for evaluation in the FS are:

- SD001 (Union Creek). Union Creek within the EIOU downstream of Outfall III;
- FT002 (FTA-1). Fire Training Area reportedly near Travis Boulevard;
- FT003 (FTA-2). Fire Training Area used from 1950 to 1952;
- FT004 (FTA-3). Fire Training Area reportedly used from 1953 to 1962;
- FT005 (FTA-4). Fire Training Area located near the decommissioned sewage treatment plant;
- OT010 (Sludge Disposal Site). Area of sludge disposal in the northeastern corner of the sewage treatment plant area;
- SS015 (SSA and Facility 552). A grassy area east of Facility 550 and a hazardous waste accumulation point;
- SS016 (OSA, Facilities 11, 13/14, 20, 42/1941 and 139/144, and SSRW). Oil Spill Area (OSA), flightline support, aircraft washrack, control tower, waste accumulation point/aerospace ground equipment washrack, vehicle/heavy equipment maintenance and Storm Sewer System C;

- WP017 (Oxidation Ponds). Part of the decommissioned sewage treatment plant consisting of 18 ponds covering approximately 34 acres;
- SS029 (MW-329 Area). Source not identified, located north of MW-269;
- SS030 (MW-269 Area). Located near Facility 1125 (radar facility) in the southern portion of the Base;
- SD031 (Facility 1205). Generator maintenance facility; and
- ST032 (MW-107 Area and MW-246 Area).

The sites and contaminants are presented in Table 1-3. The COCs in Table 1-3 differ from those in the summary section of the *Final EIOU Remedial Investigation* (Weston, 1995). Revised COCs are indicated with a footnote in the table. These revisions result in the addition of new media of concern at two sites: soil at SS029 and soil at SS030. These revisions are based on site-specific risk from groundwater at each site and revised risk calculations made from January to April 1996. The main difference in the approach was to calculate estimated groundwater risks on a site-specific basis, rather than an EIOU-wide basis. This revised approach was taken to be consistent with the risk assessment approach used in the NOU and WIOU. The original EIOU risk assessment was performed according to the October 1993 Work Plan Addendum. At agency meetings in April 1995, site groupings were changed, which also necessitated a recalculation of risk. Other changes included the use of 2,3,7,8-TCDD equivalents, instead of OCDD, to represent dioxins, and the specification of individual, rather than generic, metal COCs. Pesticides were not included for EIOU sites except FT003, WP017, and OT010 based on the findings of the statistical evaluation (CH2M Hill, 1995). Finally, the risks were recalculated by applying the maximum concentration of each COC in groundwater, rather than the upper 95% confidence level concentration. Summaries of the media and primary contaminants recommended for FS consideration by site are shown in Figures 1-12 through 1-24.

Table 1-3
Summary of EIOU Areas, Media, and Contaminants
Recommended for Evaluation in the Feasibility Study

IRP Designation	Site Description	Media	Risk Criteria Exceeded	Risk ^d	Class of Contaminants (Risk Drivers)	Contaminants of Concern ^f	Maximum Reported Concentration in Soil or Groundwater ^c	Interim Remediation Goals
SD001	Storm Sewer III/ Union Creek	Soil	Human	5.5 x 10 ⁻⁵	PAH	benzo(a)pyrene	25 mg/kg	0.26 mg/kg
		Surface Water and Tissue	Ecological	HI > 10	Metals	aluminum	0.544 mg/L ^b	0.087 mg/L ^b
FT002	FTA-1	Soil*	Ecological	HI > 10	Metals	lead chromium mercury selenium silver	739 mg/kg	3.3 mg/kg
							66.6 mg/kg	0.28 mg/kg
							4.62 mg/kg	2.3 mg/kg
FT003	FTA-2	Soil and Tissue	Human	HI > 10	Metals	boron cadmium lead	2.29 mg/kg	0.04 mg/kg
							8.25 mg/kg	0.20 mg/kg
							0.71 mg/kg	436 mg/kg ¹
FT004	FTA-3	Soil and Sediment	Human	HI > 10	Pesticides	gamma-chlordane methoxone	0.208 mg/kg	0.156 mg/kg
							17 mg/kg	3.0 mg/kg
							2.1 x 10 ⁻⁶ mg/kg	1.2 x 10 ⁻⁶ mg/kg
FT004	FTA-3	Soil and Sediment	Ecological	HI > 10	Dioxins/Furan	dioxin	160,000 pg/g	TBD ^a
							22,500 mg/kg	Not Evaluated ^d
							2,450 mg/kg	4.8 mg/kg
FT004	FTA-3	Soil and Sediment	Ecological	HI > 10	Metals	calcium copper antimony cadmium lead zinc	40.7 mg/kg	0.008 mg/kg
							2.38 mg/kg	0.11 mg/kg
							479 mg/kg	3.3 mg/kg
FT004	FTA-3	Soil and Sediment	Ecological	HI > 10	Dioxins	2,3,7,8-TCDD (equivalent)	402 mg/kg	5.0 mg/kg
							9.45 x 10 ⁻⁴ mg/kg	1.2 x 10 ⁻⁶ mg/kg

Table 1-3
(Continued)

IRP Designation	Site Description	Media	Risk Criteria Exceeded	Risk ^d	Class of Contaminants (Risk Drivers)	Contaminants of Concern ^e	Maximum Reported Concentration in Soil or Groundwater ^e	Interim Remediation Goals
FT004 (continued)	FTA-3 (continued)	Groundwater	Human	1.69 x 10 ⁻³	VOC	TCE cis 1,2-DCE 1,2-DCA chloroform* dichlorobromomethane* 1,1-DCE* vinyl chloride* 1,4-dichlorobenzene*	5,200 µg/L 14.7 µg/L 5.12 µg/L 1.81 µg/L 3.1 µg/L 1.28 µg/L 6.1 µg/L 3.8 µg/L	5 µg/L 6 µg/L 0.5 µg/L 100 µg/L 100 µg/L 6 µg/L 0.5 µg/L 5 µg/L
					SVOC	bis(2-ethylhexyl)phthalate	5.49 µg/L	4 µg/L
					Metal	nickel	2,540 µg/L	100 µg/L
FT005	FTA-4	Soil	Human	2.0 x 10 ⁻³	PAH PCB	pyrene aroclor-1254	59.9 mg/kg 1.09 mg/kg	20,000 mg/kg 0.066 mg/kg
					Metals	barium chromium copper lead cadmium nickel selenium zinc	1,940 mg/kg 393 mg/kg 111 mg/kg 337 mg/kg 14.2 mg/kg 347 mg/kg 206 mg/kg 353 mg/kg	5.9 mg/kg 0.281 mg/kg 4.84 mg/kg 3.3 mg/kg 0.11 mg/kg 0.80 mg/kg 0.04 mg/kg 5.0 mg/kg
		Soil, Sediment and Tissue	Ecological	HI > 10	Pesticides	methoxone DDE	21 mg/kg 0.199 mg/kg	3.0 mg/kg 0.15 mg/kg
					Dioxin	2,3,7,8-TCDD (equivalent)	2.08 mg/kg	1.2 x 10 ⁻⁶ mg/kg
					VOC	TCE 1,2-DCA cis 1,2-DCE chloroform* dichlorobromomethane*	120 µg/L 14.2 µg/L 19 µg/L 10 µg/L 1.8 µg/L	5 µg/L 0.5 µg/L 5 µg/L 100 µg/L 100 µg/L
		Groundwater	Human	1.12 x 10 ⁻⁴	SVOC	bis(2-ethylhexyl)phthalate	35.9 µg/L	4 µg/L
					Metal	nickel	370 µg/L	100 µg/L

**Table 1-3
(Continued)**

IRP Designation	Site Description	Media	Risk Criteria Exceeded	Risk ^d	Class of Contaminants (Risk Drivers)	Contaminants of Concern ^e	Maximum Reported Concentration in Soil or Groundwater ^e	Interim Remediation Goals
OT010	SDS	Soil	Ecological	HI > 10	Metals	mercury	1.77 mg/kg	2.3 mg/kg
						silver	18.7 mg/kg	0.2 mg/kg
						zinc	179 mg/kg	5.0 mg/kg
						copper	49.7 mg/kg	4.8 mg/kg
SS015	SSA (Fac. 552)	Soil	Human	1.7 x 10 ⁻³	PAH	DDE	0.0918 mg/kg	0.15 mg/kg
						fluoranthene	1.87 mg/kg	27,000 mg/kg
						molybdenum	12.3 mg/kg	0.04 mg/kg
		Groundwater	Ecological	HI > 10	Metals	antimony	20.7 mg/kg	0.008 mg/kg
						cadmium	22.5 mg/kg	0.11 mg/kg
						chromium	6,470 mg/kg	0.28 mg/kg
						copper	66.2 mg/kg	4.8 mg/kg
						lead	28,200 mg/kg	3.3 mg/kg
						zinc	783 mg/kg	5.0 mg/kg
						mercury	0.345 mg/kg	2.3 mg/kg
						silver	2.74 mg/kg	0.20 mg/kg
					VOC	TCE	25 µg/L	5 µg/L
						cis 1,2-DCE	370 µg/L	6 µg/L
						vinyl chloride	48 µg/L	0.5 µg/L
						1,4-DCB*	3.8 µg/L	5 µg/L
					SVOC	1,2-DCA*	0.39 µg/L	0.5 µg/L
						PCE	12 µg/L	5 µg/L
						bis(2-ethylhexyl)phthalate	6.68 µg/L	4 µg/L
					Metal	nickel	1,500 µg/L	100 µg/L

Table 1-3
(Continued)

IRP Designation	Site Description	Media	Risk Criteria Exceeded	Risk ^d	Class of Contaminants (Risk Drivers)	Contaminants of Concern ^f	Maximum Reported Concentration in Soil or Groundwater ^e	Interim Remediation Goals
SS016	OSA, Fac. 11, Fac. 13/14, Fac. 20, Fac. 42/1941, Fac. 139/144	Soil	Human	8.8×10^{-3}	PAH	fluoranthene	7.71 mg/kg	27,000 mg/kg
					PCB	aroclor-1260	0.452 mg/kg	0.066 mg/kg
		Groundwater	Human	1.11×10^{-2}	VOC	TCE	32,000 µg/L ^g	5 µg/L
						cis 1,2-DCE	4,600 µg/L	6 µg/L
						vinyl chloride	56 µg/L	0.5 µg/L
						benzene	6.4 µg/L	1 µg/L
						chloroform*	4.7 µg/L	100 µg/L
						1,4-DCB*	8.6 µg/L	5 µg/L
						dichlorobromomethane*	0.9 µg/L	100 µg/L
						1,2-DCA	3.97 µg/L	0.5 µg/L
						1,1-DCE	5.4 µg/L	6 µg/L
						PCE	220 µg/L	5 µg/L
WP017	OPS	Soil	Human Ecological	6.6×10^{-4} HI > 10	SVOC	bis(2-ethylhexyl)phthalate	67.3 µg/L	4 µg/L
					Metal	nickel	460 µg/L	100 µg/L
					PCB	aroclor-1260	1.08 mg/kg	0.066 mg/kg
					Metals	cadmium	6.76 mg/kg	0.11 mg/kg
						chromium	77.4 mg/kg	0.25 mg/kg
						molybdenum	4.67 mg/kg	0.04 mg/kg
						nickel	103 mg/kg	0.80 mg/kg
						copper	159 mg/kg	4.8 mg/kg
						selenium	3.37 mg/kg	0.04 mg/kg
						silver	127 mg/kg	0.20 mg/kg
						zinc	553 mg/kg	5.0 mg/kg
					Pesticides	mercury	1.61 mg/kg	2.3 mg/kg
						aluminum	32,700 mg/kg	65 mg/kg
						calcium	24,500 mg/kg	Not Evaluated ^h
						alpha-chlordane	0.224 mg/kg	0.156 mg/kg
						gamma-chlordane	0.417 mg/kg	0.156 mg/kg
						DDD	1.81 mg/kg	1.16 mg/kg
						DDE	0.633 mg/kg	0.15 mg/kg

Table 1-3
(Continued)

IRP Designation	Site Description	Media	Risk Criteria Exceeded	Risk ^d	Class of Contaminants (Risk Drivers)	Contaminants of Concern ^f	Maximum Reported Concentration in Soil or Groundwater ^e	Interim Remediation Goals
SS029	MW-329 Area	Soil	Human	1.96 x 10 ⁻⁶	VOC	TCE*	0.123 mg/kg	17 mg/kg
					SVOC	bis(2-ethylhexyl)phthalate* 2-methylnaphthalene*	0.123 mg/kg 0.149 mg/kg	140 mg/kg TBD
					PAH	benzo(a)anthracene* benzo(a)pyrene* benzo(b)fluoranthene* benzo(k)fluoranthene* chrysene* fluoranthene* indeno(1,2,3-cd)pyrene* naphthalene* pyrene*	0.0393 mg/kg 0.0346 mg/kg 0.0925 mg/kg 0.0925 mg/kg 0.0545 mg/kg 0.038 mg/kg 0.0222 mg/kg 0.0323 mg/kg 0.0383 mg/kg	2.6 mg/kg 0.26 mg/kg 2.6 mg/kg 26 mg/kg 24 mg/kg 27,000 mg/kg 2.6 mg/kg 800 mg/kg 20,000 mg/kg
					Metals	antimony* beryllium* cadmium* cobalt* copper* magnesium* manganese* nickel* zinc*	12.5 mg/kg 0.856 mg/kg 1.12 mg/kg 42.7 mg/kg 54.4 mg/kg 11,600 mg/kg 2,400 mg/kg 47.6 mg/kg 109 mg/kg	680 mg/kg 1.1 mg/kg 850 mg/kg 97,000 mg/kg 63,000 mg/kg TBD 7,800 mg/kg 34,000 mg/kg 100,000 mg/kg
		Groundwater	Human	4.22 x 10 ⁻⁴	VOC	TCE 1,2-DCA cis 1,2-DCE benzene* chloroform* 1,1-DCE* vinyl chloride*	1,300 µg/L 1.13 µg/L 80 µg/L 0.55 µg/L 0.61 µg/L .57 µg/L 0.22 µg/L	5 µg/L 0.5 µg/L 6 µg/L 1 µg/L 100 µg/L 6 µg/L 0.5 µg/L

**Table 1-3
(Continued)**

IRP Designation	Site Description	Media	Risk Criteria Exceeded	Risk ^d	Class of Contaminants (Risk Drivers)	Contaminants of Concern ^f	Maximum Reported Concentration in Soil or Groundwater ^e	Interim Remediation Goals
SS030	MW-269 Area	Soil*	Human	6.41 x 10 ⁻⁵	VOC	toluene* xylenes* 1,1,1-TCA* TCE* MEK*	0.00271 mg/kg 0.00425 mg/kg 0.00537 mg/kg 0.197 mg/kg 0.0181 mg/kg	2,800 mg/kg 990 mg/kg 3,000 mg/kg 17 mg/kg 34,000 mg/kg
					PAH	benzo(a)anthracene* benzo(a)pyrene* benzo(b)fluoranthene* benzo(k)fluoranthene* chrysene* fluoranthene* phenanthrene* pyrene*	0.0393 mg/kg 0.0498 mg/kg 0.0773 mg/kg 0.0804 mg/kg 0.0614 mg/kg 0.078 mg/kg 0.193 mg/kg 0.148 mg/kg	2.6 mg/kg 0.26 mg/kg 2.6 mg/kg 26 mg/kg 24 mg/kg 27,000 mg/kg TBD 20,000 mg/kg
					SVOC	benzyl butyl phthalate* bis(2-ethylhexyl)phthalate*	0.177 mg/kg 1.1 mg/kg	100,000 mg/kg 140 mg/kg
					Metals	antimony* beryllium* barium* chromium* copper* lead* magnesium* nickel* selenium* zinc*	37.6 mg/kg 0.946 mg/kg 1,350 mg/kg 58.5 mg/kg 106 mg/kg 97.4 mg/kg 11,300 mg/kg 51.2 mg/kg 148 mg/kg 392 mg/kg	680 mg/kg 1.1 mg/kg 100,000 mg/kg 450 mg/kg 63,000 mg/kg 1,000 mg/kg TBD 34,000 mg/kg 8,500 mg/kg 100,000 mg/kg
		Groundwater	Human	7.6 x 10 ⁻⁴	VOC	TCE chloroform* dichlorobromomethane* 1,2-DCA*	2,400 µg/L 1.2 µg/L 0.53 µg/L 0.34 µg/L	5 µg/L 100 µg/L 100 µg/L 0.5 µg/L
					Metal	nickel	903 µg/L	100 µg/L
					Metals	barium lead zinc	1,350 mg/kg 97.4 mg/kg 392 mg/kg	5.8 mg/kg 3.3 mg/kg 5.0 mg/kg
		Soil and Tissue ^e	Ecological	HI > 10				

Table 1-3
(Continued)

IRP Designation	Site Description	Media	Risk Criteria Exceeded	Risk ^d	Class of Contaminants (Risk Drivers)	Contaminants of Concern ^f	Maximum Reported Concentration in Soil or Groundwater ^e	Interim Remediation Goals
SD031	Fac. 1205	Groundwater	Human	5.24 x 10 ⁻²	VOC	TCE benzene 1,1-DCE cis 1,2-DCE carbon tetrachloride chloroform 1,2-DCA vinyl chloride	8,100 µg/L 6.75 µg/L 7,300 µg/L 3,600 µg/L 11 µg/L 4.34 µg/L 0.41 µg/L 0.22 µg/L	5 µg/L 1 µg/L 6 µg/L 6 µg/L 0.5 µg/L 100 µg/L 0.5 µg/L 0.5 µg/L
ST032	MW-107 Area and MW-246 Area	Soil	Human	1.29 x 10 ⁻³	Metal VOC PAH Pesticide PCB Metals	nickel benzene* 1,1-DCE* TCE* benzo(a)pyrene* benzo(b)fluoranthrene* chrysene* indeno(1,2,3-c,d)pyrene* alpha-chlordane* aroclor-1260* arsenic* cadmium* copper* nickel*	2,050 µg/L 12.6 mg/kg 0.0049 mg/kg 0.0015 mg/kg 0.034 mg/kg 0.0692 mg/kg 0.0394 mg/kg 0.024 mg/kg 0.000356 mg/kg 0.0292 mg/kg 14.9 mg/kg 2.57 mg/kg 66.4 mg/kg 54.7 mg/kg	100 µg/L 3.2 mg/kg 0.082 mg/kg 17 mg/kg 0.26 mg/kg 2.6 mg/kg 24 mg/kg 2.6 mg/kg 1.5 mg/kg 0.066 mg/kg 2.4 mg/kg 850 mg/kg 63,000 mg/kg 34,000 mg/kg
		Groundwater	Human	1.5 x 10 ⁻²	VOC SVOC	benzene TCE 1,1-DCE* xylenes* bis(2-ethylhexyl)phthalate*	5,040 µg/L 64 µg/L 0.36 µg/L 6,702 µg/L 153 µg/L	1 µg/L 5 µg/L 6 µg/L 1,750 µg/L 4 µg/L

^a = To be determined during negotiations with agencies.

^b = Surface water.

^c = Risk assessment quality data only, 0 to 20' bgs for human health, 0 to 1' bgs or 0 to 3', depending on receptor, for ecological.

^d = Human risk for groundwater is total potential lifetime cancer risk. The ecological Hazard Index (HI) is based on maximum exposure concentrations for one or more receptors.

^e = FTA-4 tissue data used to calculate HI.

Table 1-3
(Continued)

f	=	Metals detected at or below the maximum reference area concentrations in soil are excluded. However, metals excluded from this table may be a concern due to concentrations detected in tissue. All contaminants are included which contributed to risk, although, in several cases, remediation may not be appropriate since the maximum concentrations are one or more orders of magnitude less than IRGs.
g	=	Recent testing has documented higher concentrations of TCE, up to a maximum of approximately 180,000 ppb. However, these results were derived from Cone Penetrometer Testing (CPT) data and should not be directly compared to monitoring well data.
h	=	EPA Region IV freshwater screening value.
i	=	Weston did not use a bioaccumulation factor. Number is based solely on soil ingestion.
j	=	Calcium is an essential nutrient and does not have a critical toxicity value to generate an IRG.
DCA	=	Dichloroethane
DCB	=	Dichlorobenzene
DCE	=	Dichloroethene
HI	=	Maximum exposure concentration Hazard Index for one or more receptors.
IRG	=	Interim Remedial Goals
mg/kg	=	Milligrams per Kilogram
µg/L	=	Micrograms per Liter
MW	=	Monitoring Well
OSA	=	Oil Spill Area
PAH	=	Polynuclear Aromatic Hydrocarbon
PCB	=	Polychlorinated Biphenyl
PCE	=	Tetrachloroethene
pg/g	=	Picograms per Gram
SDS	=	Sludge Disposal Site
SSA	=	Solvent Spill Area
TBD	=	To be determined during agency negotiations
TCE	=	Trichloroethene
VOC	=	Volatile Organic Compound

* This table is an updated version of Table ES-2 from the EIOU RI (Weston, 1995). Revisions are based on recalculated risks (April, 1996). Contaminants of concern that have been added to this table are noted by an asterisk (*). In addition, PCB (Aroclor-1260) was removed as a human health risk (11 April 1996) based on an industrial exposure scenario rather than a residential scenario.

In addition to the contaminants identified in Table 1-3, the EIOU ERA identified other chemicals of ecological concern. Instead of an HQ analysis, a weight of evidence analysis was used to relate toxic effects with chemicals identified at the site. Weight of evidence analysis is based on establishing an observed toxic effect and establishing compounds existing at the site. The two (toxic effect and compounds) are then assumed to be related. In the case of surface water at Union Creek, observance of gross pathology (skin lesions, fin rot, and spinal curvature in fish) were noted in field observations. Chemical analysis of the water identified metals and organics concentrations. These concentrations were compared to Federal and State acute and chronic water quality criteria. Any of the concentrations exceeding criteria were identified and considered to be eliciting the observed toxic effect. In the case of sediments, site specific bioassay and macroinvertebrate analysis results established a toxic effect at specific sites. Chemical concentrations in sediments that exceeded an effects range-median value were then selected as those eliciting the toxic effects. Table 1-4 presents sites, media and contaminants identified by weight of evidence analysis as potentially eliciting a toxic effect at Union Creek.

1.3.1 EIOU Interim Removal Actions

Three interim removal actions are in various stages of implementation at three sites within the EIOU. These actions address COCs that pose an immediate threat to human health or the environment. The NEWIOU remedial action will consider, and be coordinated with, these interim actions. A summary of the interim actions is presented below.

TCE Source Control Area Removal Action

Using results from groundwater sampling events conducted from 1988 to 1992, Travis AFB determined that a removal action was required at Site SS016 (OSA). The COCs include TCE, TCA and 1,2-DCA. The *Engineering Evaluation/Cost Analysis for the TCE Source Control Area Removal Action* (CH2M Hill, 1994) provides an analysis of viable contaminant removal action alternatives. The selected alternative for the removal action was

Table 1-4

EIOU Contaminants of Concern Identified by Weight of Evidence Analysis

IRP Designation	Site Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Contaminant of Concern
SD001	Storm Sewer III/Union Creek	Sediment	Ecological	Metals	Cadmium
					Lead
					Mercury
					Molybdenum
					Nickel
					Silver
					Zinc
				PAHs	Benzo(a)anthracene
					Benzo(a)pyrene
					Chrysene
					Dibenzo(a,h)anthracene
					Phenanthrene
					Pyrene
		Surface Water	Ecological	Pesticides	Chlordane
					DDD
					DDE
					Dieldrin
				Metals	Aluminum
					Selenium
					Silver
				Pesticides	Chlordane
					Dieldrin
					Beta endosulfan
FT003	FTA-2	Surface Water (vernal pool)	Ecological	Metals	Aluminum

pumping monitoring well (MW)-214, followed by an activated carbon treatment system for polishing, and disposing treated groundwater by using the water for irrigation or by discharging to the storm drain or sanitary sewer. The Source Control Area Removal Action has been integrated with the Tower Area Removal Action (TARA). The integration is described in an Explanation of Significant Differences (Radian, 1996b). The Explanation of Significant Differences describes changes to the "Final Action Memorandum for the Tower Area Removal Action" (Radian, 1994a). The Explanation identified two additional removal actions for the contaminated groundwater in SS016. The first involves installation of a horizontal groundwater extraction well in an area where TCE concentrations in groundwater exceed 1,000 $\mu\text{g/L}$. The second is use of Two-phase Extraction® in the source area of SS016. The key objectives for the removal actions are to:

- Contain groundwater contamination in areas where TCE concentrations exceed 10,000 $\mu\text{g/L}$;
- Remove contaminants from the subsurface to support long-term remediation; and
- Provide information to help design the long-term remedial action in the SS016.

The proposed removal actions have been designed and construction is underway with implementation scheduled for early 1997.

Tower Area Removal Action

Data from the remedial investigation of the EIOU were used to formulate the initial removal action for the TARA located in Site SS016. Recent investigations in the TARA area conducted in 1994 characterized the extent of chlorinated hydrocarbons, particularly TCE in groundwater, which has been detected as high as 2,600 $\mu\text{g/L}$.

A treatability study at the 300 Area Ramp has been initiated to evaluate the effectiveness of using horizontal wells for groundwater extraction. Groundwater is being extracted through two horizontal wells located beneath the eastern portion of the 300 Ramp. The extracted groundwater is conveyed through an underground pipe to the treatment system located in the area of former Hangar 12. At times, soil vapor has been extracted concurrently with groundwater from the wells and treated by vapor phase granular activated carbon (GAC). The treatment system includes a flow equalization tank, a transfer pump followed by a particulate filter and two carbon vessels in series. Treated water from the system is used for irrigation of the 200 Building Area. This removal action has established a treatment system that can be used to remediate other sites with modifications to the existing system. The FS will consider use of the system for other sites.

From mid-May 1995 to the end of 1995, the system extracted approximately 10 million gallons of contaminated water and removed about 100 pounds of volatile organic contaminants, primarily TCE. The average influent concentrations have been approximately 1,100 $\mu\text{g/L}$ TCE, 200 $\mu\text{g/L}$ dichloroethylene, and 5 $\mu\text{g/L}$ vinyl chloride. The capital cost of the system is \$1,100,000 and operation and maintenance (O&M) has been \$250,000 over the nine month period preceding February 1996.

Outfall III

Outfall III (part of SD001) is a surface water treatment system using a liquid phase carbon system. The purpose of the system is to treat surface water (up to 1,500 gallons per minute [gpm]) collected via the storm sewer system from the upstream industrial area (OHM, 1996). Contaminants detected in surface water samples from Outfall III include VOCs, SVOCs, and metals. The system with a capital cost of 1.27 million dollars was operated from June through September 1995. Treated water was discharged to Union Creek. Although currently not in use, the system is permanent and could be used to treat groundwater from nearby sites. Water samples will be collected from Outfall III under the groundwater sampling and analysis plan to monitor surface water quality.

The WIOU is located in the west-central portion of Travis AFB and includes facilities related to the maintenance and repair of C-141 and C-5 aircraft (Figure 1-25). Facilities include aircraft taxiways, a refueling area, fuel storage areas, and portions of three pipeline systems: the fuel distribution pipeline, Storm Sewer System II (formerly Storm Sewer System B), and the sanitary sewer. Several sites were combined because of geographic proximity or commingling of contaminants (Radian, 1995c). The combined sites are as follows:

- Facilities 872, 873, and 876;
- Sanitary Sewer System including Facilities 837, 838, 919, 977, 981, the Area G Ramp, and Ragsdale/V Area; and
- Facilities 810 and 1917, Storm Sewer System II, and South Gate Area.

Two primary contaminant types were identified in WIOU media: TPH and related compounds, primarily benzene, and chlorinated solvents, primarily TCE. These two types of contaminants were generally detected in different areas: the TPH contamination occurs at jet fuel spill areas, and TCE contamination occurs at sites and facilities associated with industrial activities. These contaminants were detected in soil, soil gas, surface water, sediment, and groundwater samples at various locations within the WIOU.

The sites recommended for evaluation in the FS include:

- SD033 (Storm Sewer System II, Facilities 810 and 1917, South Gate Area, and West Branch of Union Creek). Underground storm sewer, aircraft refurbishing, and channelized Union Creek within the WIOU;
- SD034 (Facility 811). Indoor washrack;
- SD035 (Facility 818/819). Aircraft repair, wash and painting facilities;

- SD036 (Facilities 872/873/876). Civil engineering use; and
- SD037 (Sanitary Sewer System, Facilities 837/838, 919, 977, and 981, Ragsdale/V Area, and Area G Ramp). Sanitary sewer, aircraft maintenance, equipment maintenance, and area near jet fuel distribution lines.

A summary of these areas is presented in Table 1-5 and is shown in Figures 1-26 through 1-30.

Based on the conceptual models of the contaminated media, contaminant types, and contaminant volumes at the sites in the NEWIOU, RAOs and ARARs were developed. Section 2.0 discusses the RAOs and ARARs, and their use in screening remedial alternatives will be discussed in Section 3.0.

Table 1-5
Summary of WIOU Sites and Contaminants
Recommended for Evaluation in the Feasibility Study

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk ^a	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD033	Storm Sewer System II (former Storm Sewer System B) (includes Facilities 810, 1917, and South Gate Area, and the West Branch of Union Creek)	Groundwater	Human (Total Risk = 5.6×10^{-5})	VOCs	3.6×10^{-5}	Trichloroethene	941 µg/L	5 µg/L
					1.7×10^{-6}	1,1-DCE	0.420 µg/L	6 µg/L
					Exceeds MCL	1,2-Dichloroethane	1.36 µg/L	0.5 µg/L
					Exceeds MCL	cis-1,2-Dichloroethene	199 µg/L	6 µg/L
					Exceeds Standard	TPH-gasoline	1,000 µg/L	TBD
		Soil Gas	NA	SVOC	Exceeds Standard	TPH-E	1,420 µg/L	TBD
					NA	Trichloroethene	54,000 ppbv	TBD ^b
					NA	Benzene	506 ppbv	TBD ^b
					NA	cis-1,2-Dichloroethene	23,000 ppbv	TBD ^b
					NA	TPH-gasoline	2,700,000 ppbv	TBD ^b
		Sediment	Ecological	VOCs	HQ:10-100	Acetone	2,500 µg/kg	64 µg/kg
					HQ:10-100	Carbon Disulfide	560 µg/kg	13 µg/kg
					HQ:1-10	Benzo(a)anthracene	3.66 mg/kg	0.27 mg/kg
					HQ:1-10	Benzo(a)pyrene	4.04 mg/kg	0.43 mg/kg
					HQ:1-100	2-Butanone	16,000 µg/kg	1-100 µg/kg ^c
				SVOCs	HQ:1-10	Pyrene	4.44 mg/kg	0.66 mg/kg
					HQ:1-10	Chrysene	4.34 mg/kg	0.38 mg/kg

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk*	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD033 (cont'd)	Storm Sewer System II (former Storm Sewer System B) (includes Facility 810, 1917, and South Gate Area, and the West Branch of Union Creek) (cont'd)	Sediment (cont'd)	Ecological (cont'd)	SVOCs (cont'd)	HQ:1-10	Benzo(b)fluoranthene	7.7 mg/kg	0.52 mg/kg
					HQ:1-10	Anthracene	2.8 mg/kg	0.085 mg/kg
					HQ:1-10	Benzo(a)pyrene	4.04 mg/kg	0.43 mg/kg
					HQ:1-10	Dibenzo(a,h)anthracene	0.362 mg/kg	0.063 mg/kg
					HQ:1-10	Fluorene	1.19 mg/kg	0.54 mg/kg
					HQ:1-10	Indeno(1,2,3,-c,d)pyrene	1.22 mg/kg	0.18 mg/kg
					HQ:1-10	Cadmium	13.0 mg/kg	1.2 mg/kg
		Metals			HQ:1-10	Molybdenum	5.76 mg/kg	2.78 mg/kg
					HQ:1-10	Nickel	63.6 mg/kg	21 mg/kg
					HQ:1-10	Lead	433 mg/kg	275 mg/kg
		Surface Soil	Ecological	Metals	HQ:1-10	Mercury	1.28 mg/kg	0.418 mg/kg
					HQ:1-10	Zinc	315 mg/kg	134 mg/kg
		Surface Water	Ecological	Metals	HQ:10-100	Barium	0.135 mg/L (dissolved)	20-60 mg/L ^d
					HQ:1-10	Copper	0.0304 mg/L (total)	0.00934 mg/L ^d
					HQ:1-10	Lead	0.248 mg/L (dissolved) 0.0596 mg/L (total)	0.00224 mg/L ^d

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk ^a	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD034	Facility 811	Groundwater	Human (Total Risk = 6.2×10^{-4})	VOCs	NA	LNAPL (PD-680)	~1 foot thick	NA
					3.0×10^{-5}	Trichloroethene	740 $\mu\text{g/L}$	5 $\mu\text{g/L}$
					3.1×10^{-5}	Vinyl Chloride	2.38 $\mu\text{g/L}$	0.5 $\mu\text{g/L}$
					1.2×10^{-6}	1,1 Dichloroethene	0.317 $\mu\text{g/L}$	6 $\mu\text{g/L}$
					Exceeds MCL	Benzene	6.8 $\mu\text{g/L}$	1 $\mu\text{g/L}$
					Exceeds MCL	cis-1,2-Dichloroethene	496 $\mu\text{g/L}$	6 $\mu\text{g/L}$
					1.2×10^{-5}	Tetrachloroethene	88 $\mu\text{g/L}$	5 $\mu\text{g/L}$
					Exceeds Standard	TPH-gasoline	10,600,000 $\mu\text{g/L}$	TBD
		Soil Gas	NA	SVOCs	Exceeds Standard	TPH-E	13,000,000 $\mu\text{g/L}$	TBD
					3.3×10^{-4}	bis(2-ethylhexyl)phthalate	6,390 $\mu\text{g/L}$	4.8 $\mu\text{g/L}$
					NA	Trichloroethene	180 ppbv	TBD ^b
					NA	Tetrachloroethene	230 ppbv	TBD ^b
					NA	cis-1,2-Dichloroethene	3,500 ppbv	TBD ^b
	Soil		NA	VOCs	Exceeds Standard	TPH-gasoline	15,900 mg/kg	10 mg/kg
				SVOCs	Exceeds Standard	TPH-E	11,600 mg/kg	100 mg/kg

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk*	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals		
SS035	Facilities 818 and 819	Surface Soil	Human (Total Risk = 1.5×10^{-5})	Pesticides/PCBs	7.9×10^{-5}	PCBs Arochlor 1260	0.523 mg/kg	0.34 mg/kg		
			Ecological	Metals	HQ:1-10	Molybdenum	46.4 mg/kg	7.65 mg/kg		
					HQ:10-100	Silver	86 mg/kg	0.972 mg/kg		
		Soil Gas	NA	VOCs	HQ:1-10	Vanadium	220 mg/kg	15.23 mg/kg		
					NA	Trichloroethene	1,100 ppbv	TBD ^b		
		Groundwater	NA	VOCs	NA	Vinyl Chloride	74 ppbv	TBD ^b		
				SVOCs	Exceeds MCL	Trichloroethene	21 µg/L	5 µg/L		
		SD036	Facilities 872, 873, and 876	Groundwater	Human (Total Risk = 1.3×10^{-5})	VOCs	Exceeds Standard	TPH-E	160 µg/L	TBD
							2.1×10^{-3}	Vinyl Chloride	198 µg/L	0.5 µg/L
							2.4×10^{-5}	Trichloroethene	308 µg/L	5 µg/L
2.2×10^{-5}	1,1-Dichloroethene						3.71 µg/L	6 µg/L		
HI = 6.2	cis-1,2-Dichloroethene						3,870 µg/L	6 µg/L		
Exceeds MCL	1,2-Dichloroethane						1.36 µg/L	0.5 µg/L		
1.2×10^{-6}	Benzene						3.87 µg/L	1.0 µg/L		
1.0×10^{-6}	Bromodichloromethane						2.26 µg/L	0.18 µg/L		
1.6×10^{-4}	Tetrachloroethene						382 µg/L	5 µg/L		
Exceeds Standard	TPH-gasoline						4,380 µg/L	TBD		
Exceeds Standard	TPH-E	480 µg/L	TBD							

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk*	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD036 (cont'd)	Facilities 872, 873, and 876 (cont'd)	Soil Gas	NA	VOCs	NA	Trichloroethene	36,000 ppbv	TBD ^b
					NA	Vinyl Chloride	110,000 ppbv	TBD ^b
					NA	1,1-Dichloroethene	100 ppbv	TBD ^b
					NA	cis-1,2-Dichloroethene	230,000 ppbv	TBD ^b
					NA	Benzene	1,600 ppbv	TBD ^b
					NA	Tetrachloroethene	51,000 ppbv	TBD ^b
					NA	TPH-gasoline	4,500,000 ppbv	TBD ^b
					Luft Manual	TPH-gasoline	292 mg/kg	10 mg/kg
SD037	Sanitary Sewer (includes Facilities 837, 838, 981, 977, the Area G Ramp, and Ragsdale/V Area)	Soil	NA	VOCs	Luft Manual	TPH-E	621 mg/kg	100 mg/kg
				SVOCs				
		Groundwater	Human (Total Risk = 1.6×10^{-4})	VOCs	1.1×10^{-6}	1,1-Dichloroethene	0.598 $\mu\text{g/L}$	6 $\mu\text{g/L}$
					Exceeds MCL	1,2-Dichloroethane	0.597 $\mu\text{g/L}$	0.5 $\mu\text{g/L}$
					1.9×10^{-7}	Benzene	1.93 $\mu\text{g/L}$	1.0 $\mu\text{g/L}$
					Exceeds MCL	Bromodichloromethane	0.69 $\mu\text{g/L}$	0.18 $\mu\text{g/L}$
					Exceeds MCL	Carbon Tetrachloride	60.7 $\mu\text{g/L}$	5 $\mu\text{g/L}$
					1.3×10^{-8}	Chloromethane	1.03 $\mu\text{g/L}$	1.51 $\mu\text{g/L}$
					4.6×10^{-5}	Tetrachloroethene	407 $\mu\text{g/L}$	5 $\mu\text{g/L}$
					5.4×10^{-5}	Trichloroethene	6,990 $\mu\text{g/L}$	5 $\mu\text{g/L}$
					6.0×10^{-5}	Vinyl Chloride	60.2 $\mu\text{g/L}$	0.5 $\mu\text{g/L}$
					Exceeds MCL	cis-1,2-Dichloroethene	340 $\mu\text{g/L}$	6 $\mu\text{g/L}$

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk ^a	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD037 (cont'd)	Sanitary Sewer (cont'd)	Groundwater	Human	VOCs	Exceeds Standard	TPH-gasoline	4,160 µg/L	TBD
				SVOCs	1.4 x 10 ⁻⁶	bis(2-ethylhexyl)phthalate	139 µg/L	4.8 µg/L
					Exceeds MCL	Naphthalene	115 µg/L	23 µg/L
					Exceeds Standard	TPH-E	34,000 µg/L	TBD
		Surface Flux	Human	VOCs	3.6 x 10 ⁻⁴	1,3-Butadiene	11 ppbv	0.0031 ppbv
					HI:163	Acrolein	3.6 ppbv	0.0092 ppbv
					2.4 x 10 ⁻⁵	Benzene	22 ppbv	0.072 ppbv
					5.1 x 10 ⁻⁶	Chloromethane	38 ppbv	0.53 ppbv
					Exceeds MCL	Methanol	1,600 ppbv	1,400 ppbv
					3.0 x 10 ⁻⁶	Vinyl Chloride	0.31 ppbv	0.0086 ppbv
					4.3 x 10 ⁻⁶	Benzo(a)anthracene	1.68 mg/kg	0.11 mg/kg
		Surface Soil	Human	SVOCs	3.7 x 10 ⁻⁶	Benzo(a)pyrene	1.4 mg/kg	0.14 mg/kg
					5.4 x 10 ⁻⁶	Benzo(b)fluoranthene	1.3 mg/kg	2.6 mg/kg
					1.1 x 10 ⁻⁷	bis(2-ethylhexyl)phthalate	0.309 mg/kg	140 mg/kg
		Soil Gas	NA	VOCs	NA	Trichloroethene	2,800 ppbv	TBD ^b
					NA	Benzene	5,800 ppbv	TBD ^b
					NA	Carbon Tetrachloride	33 ppbv	TBD ^b
					NA	Vinyl Chloride	2,000 ppbv	TBD ^b
					NA	TPH-gasoline	3,600,000 ppbv	TBD ^b

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk*	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD037 (cont'd)	Sanitary Sewer (cont'd)	Subsurface Soil	Human	SVOCs	14.6×10^{-6}	Benzo(k)fluoranthene	1.99 mg/kg	26 mg/kg
		Sediment	Ecological	Metal	HQ = 1-10	Cadmium	1.53 mg/kg	1.2 mg/kg
		Soil	NA	VOCs	Luft Manual	TPH-gasoline	909 mg/kg	10 mg/kg
		Soil	NA	SVOCs	NA	TPE	3,580 mg/kg	100 mg/kg
	Facility 977 (Sanitary Sewer) (SD037)	Groundwater	NA	VOCs	NA	TPH-gasoline	61 µg/L	TBD
					NA	Trichloroethene	12.2 µg/L	5 µg/L
				SVOCs	NA	TPE	2,660,000 µg/L	TBD
				Metals	HQ: 1-10	Copper	50.7 mg/kg	20.2 mg/kg
	Facility 981 (Sanitary Sewer) (SD037)	Surface Soil	Ecological		HQ: 1-10	Lead	410 mg/kg	275 mg/kg
					HQ: 1-10	Mercury	0.922 mg/kg	0.148 mg/kg
					HQ: 1-10	Molybdenum	37.6 mg/kg	7.65 mg/kg
					HQ: 1-10	Zinc	362 mg/kg	134 mg/kg
					3.3×10^{-6}	Benzo(a)anthracene	0.0376 mg/kg	2.6 mg/kg
					5.1×10^{-5}	Benzo(a)pyrene	0.0395 mg/kg	0.26 mg/kg
			Human	SVOCs	7.8×10^{-6}	Benzo(k)fluoranthene	0.0403 mg/kg	26 mg/kg
					2.8×10^{-6}	Indeno(1,2,3-cd)pyrene	0.0227 mg/kg	2.6 mg/kg
					NA	TPE	99,800 mg/kg	100 mg/kg

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk*	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD037 (cont'd)	Facility 981 (Sanitary Sewer) (SD037) (cont'd)	Subsurface Soil	NA	VOCs	NA	TPH-gasoline	49,100 mg/kg	100 mg/kg
				SVOCs	NA	TPE	1,450 mg/kg	100 mg/kg
		Soil Gas	NA	VOCs	NA	TPH-gasoline	15,000,000 ppbv	TBD ^b
						Benzene	100,000 ppbv	TBD ^b
						m,p-Xylene	280,000 ppbv	TBD ^b
		Groundwater	NA	VOCs	NA	Benzene	14 µg/L	1.0 µg/L
						Trichloroethene	2.65 µg/L	6 µg/L
	Area G Ramp (Sanitary Sewer) (SD037)	Soil Gas	NA	SVOCs	NA	TPH-gasoline	790 µg/L	TBD
						TPE	530 µg/L	TBD
				VOCs	NA	TPH-gasoline	17,000,000 ppbv	TBD ^b
						Benzene	120,000 ppbv	TBD ^b

Table 1-5

(Continued)

IRP Designation	Name/Description	Medium	Risk Criteria Exceeded	Class of Contaminants	Risk ^a	Contaminants of Concern	Maximum Reported Concentration	Interim Remediation Goals
SD037 (cont'd)	Area G Ramp (Sanitary Sewer) (SD037) (cont'd)	Groundwater	NA	VOCs	NA	Benzene	2.3 µg/L	1 µg/L
						Tetrachloroethene	17 µg/L	5 µg/L
						Trichloroethene	6.7 µg/L	5 µg/L
						cis-1,2-Dichloroethene	1.32 µg/L	6 µg/L
				SVOCs	NA	TPE	4,100 µg/L	TBD

- ^a = Human carcinogenic health risks of greater than one-in-one million (i.e., $> 1 \times 10^{-6}$) are reported. Noncarcinogenic human health risks are reported as hazard indexes (HI); a HI greater than 1 suggests there may be a potential for adverse effects. COCs were also identified when standards such as MCLs were exceeded (risks were not determined for all COCs).
- ^b = Soil gas IRGs will be determined in the Proposed Plan process, using techniques such as modeling.
- ^c = 2-Butanone ecological IRGs based on dry weight. Reference - "Interim Guidance - Freshwater Navigational Dredging", New York State Department of Environmental Conservation, Division of Water, October 1994.
- ^d = Barium ecological IRGs based on "Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments", U.S. EPA Region V, April 1977.

Note: All metals concentrations are dissolved (filtered samples).

HI = Hazard Index
 IRG = Interim Remediation Goal
 IRP = Installation Restoration Program
 LNAPL = Light Non-Aqueous Phase Liquid
 LUFT = Leaking Underground Fuel Tank
 mg/kg = Milligrams per Kilogram
 NA = No risk assessment performed
 ppbv = Parts per Billion Volume
 SVOCs = Semi-volatile Organic Compounds
 TBD = To be determined during agency negotiations
 TPH-E = Total Petroleum Hydrocarbon - Extractable (also TPE)
 TPH = Total Petroleum Hydrocarbons
 µg/kg = Micrograms per Kilogram
 µg/L = Micrograms per Liter
 VOCs = Volatile Organic Compounds

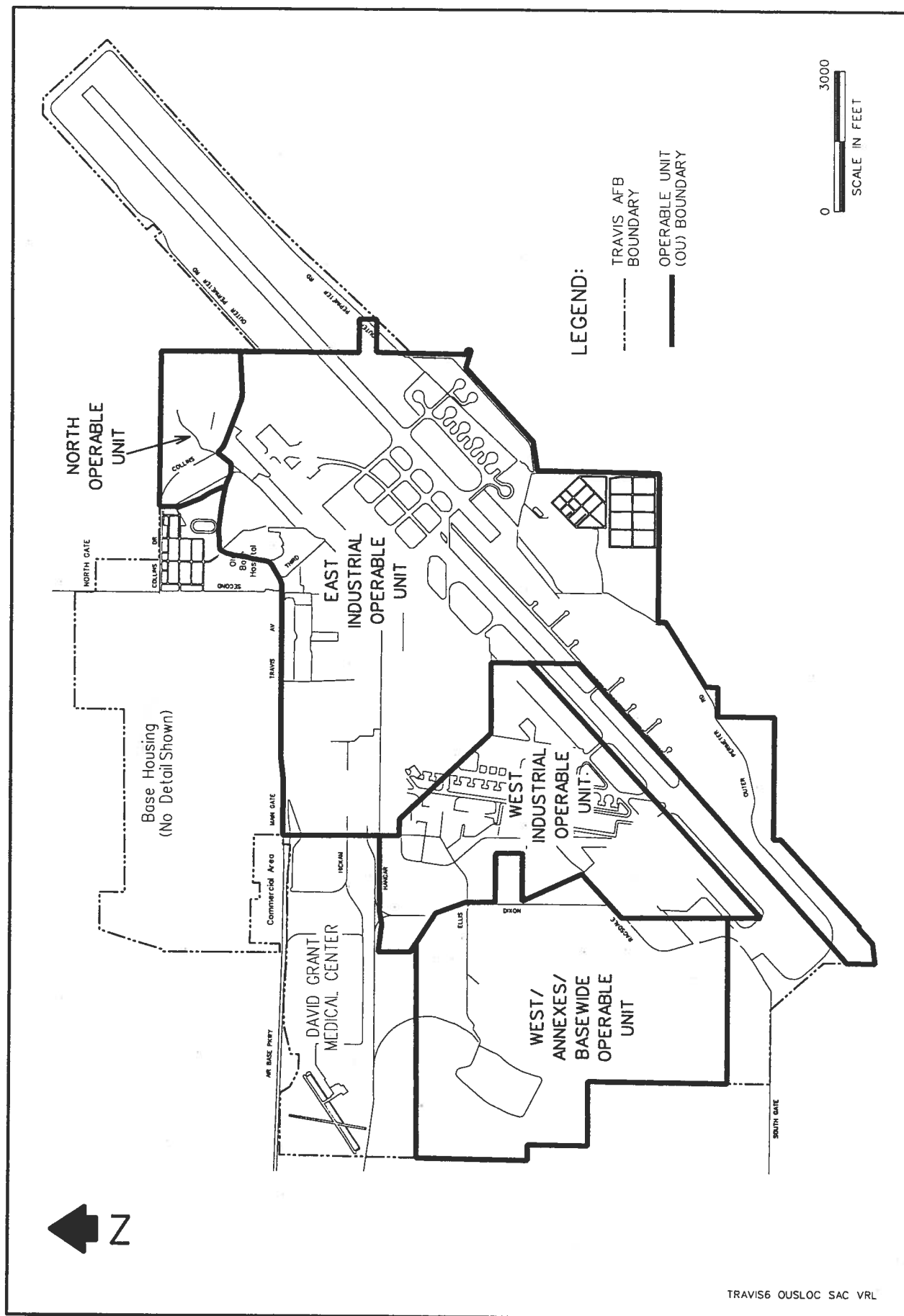
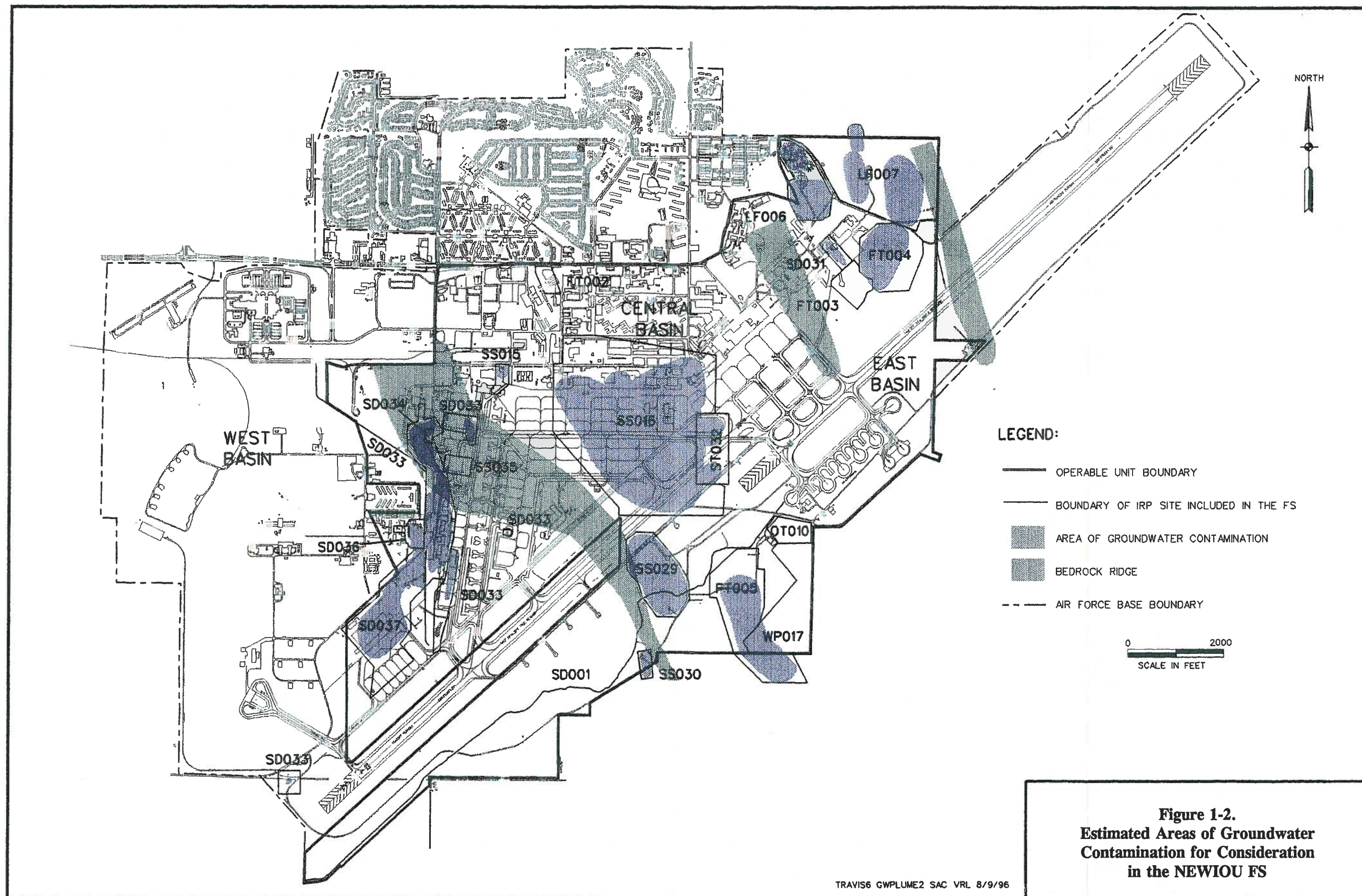
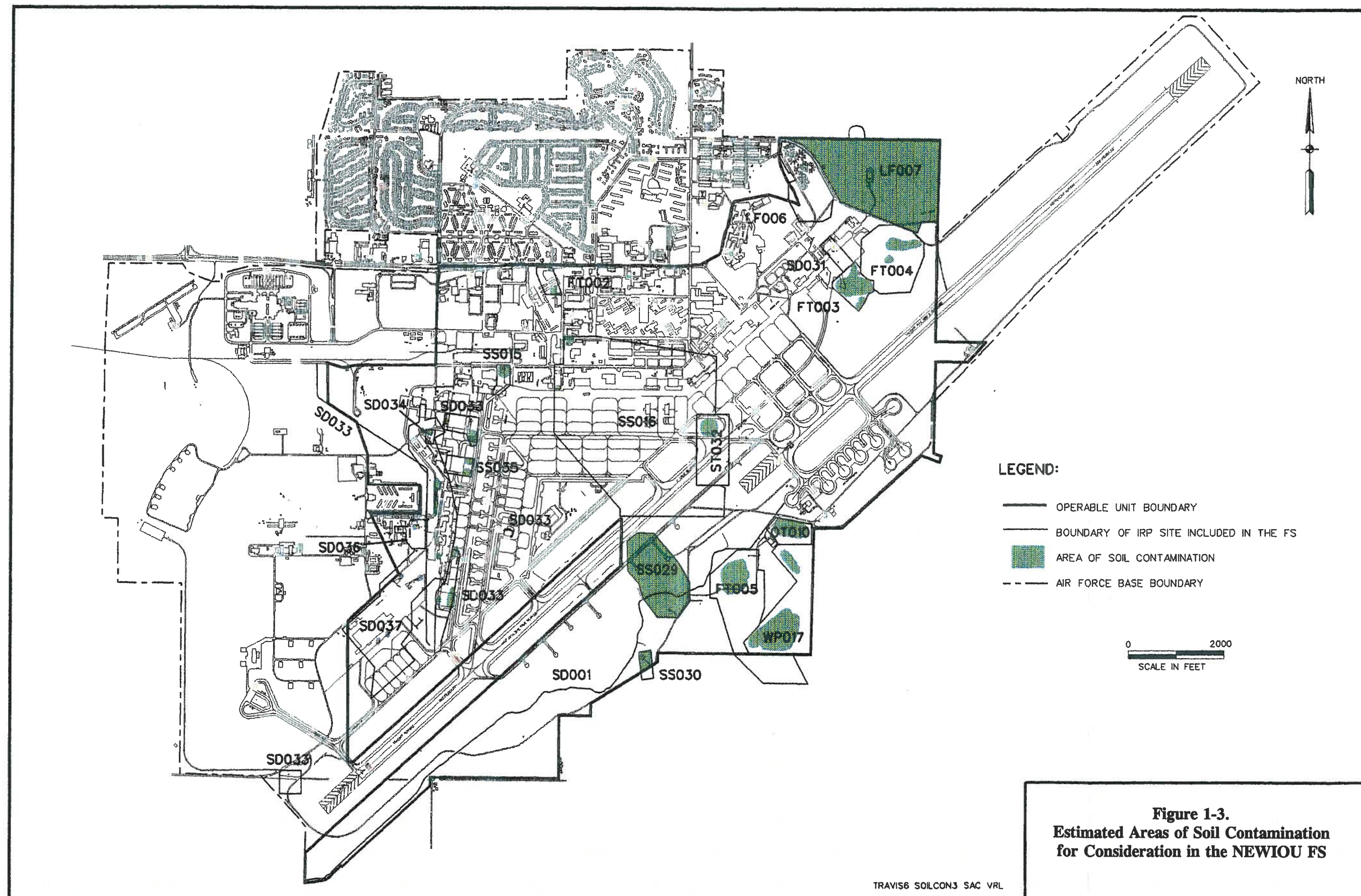


Figure 1-1. Travis AFB and Operable Units





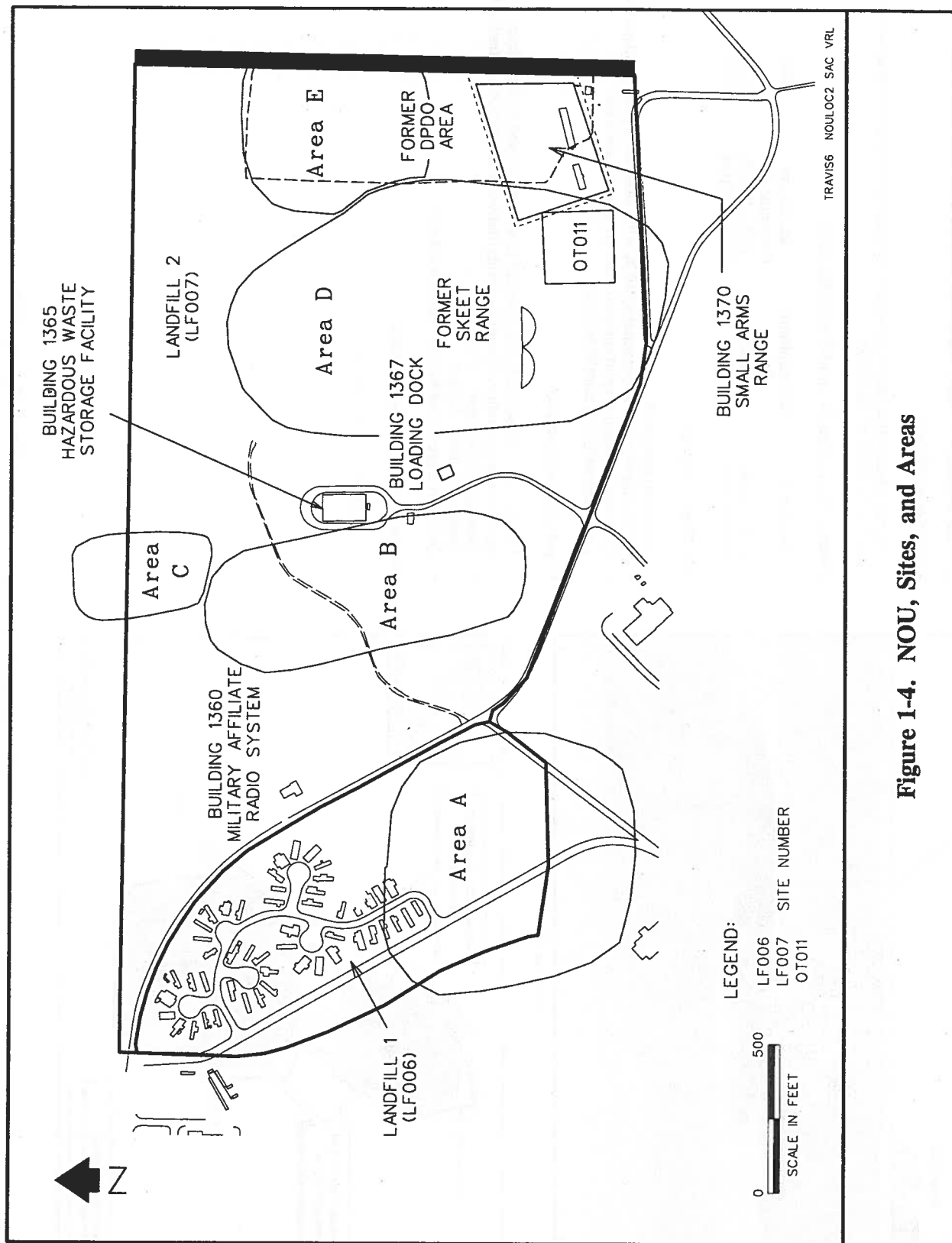


Figure 1-4. NOU, Sites, and Areas

LF006 (Landfill 1, Area A)

Remediation Drivers

- Human health risk associated with chlorinated hydrocarbons in groundwater.
- MCLs for VOC are exceeded.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 20 µg/L	5 µg/L
Groundwater	VOCs	TPH - 330 µg/L	TBD

Site Characteristics

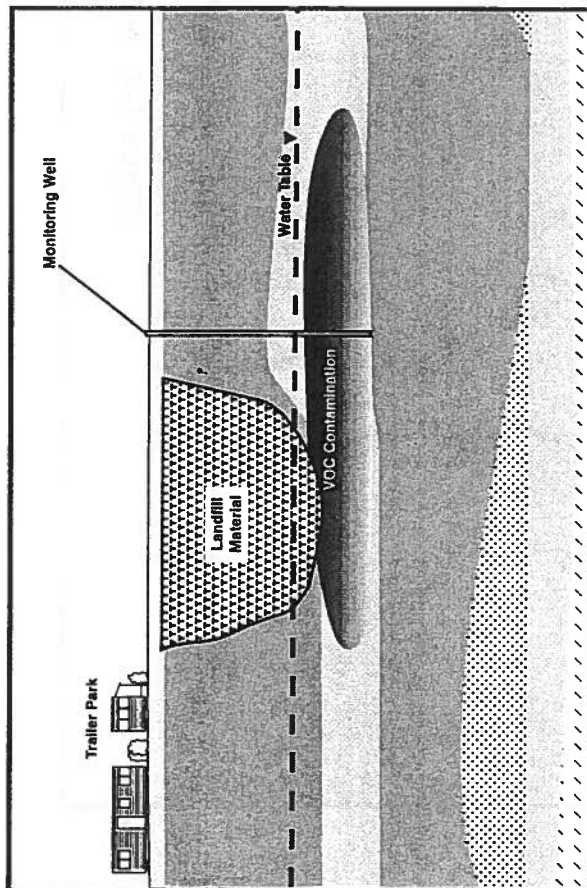
- Mostly flat grassland.
- Mobile homes cover approximately 40 % of the study area (northwest portion).
- Drainage ditches transport surface water to the south and east.
- Located over former burn/fill trenches.

Physical Characteristics

- Low permeability soils (clay) to about 25 feet below ground surface (bgs).
- More permeable material (sands and silts) between 25 feet bgs and bedrock.
- Depth to groundwater: 10 feet.
- Depth to bedrock: 50 feet.
- Direction of groundwater flow: south/southeast.

Contaminated Volume Estimate:

- Groundwater - 2,200,000 ft³



Conceptual Model

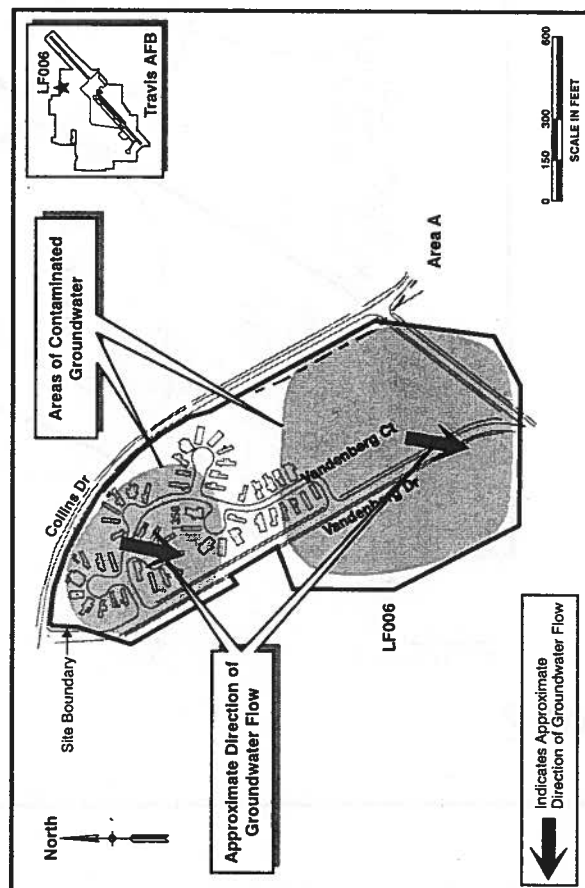


Figure 1-5. RI Summary Information for LF006, Travis AFB

LF007 (Landfill 2, Area B)

Remediation Drivers

- Human health risk associated with contaminants in groundwater and surface soils.
- Interim Remediation Goals (IRGs) for groundwater and surface soils are exceeded.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	Benzene - 59.3 µg/L	1 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 14.3 µg/L	4.0 µg/L
Groundwater	PCBs	Aroclor-1248 - 13.5 µg/L	0.50 µg/L
Groundwater	Dioxins	2,3,7,8-TCDD equivalent - 0.55 pg/L	0.45 pg/L
Surface Soils	SVOCs	Benzo(b)fluoranthene - 12.6 mg/kg	0.61 mg/kg

Site Characteristics

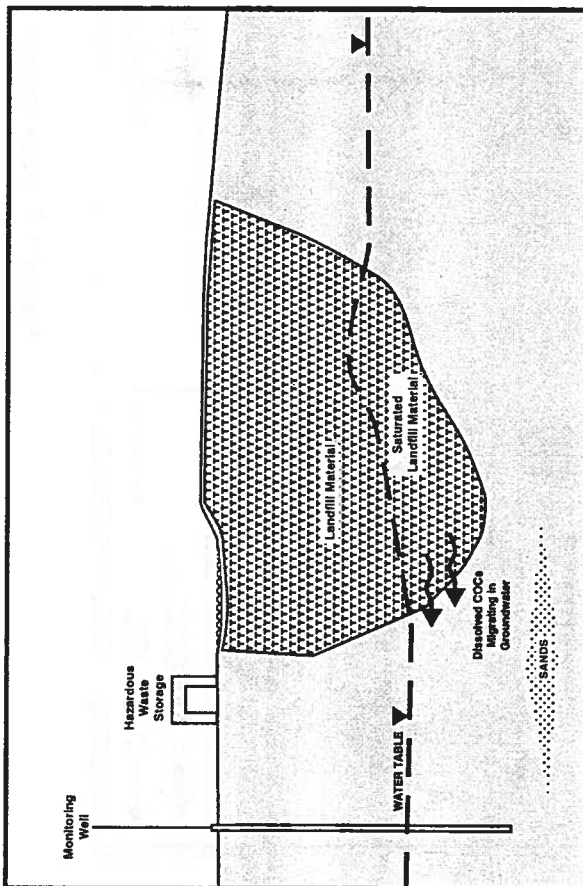
- Mostly grassy flatlands.
- Differential settling has resulted in adjacent depressions and ridges up to 6 feet tall.
- Unpaved access road.

Physical Characteristics

- Backfill and landfill material ranging from 0 to 15 feet thick.
- Intermittent layers of clays and sands between landfill material and 25 feet bgs.
- Intermittent layers of clays and silts from 25 feet bgs to 50 feet bgs.
- Depth to groundwater: 10 feet.
- Depth to bedrock: 40 feet.
- Direction of groundwater flow: south/southwest.

Contaminated Volume Estimates:

- Groundwater - 2,000,000 ft³
- Soil - 14,800 cubic yards (human health risk)



Conceptual Model

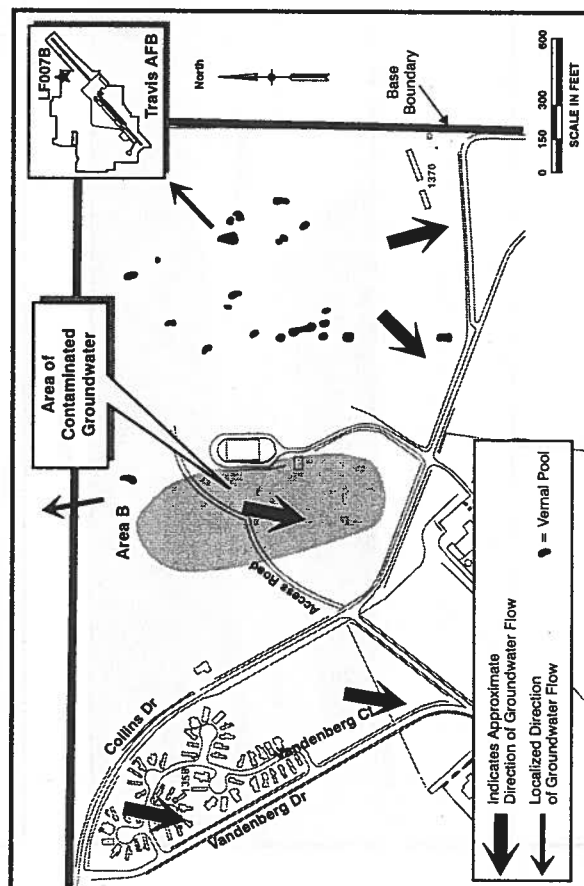
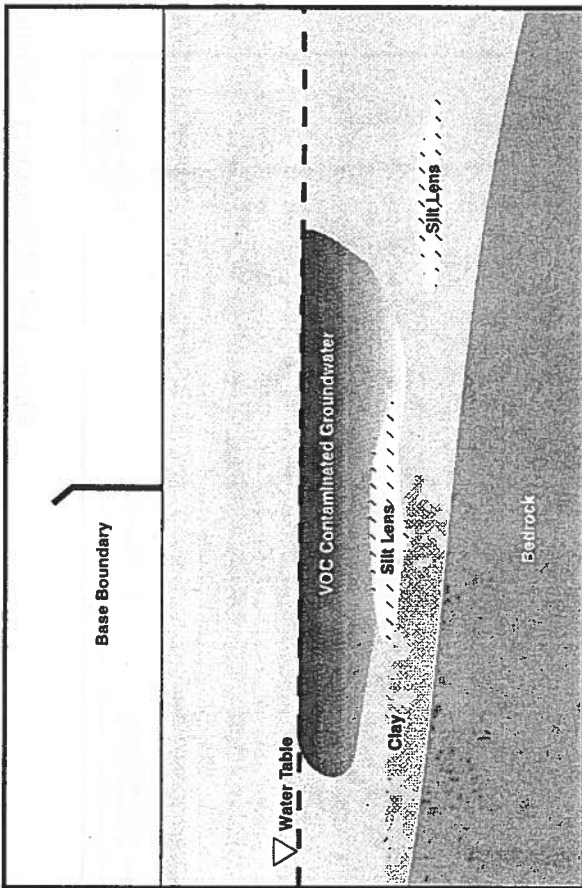


Figure 1-6. RI Summary Information for LF007, Area B, Travis AFB



LF007 (Landfill 2, Area C)

Remediation Drivers

- Human health risk associated with chlorinated hydrocarbons in groundwater.
- MCL for TCE in groundwater is exceeded.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 49.1 µg/L	5 µg/L

Site Characteristics

- Low, grassy, flat swampy area.
- Base boundary bisects the study area with east-west fence.
- Northern half of study area is privately owned property.
- TPH in groundwater (390 µg/L)

Physical Characteristics

- Low permeability soils (clay) to about 20 feet bgs
- Silt lenses between 20 feet bgs and bedrock.
- Depth to groundwater varies from 1 to 10 feet, depending on season.
- Depth to bedrock: 30 feet.
- Direction of groundwater flow: north/northwest.

Contaminated Volume Estimates:

- Groundwater - 1,200,000 ft³

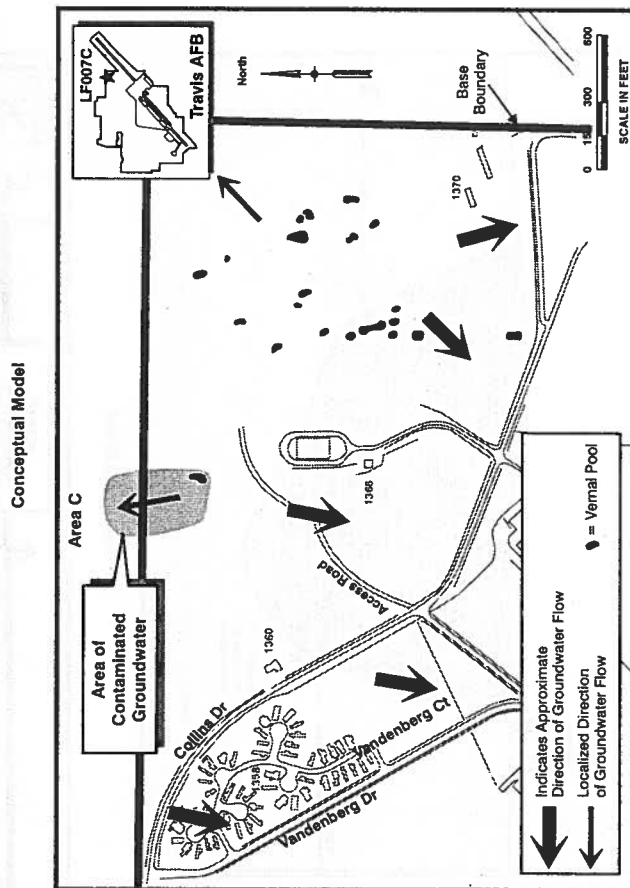
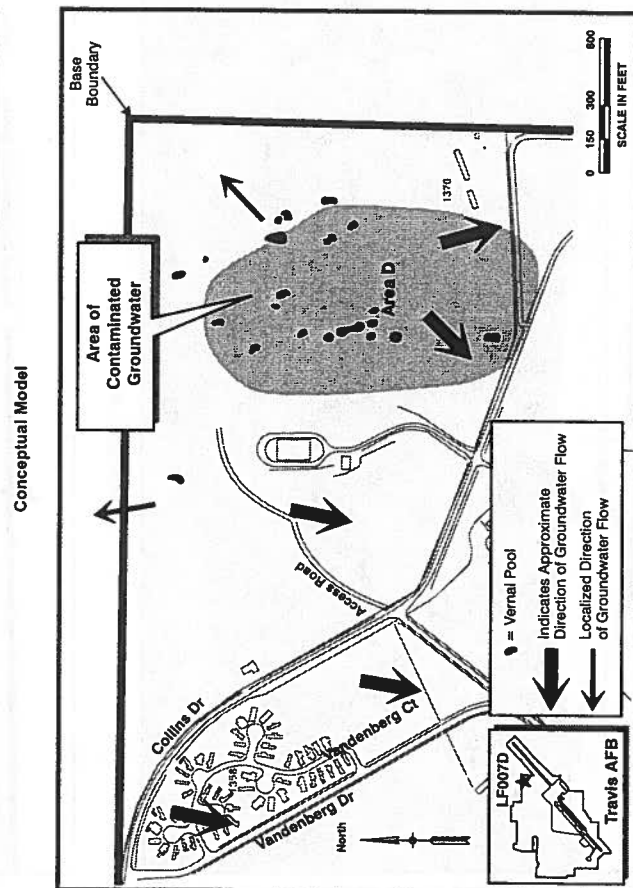
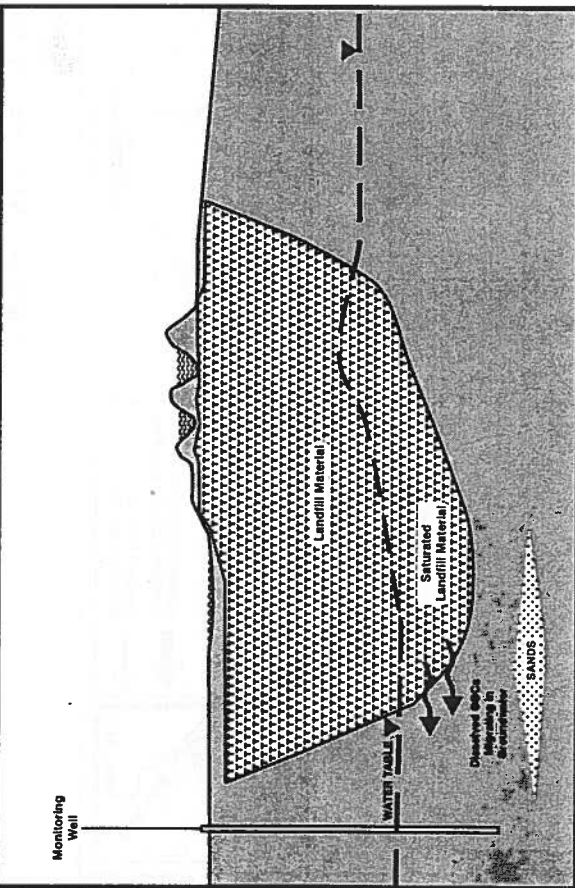


Figure 1-7. RI Summary Information for LF007, Area C, Travis AFB



LF007 (Landfill 2, Area D)

Remediation Drivers

- Human health risk associated with contaminants in groundwater and surface soil.
- Interim Remediation Goals (IRGs) for groundwater and surface soil are exceeded.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	Chlorobenzene - 282 µg/L	39 µg/L
Groundwater	Dioxins	2,3,7,8-TCDDeq - 16.99 pg/L	0.45 pg/L
Groundwater	PCBs	Aroclor-1242 - 14.1 µg/L	0.50 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 124 µg/L	4.0 µg/L
Surface Soil	PCBs	Aroclor-1260 - 0.986 mg/kg	0.066 mg/kg
Surface Soil	SVOCs	Benzo(b)fluoranthene - 1.12 mg/kg	0.610 mg/kg

Site Characteristics

- Southwestern portion of the study area is grassy flatland.
- Ground surface is as much as 15 to 20 feet above natural ground surface (north-south trending).
- Differential settling in the remaining portions of the study result in berms and trenches up to 6 feet deep.
- Approximately 19 vernal pools in the study area.

Physical Characteristics

- Landfill and backfill material extends from ground surface to about 15 feet bgs.
- Clay layer extends from about 15 feet bgs to bedrock.
- Depth to groundwater varies from 1 to 10 feet, depending on season.
- Depth to bedrock: 0 to 20 feet.
- Direction of groundwater flow: varies depending on location (area of recharge).

Contaminated Volume Estimates:

- Groundwater - 4,800,000 ft³
- Soil - 36,300 cubic yards (human health risk)

Figure 1-8. RI Summary Information for LF007, Area D, Travis AFB

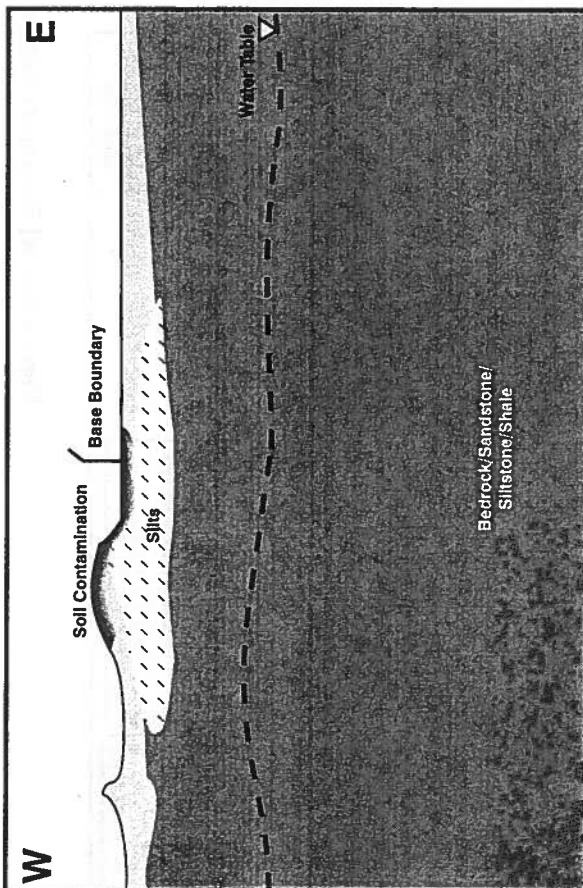


Figure 1-9. RI Summary Information for LF007, Area E, Travis AFB

LF007 (Landfill 2, Area E)

Remediation Drivers

- Human health risk associated with Arsenic and PCBs in surface soils.
- Interim Remediation Goals (IRGs) for surface soils are exceeded.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG
Surface Soil	Metals	Arsenic - 33.4 mg/kg	49.0 mg/kg
Surface Soil	PCBs	Arochlor-1260 - 336 mg/kg	0.066 mg/kg

Site Characteristics

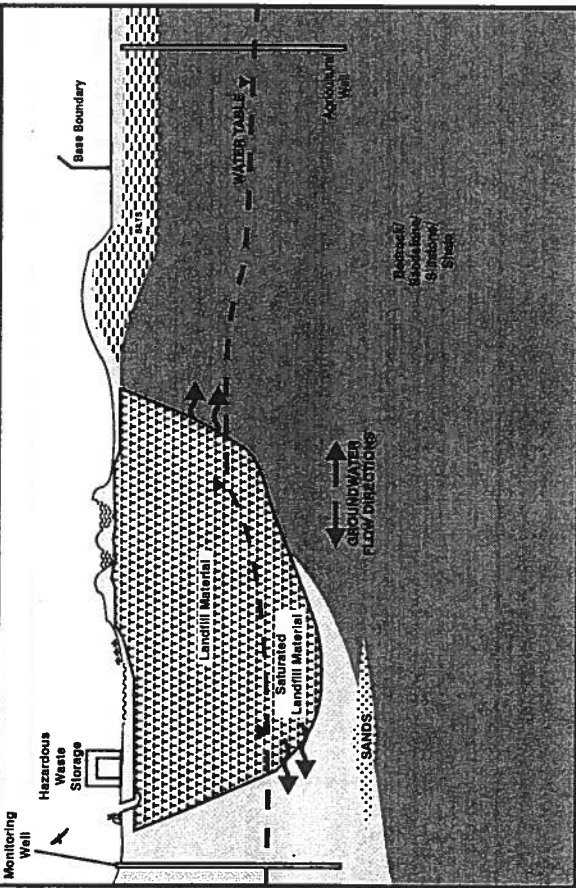
- Located behind the shooting range and within the former Defense Property Disposal Office (DPDO) area.
- Largely grassy flatland overlying disposal trenches.
- Eastern edge of study area slopes to the east.
- Vernal pools in the study area.

Physical Characteristics

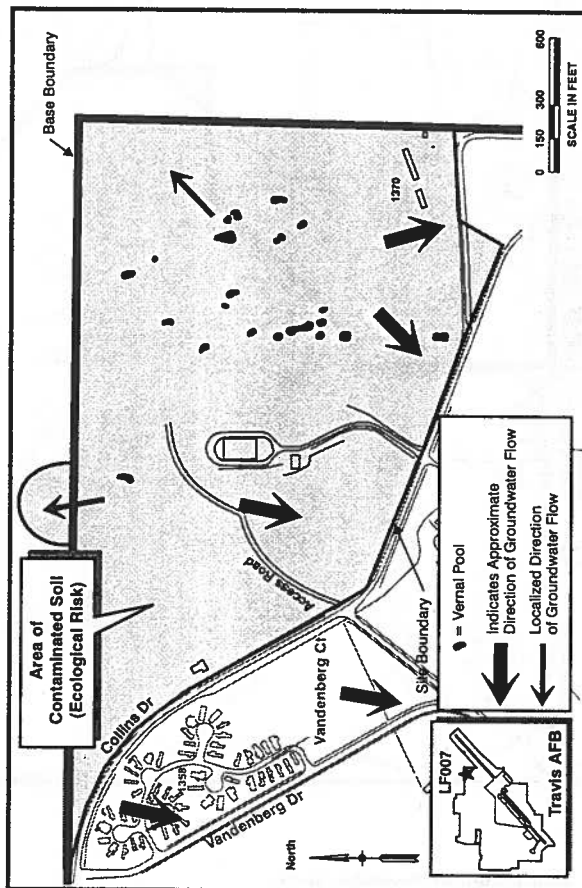
- Moderately permeable material (sills) from ground surface to bedrock.
- Depth to groundwater: 25 feet.
- Depth to bedrock: 0-10 feet.
- Direction of groundwater flow: northeast.

Contaminated Volume Estimates:

- Soil - 13,400 cubic yards (human health risk)



Conceptual Model



LF007 (Entire Landfill 2)

Remediation Drivers

- Ecological risk associated with inorganics and PCBs in surface soils.

Primary Contaminants and Affected Medium

Medium	Contaminant Type	Maximum Concentration	IRG
Surface Soil	Metals	Zinc - 1,200 mg/kg	4.9 mg/kg (eco)
Surface Soil	PCBs	Aroclor-1260 - 336 mg/kg	0.034 mg/kg (eco)

Site Characteristics

- Largely open field.
- Hazardous materials storage area in the center of the study area.
- Berms and trenches in eastern half of the study area.
- Eastern edge of study area slopes to the east.
- Approximately 20 vernal pools in the eastern half of the study area.

Physical Characteristics

- Variable soil between surface and bedrock, mostly composed of clays and silts.
- Depth to groundwater: 5 to 20 feet.
- Depth to bedrock: 0 to 50 feet.
- Direction of groundwater flow: varies with location

Contaminated Volume Estimates:

- Soil - 65,000 cubic yards (human health risk)
- Soil - 50,000 cubic yards (ecological health risk).

Figure 1-10. RI Summary Information for LF007, Ecological, Travis AFB

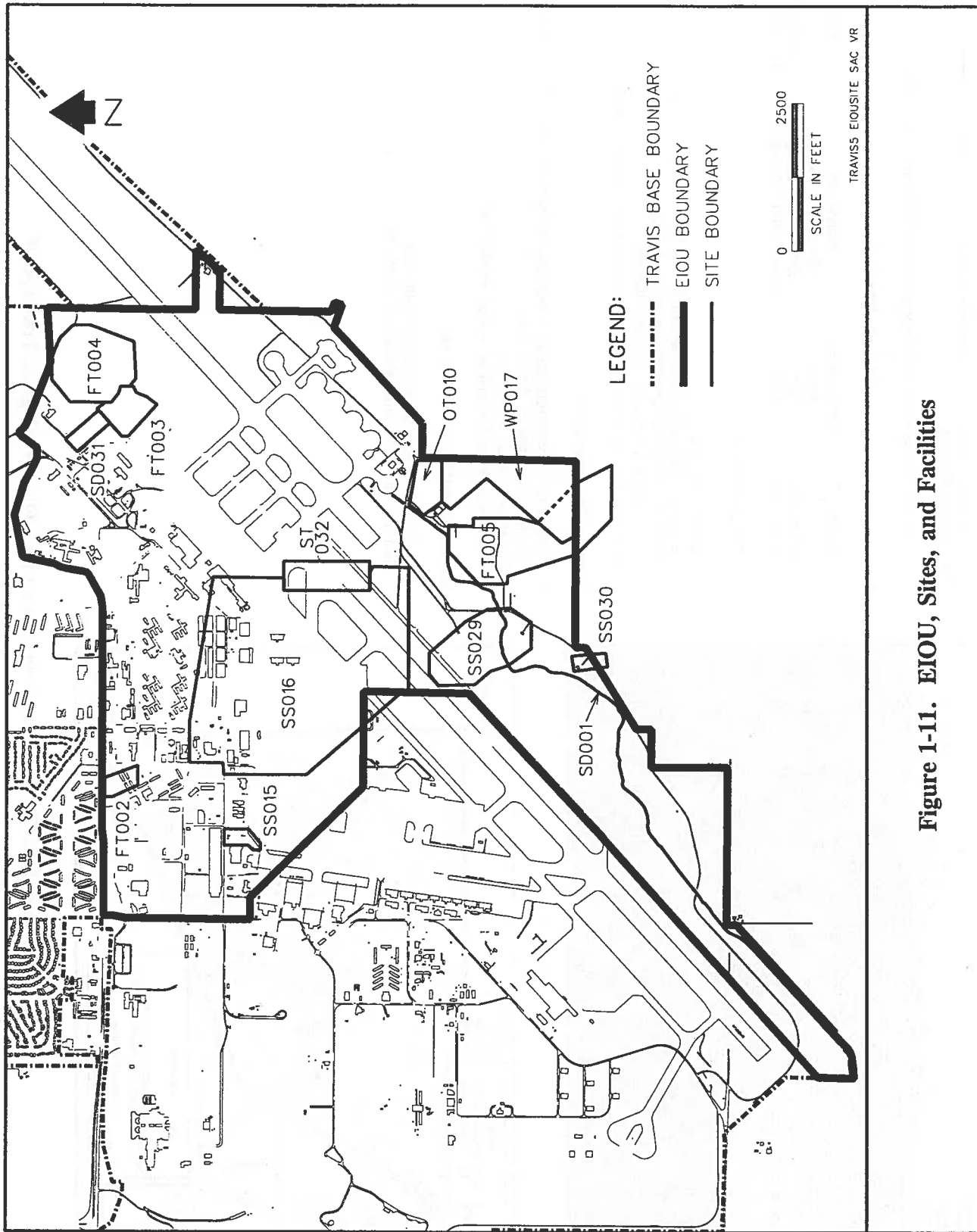


Figure 1-11. EIOU, Sites, and Facilities

SD001 (Union Creek)

Remediation Drivers:

- Ecological risks associated with metals in surface water.
- Human health risks associated with PAHs.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Surface Water	Metals	Aluminum - 0.544 mg/L	0.087 mg/L (eco)
Soil	PAH	Benzo(a)pyrene - 25 mg/kg	0.26 mg/kg

Site Characteristics:

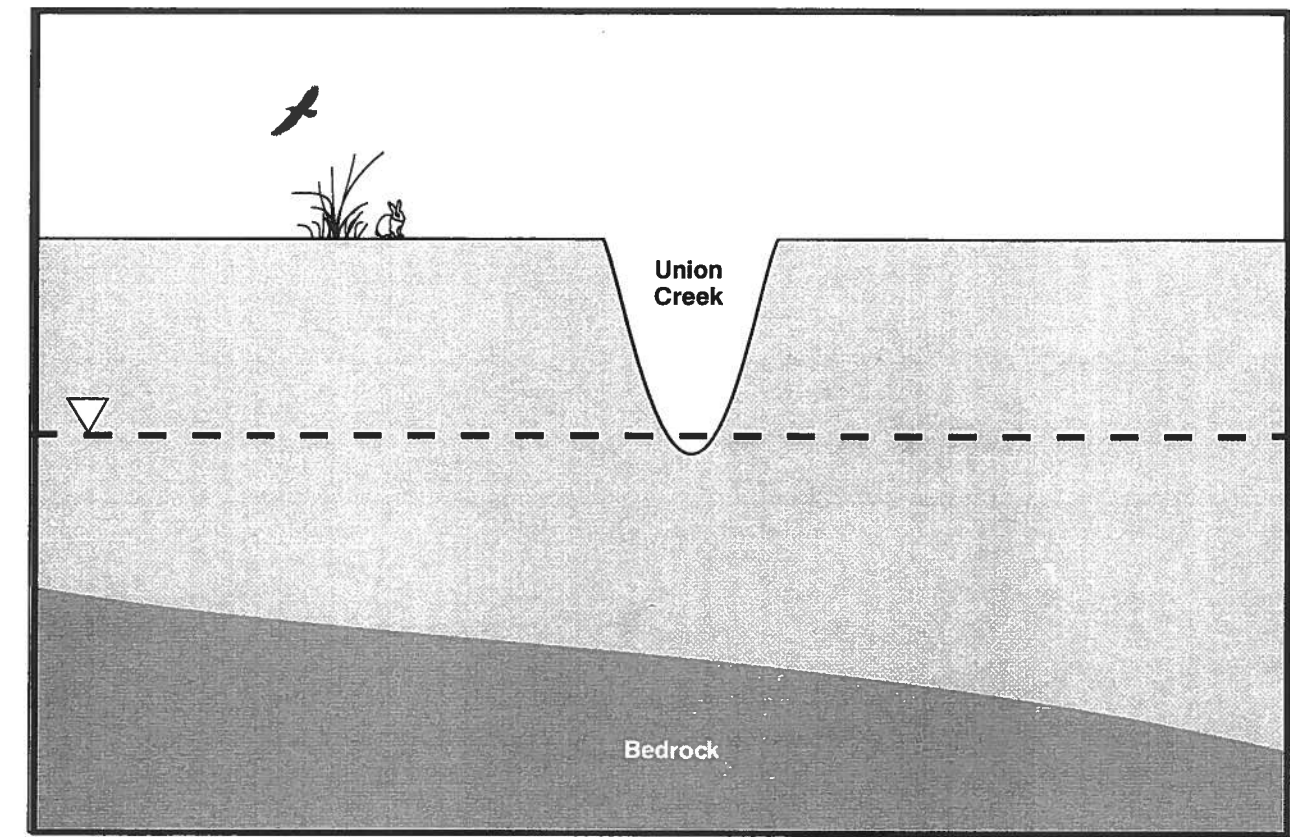
- Site includes open drainages/creek in the southern portion of EIOU.

Physical Characteristics:

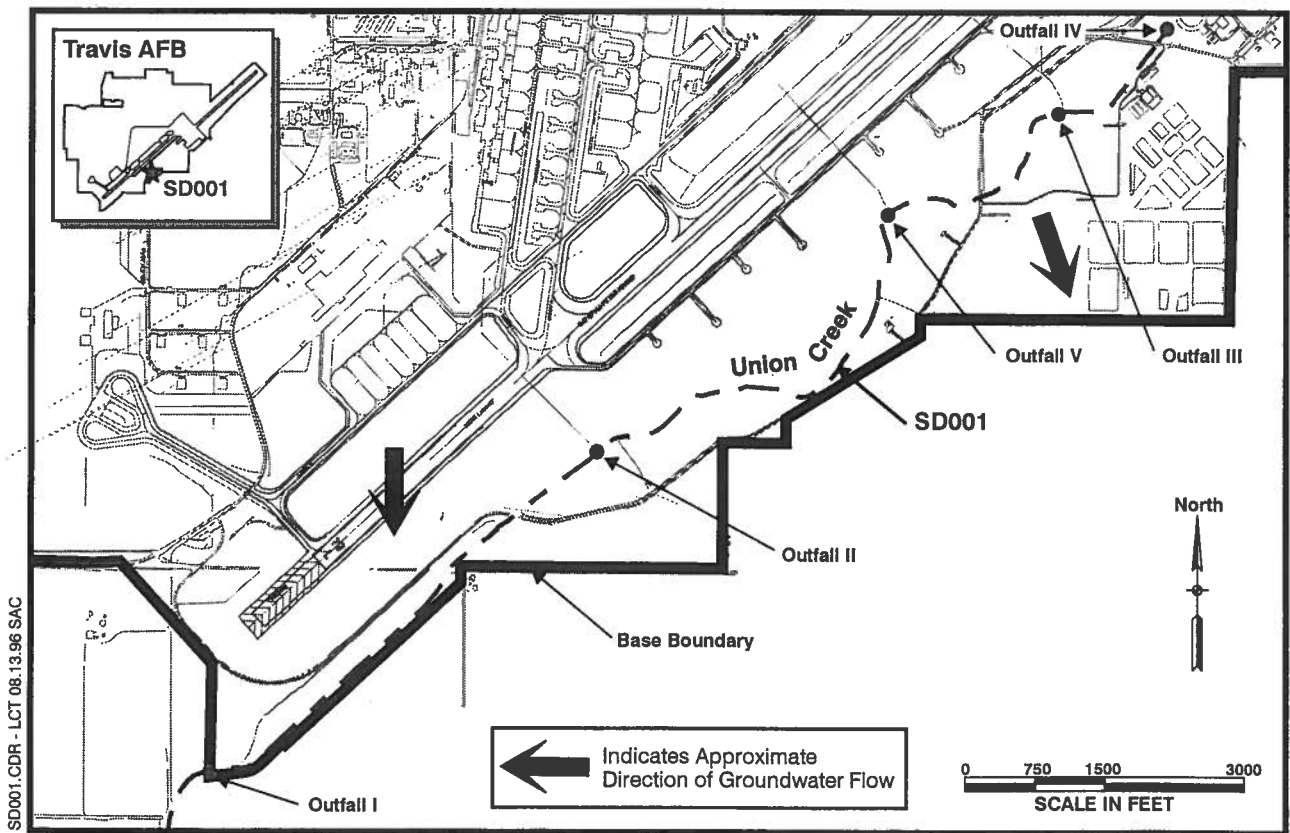
- All storm sewer systems discharge into Union Creek within the EIOU at Outfalls II, III and IV.
- Union Creek exits Travis AFB at the southwest tip and flows south to Hill Slough, which discharges into Suisun Marsh and ultimately to Suisun Bay.
- Treatment plant at Outfall III treats surface water runoff from Storm Sewer III for VOCs.
- Metals concentrations from discharge of Outfall III treatment plant sometimes exceed effluent limitations set by RWQCB.

Contaminated Volume Estimates:

- Sediment - length of creek with contaminants above screening levels 13,000 ft.



Conceptual Model



SD001.CDR - LCT 08.13.96 SAC

Figure 1-12.
RI Summary Information
for SD001, Travis AFB

FT002 (Fire Training Area 1)

Remediation Drivers:

- Ecological risk associated with metals and SVOCs in soil.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG
Soil	Metals	Lead - 739 mg/kg	3.3 mg/kg (eco)
Soil	SVOCs	Di-n-butyl phthalate - 0.71 mg/kg	436 mg/kg (eco)

Site Characteristics:

- Dormitory area and parking lot with paved access road.

Physical Characteristics:

- Depth to groundwater: 10 feet.
- Silt and clay to less than 5 feet bgs.
- Silty sand with minor gravel from 5 to 15 feet bgs.
- Depth to bedrock: 10 to 15 feet.
- Direction of groundwater flow: south/southeast.

Contaminant Volume Estimates:

- Soil - 1,000 cubic yards (ecological risk)

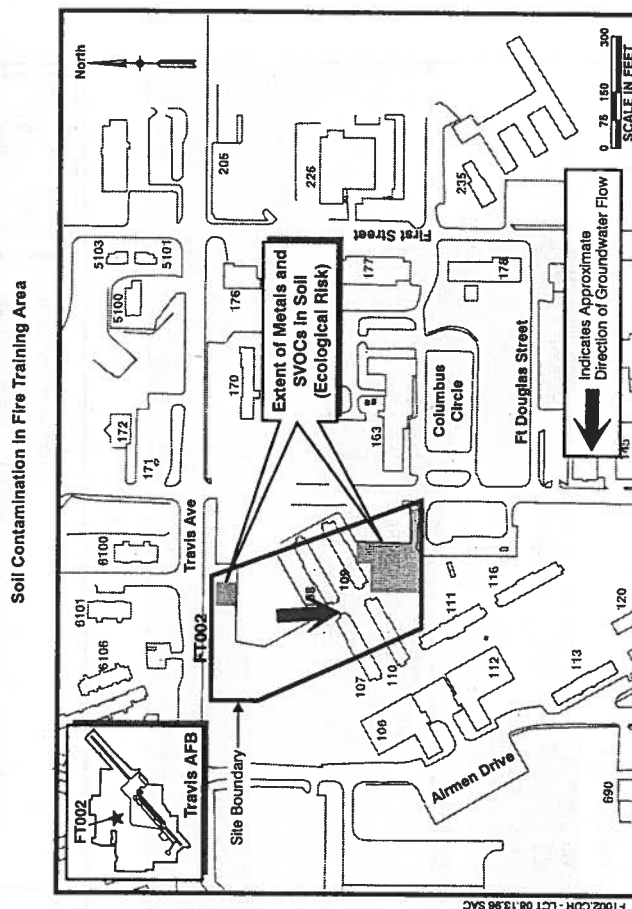
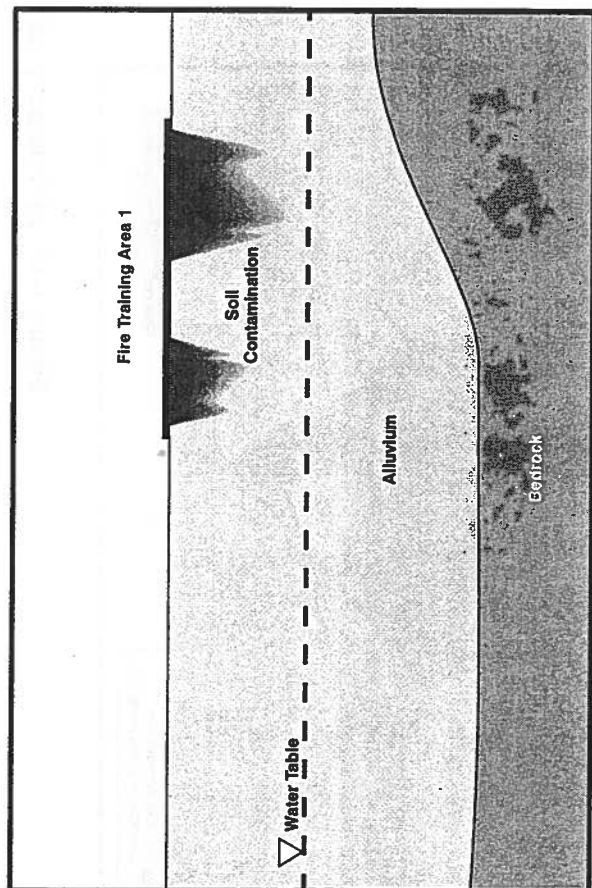


Figure 1-13. RI Summary Information for FT002, Travis AFB

FT003 (Fire Training Area 2)

Remediation Drivers:

- Human health risk associated with PAH, metals, pesticides, and dioxins in soil.
- Ecological risk associated with metals, pesticides, and dioxins/furans in soil.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG
Soil	PAHs	Fluoranthene - 71.7 mg/kg	27,000 mg/kg
Soil	Metals	Cadmium - 10.7 mg/kg	0.11 mg/kg (eco)
Soil	Metals	Lead - 686 mg/kg	3.3 mg/kg (eco)
Soil	Pesticide	gamma Chlordane - 0.208 mg/kg	0.156 mg/kg (eco)
Soil	Dioxins/Furans	2,3,7,8-TCDD (equivalent) - 2.1×10^{-5} mg/kg	1.2×10^{-6} mg/kg (eco)

Site Characteristics:

- 20% paved area with 80% open field.
- Paved access road.

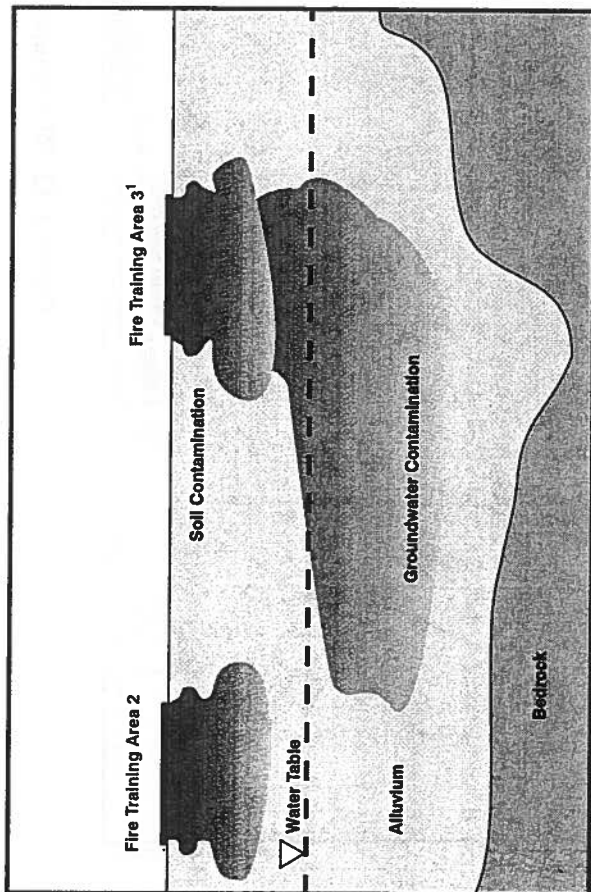
Physical Characteristics:

- Depth to groundwater: 5 to 15 feet.
- Depth to bedrock: 30 to 40 feet.
- Silt and clay to 10 feet bgs.
- Direction of groundwater flow: south.
- Silty sand with minor gravel from 10 to 40 feet bgs.

Contaminated Volume Estimates:

- Soil - 13,600 cubic yards (human health risk)
- Soil - 2,100 cubic yards (ecological risk)

¹ Fire training Area 3 (FT004) is also shown on this figure as it is close to FT003.



Conceptual Model

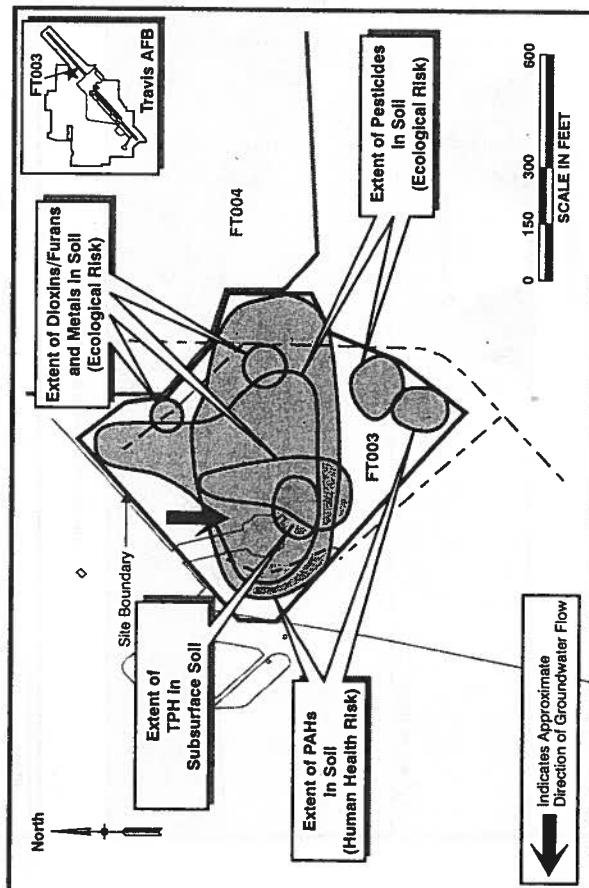
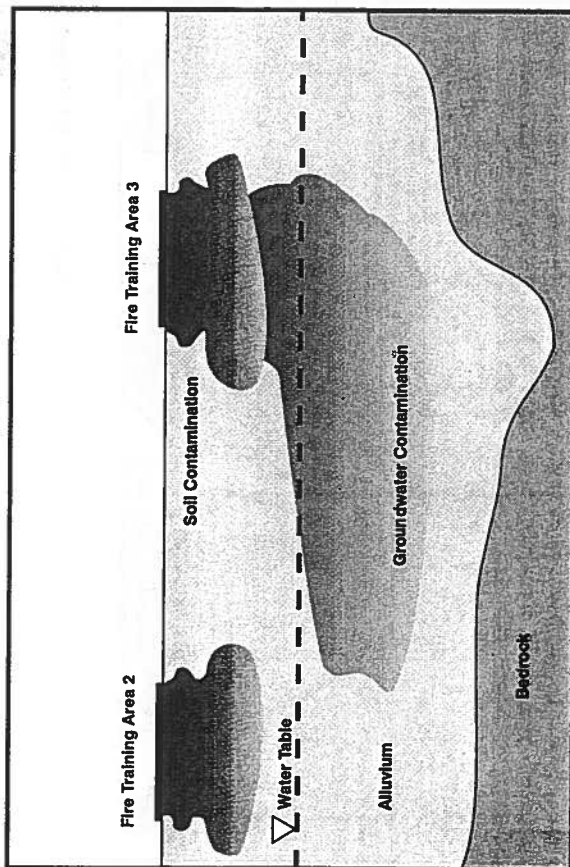


Figure 1-14. RI Summary Information for FT003, Travis AFB



Conceptual Model

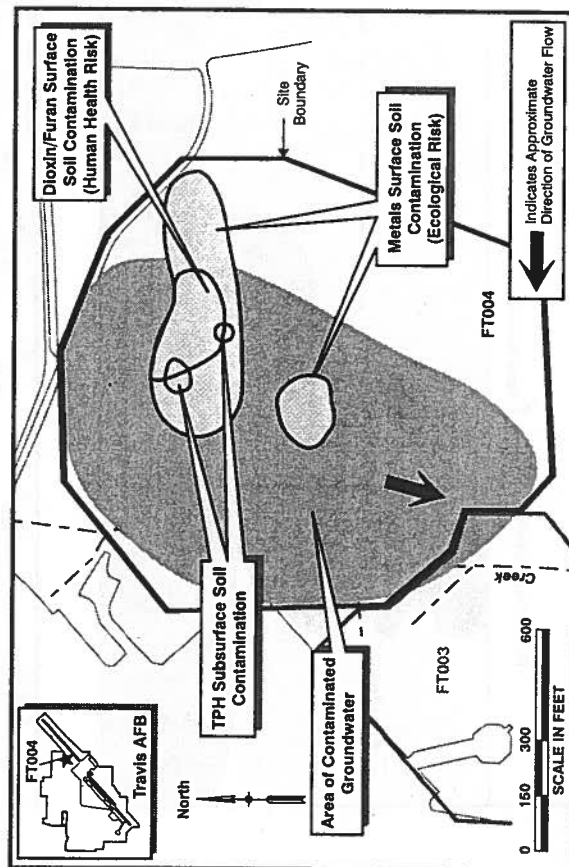


Figure 1-15. RI Summary Information for FT004, Travis AFB

FT004 (Fire Training Area 3)

Remediation Drivers:

- Human health risk associated with VOCs, SVOCs, and metals in groundwater.
- MCLs are exceeded for VOCs, SVOCs, and metals in groundwater.
- Human health risk associated with dioxins/furans in soil.
- Ecological risk associated with metals and dioxins/furans in soil.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 5,200 µg/L	5 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 5.49 µg/L	4 µg/L
Groundwater	Metals	Nickel - 2,540 µg/L	100 µg/L
Surface Soil	Metals	Copper - 2,450 mg/kg	4.8 mg/kg (eco)
Surface Soil	Metals	Antimony - 40.7 mg/kg	0.008 mg/kg (eco)
Surface Soil	Dioxins/Furans	2,3,7,8-TCDD equivalent - 0.000945 mg/kg	1.2 x 10 ⁻⁶ mg/kg (eco)

Site Characteristics:

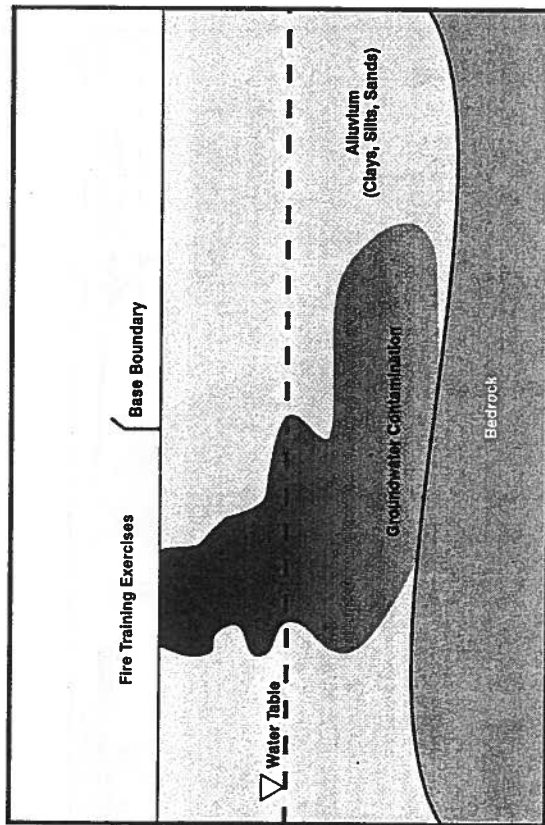
- Open field, less than 10% paved area.

Physical Characteristics:

- Depth to groundwater: 5 to 15 feet.
- Silt and clay to 10 feet bgs.
- Silty sand with minor gravel from 10 to 40 feet bgs.
- Depth to bedrock: 20 to 30 feet.
- Direction of groundwater flow: south/southwesterly.

Contaminated Volume Estimates:

- Soil - 2,150 cubic yards (human health risk)
- Soil - 12,800 cubic yards (ecological risk)
- Groundwater - 4,100,000 ft³



Conceptual Model

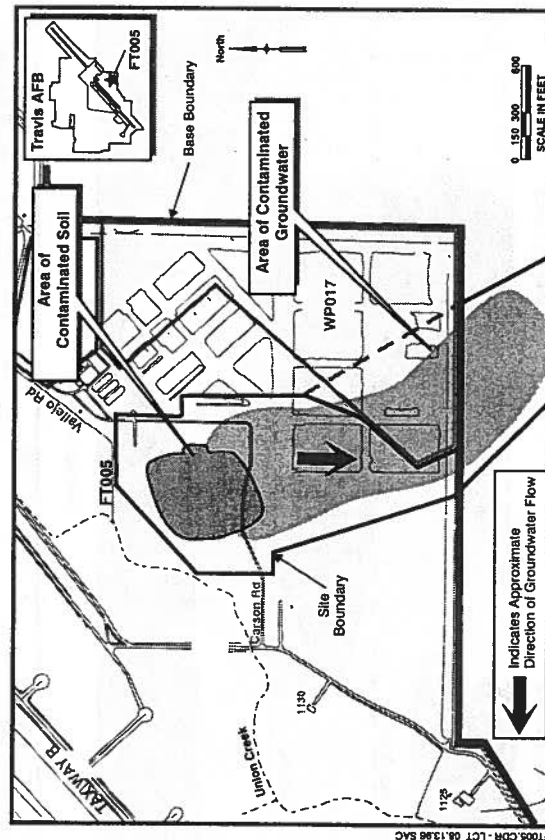


Figure 1-16. RI Summary Information for FT005, Travis AFB

FT005 (Fire Training Area 4)

Remediation Drivers:

- Human health risk associated with VOCs, SVOCs, and metals in groundwater.
- Human health risk associated with polynuclear aromatic hydrocarbons and polychlorinated biphenyls in soils.
- MCLs exceeded in groundwater for VOCs, SVOCs, and metals.
- Ecological risk associated with metals, pesticides, and dioxins in soil.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 120 µg/L	5 µg/L
Groundwater	VOCs	1,2 DCA - 14.2 µg/L	0.5 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 35.9 µg/L	4 µg/L
Groundwater	Metals	Nickel - 370 µg/L	100 µg/L
Soil	PAH	Pyrene - 59.9 mg/kg	20,000 mg/kg
Soil	PCB	Aroclor-1254 - 1.09 mg/kg	0.066 mg/kg
Soil	Dioxin	2,3,7,8-TCDD (equivalent) - 2.08 mg/kg	1.2 x 10 ⁻⁶ mg/kg (eco)
Soil	Metals	Nickel - 347 mg/kg	0.80 mg/kg (eco)
Soil	Pesticides	Methoxone - 21 mg/kg	3.0 mg/kg (eco)

Site Characteristics:

- Site located in an inactive area of the Base.
- The dashed line on the figure (---) indicates where the FT005 groundwater contamination overlaps the soil site WP017.

Physical Characteristics:

- Permeable materials (sand and silt) occur through depths of 20 to 40 feet bgs.
- Some low permeability soils (clay and silt) occur between 10 and 30 feet bgs.
- Depth to groundwater: 5 to 20 feet.
- Depth to bedrock: 30 to 50 feet.
- Direction of groundwater flow: south.

Contaminated Volume Estimates:

- Soil - 30,000 cubic yards (human health risk)
- Soil - 1,200 cubic yards (ecological risk)
- Groundwater - 12,000,000 ft³

OT010 (Sludge Disposal Site)

Remediation Drivers:

- Human health risk associated with PAHs in soil.
- Ecological risk associated with metals and pesticides in soil.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG
Soil	PAH	Benzo(a)pyrene - 0.262 mg/kg	0.26 mg/kg
Soil	Metals	Copper - 49.7 mg/kg	4.8 mg/kg (eco)
Soil	Pesticides	DDE - 0.0918 mg/kg	0.15 mg/kg (eco)

Site Characteristics:

- Site located in an inactive area of Travis AFB.

Physical Characteristics:

- Permeable materials (sand and silt) occur through depths of 20 to 40 feet bgs.
- Some low permeability soils (clay and silt) occur between 10 and 30 feet bgs.
- Depth to groundwater: 5 to 20 feet.
- Depth to bedrock: 30 to 50 feet.
- Direction of groundwater flow: south.

Contaminated Volume Estimates:

- Soil - 7,300 cubic yards (human health risk)
- Soil - 4,500 cubic yards (ecological risk)

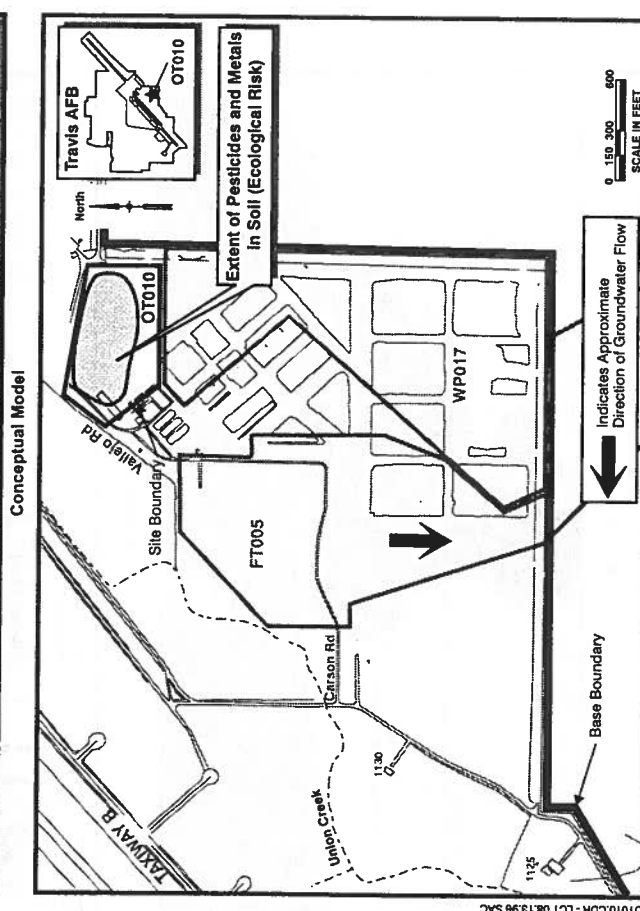
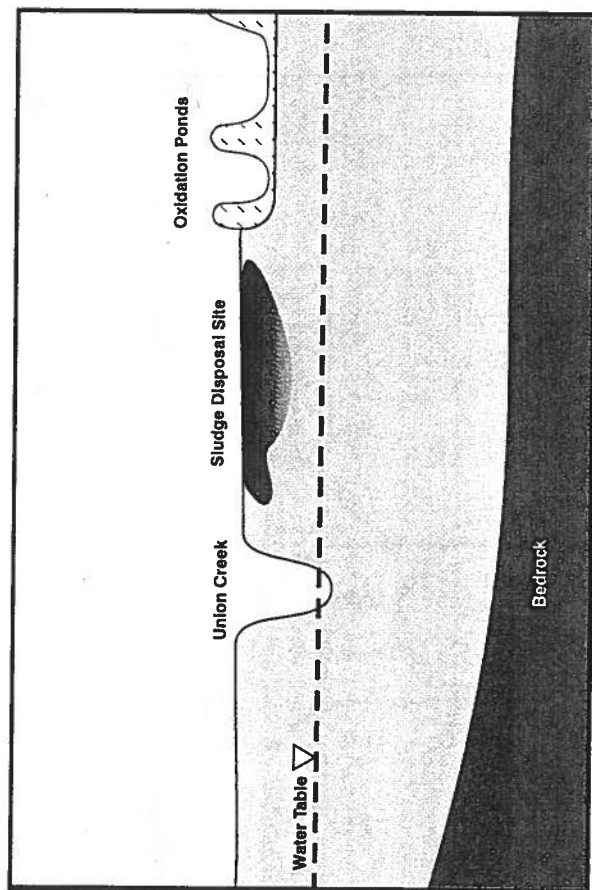
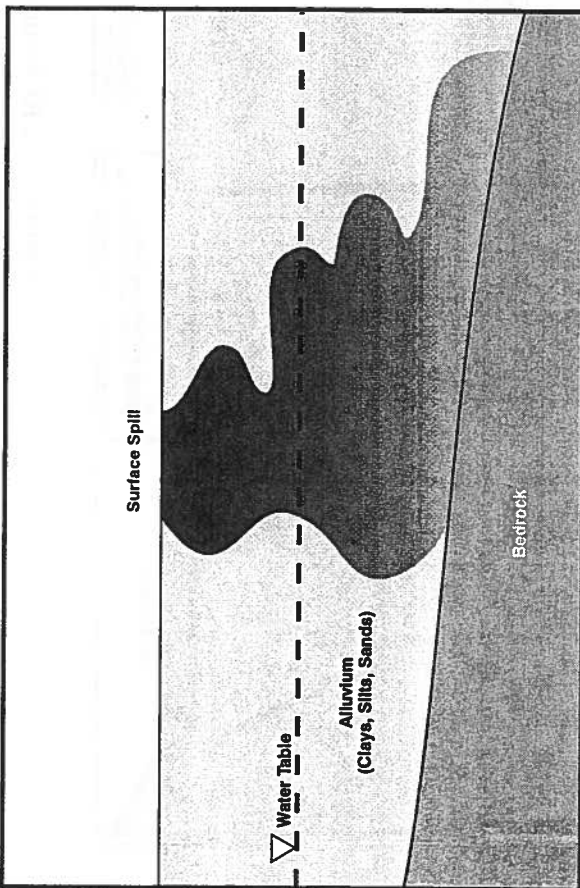
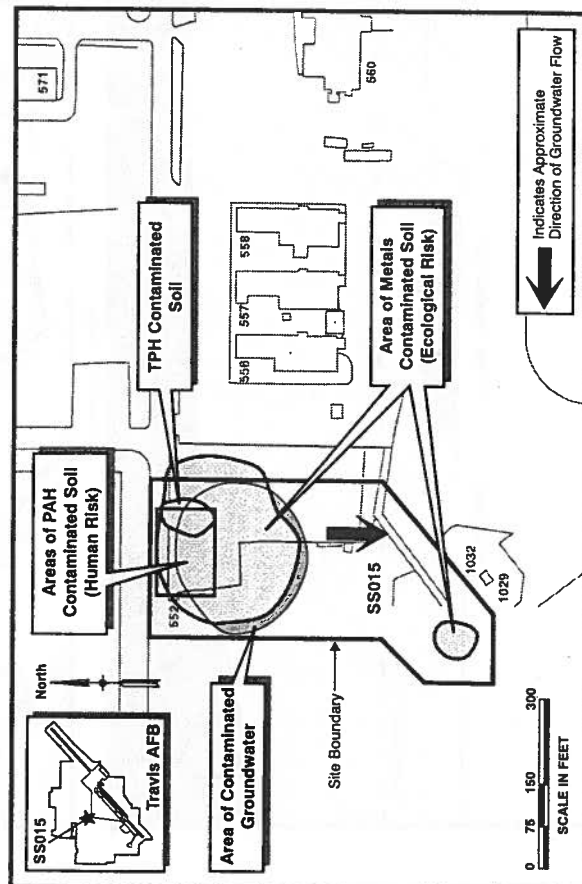


Figure 1-17. RI Summary Information for OT010, Travis AFB



Conceptual Model



SS015 (Solvent Spill Area and Facility 550)

Remediation Drivers:

- Human health risk associated with VOCs, SVOCs, and metals in groundwater.
- Human health risk associated with PAHs in soil.
- Ecological health risk associated with metals in soil.
- MCLs exceeded in groundwater for VOCs, phthalates, and metals.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 25 µg/L	5 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 6.68 µg/L	4.0 µg/L
Groundwater	Metals	Nickel - 1,500 µg/L	100 µg/L
Soil	PAH	Fluoranthene - 1.87 mg/kg	27,000 mg/kg
Soil	Metals	Lead - 28,200 mg/kg	3.3 mg/kg (eco)

Site Characteristics:

- Approximately 50% of the area is covered by pavement and buildings.
- Site located in an active area of Travis AFB.
- TPH in groundwater at 4,300 µg/L.

Physical Characteristics:

- Low permeability soils (clay and silt) occur up to a depth of between 15 and 25 feet bgs.
- More permeable materials occur at various intervals, mostly between 10 to 15 feet bgs.
- Depth to groundwater: 5 to 15 feet.
- Depth to bedrock: 15 to 25 feet.
- Direction of groundwater flow: south/southeast.

Contaminated Volume Estimates:

- Soil - 600 cubic yards (human health risk)
- Soil - 525 cubic yards (ecological risk)
- Groundwater - 200,000 ft³

Figure 1-18. RI Summary Information for SS015, Travis AFB

SS016 (OSA, Facilities 11, 13/14, 20, 42/1941, 139/144, and selected sections of SSRW)

Remediation Drivers:

- Human health risk associated with VOCs, SVOCs, and metals in groundwater.
- Human health risk associated with polynuclear aromatic hydrocarbons and PCBs in soil.
- MCLs exceeded in groundwater for TCE, benzene, phthalates, and metals.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 32,000 µg/L ¹	5 µg/L
Groundwater	VOCs	Benzene - 6.4 µg/L	1 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 67.3 µg/L	4 µg/L
Groundwater	Metals	Nickel - 460 µg/L	100 µg/L
Soil	PAH	Fluoranthene - 7.71 mg/kg	27,000 mg/kg
Soil	PCB	Aroclor-1260 - 0.452 mg/kg	0.066 mg/kg

Site Characteristics:

- Approximately 100% of the area is covered by pavement and buildings.
- Site located in an active area of Travis AFB (maintenance facilities and aircraft parking apron).

Physical Characteristics:

- Low permeability soils (clay and silt) to a depth of between 15 and 25 feet bgs.
- More permeable material (sands and silts) below 15 to 25 feet bgs.
- Depth to groundwater: 5 to 15 feet.
- Depth to bedrock: 20 to 40 feet.
- Well pumping rates: MW-214 at 6.7 gpm, MW-245 at 2 gpm, TARA horizontal wells at rates of 10 to 40 gpm.
- Direction of groundwater flow: southeast.

Interim Actions:

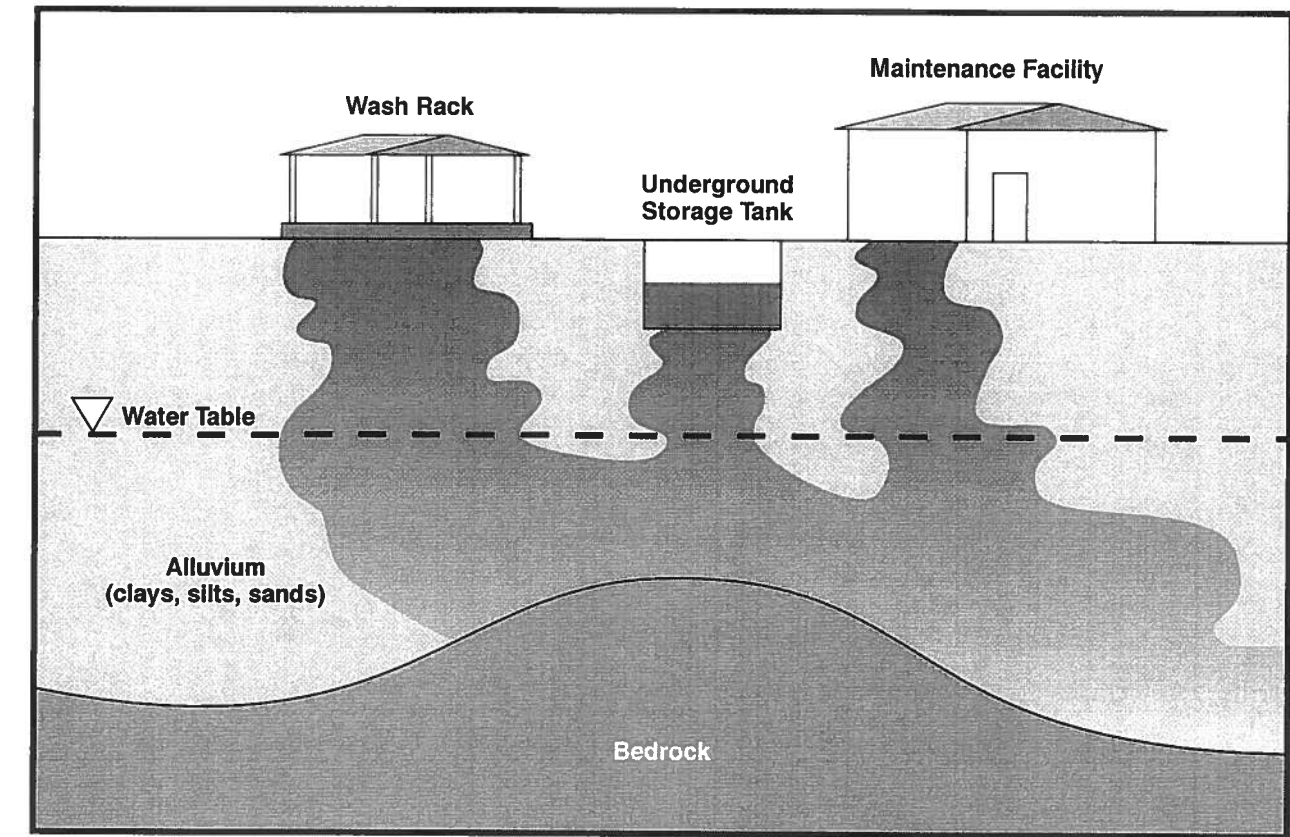
- USTs removed from various locations throughout SS016.
- Tower Area Removal Action (TARA) - horizontal extraction wells for source removal.

Contaminated Volume Estimates:

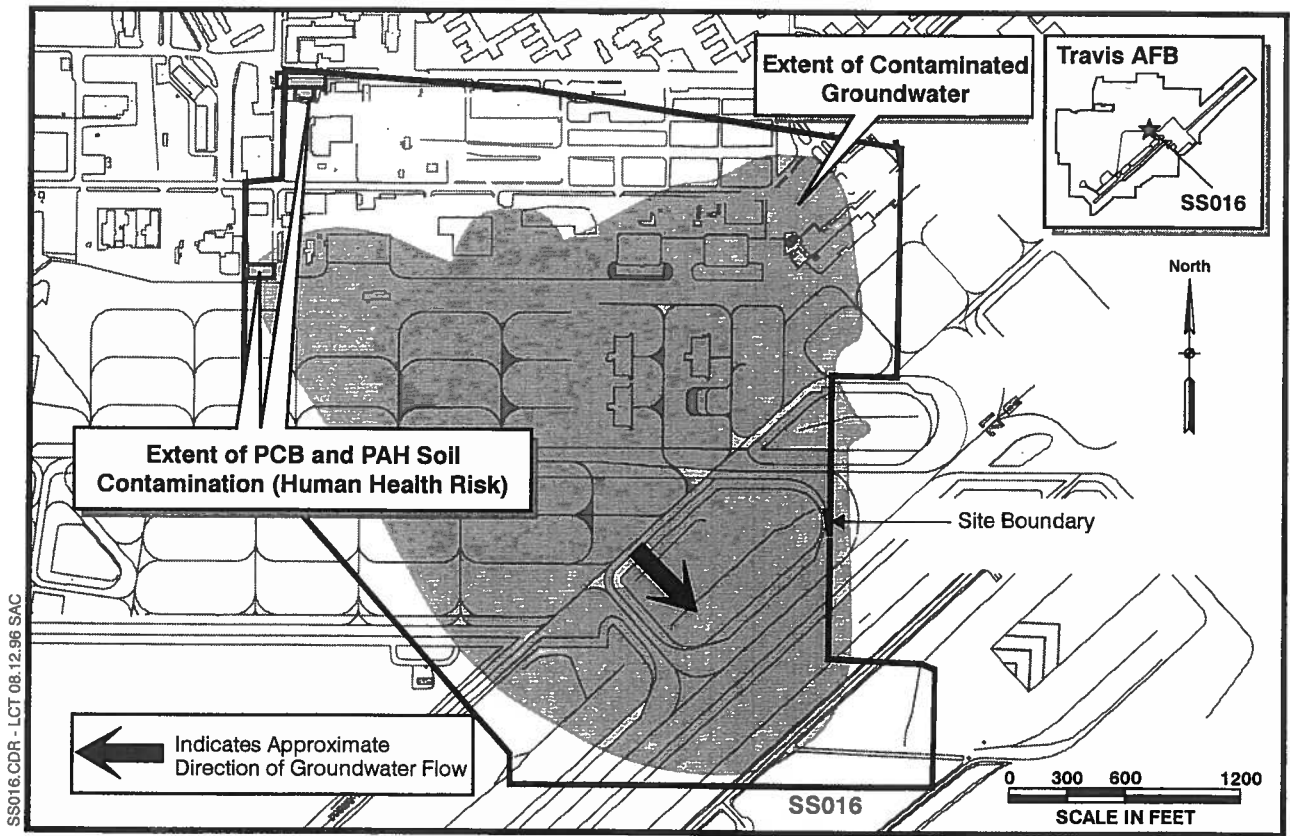
- Soil - 1500 cubic yards (human health risk)
- Groundwater - 29,000,000 ft³

¹ Recent testing has documented higher concentrations of TCE, up to a maximum of approximately 180,000 µg/L. However, these results were derived from CPT data and should not be directly compared to monitoring well data.

Figure 1-19.
RI Summary Information
for SS016, Travis AFB



Conceptual Model



WP017 (Oxidation Pond Site)

Remediation Drivers:

- Human health risk associated with PCB in soil.
- Ecological health risk associated with metals and pesticides in soil.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG
Soil	PCB	Aroclor-1260 - 1.08 mg/kg	0.066 mg/kg
Soil	Metals	Copper - 159 mg/kg	4.8 mg/kg (eco)
Soil	Pesticides	DDD - 1.81 mg/kg	1.16 mg/kg (eco)

Site Characteristics:

- Approximately 30% of the area is covered by oxidation ponds.
- Site located in an inactive area of Travis AFB.
- The dashed line on the figure (---) indicates where the FT005 groundwater contamination overlaps the soil site WP017.

Physical Characteristics:

- Permeable materials (sand and silt) occur through depths of 20 to 40 feet bgs.
- Some low permeability soils (clay and silt) occur between 10 and 30 feet bgs.
- Depth to groundwater: 5 to 20 feet.
- Depth to bedrock: 30 to 50 feet.
- Direction of groundwater flow: south.

Contaminated Volume Estimates:

- Soil - 7,900 cubic yards (human health risk)
- Soil - 15,000 cubic yards (ecological risk).

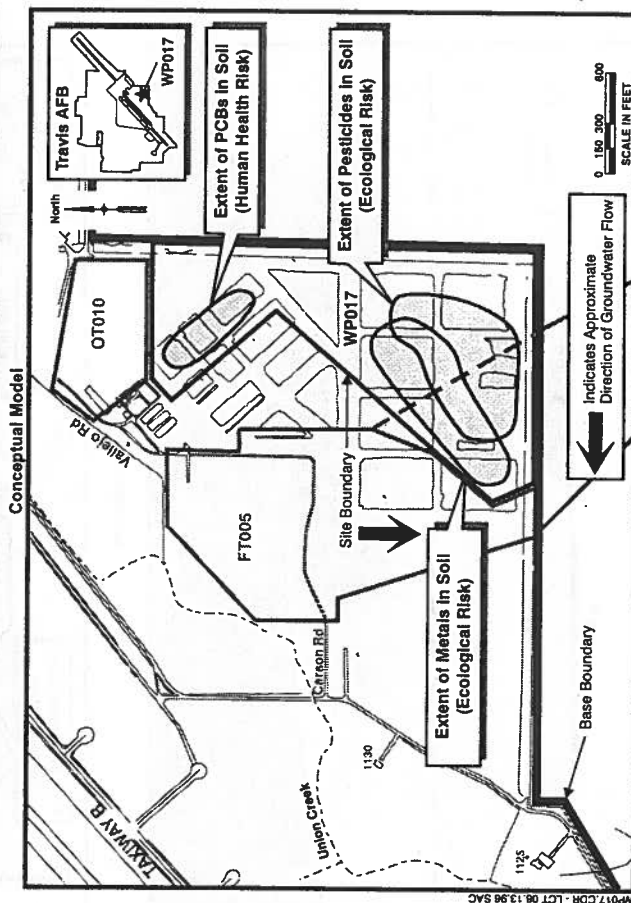
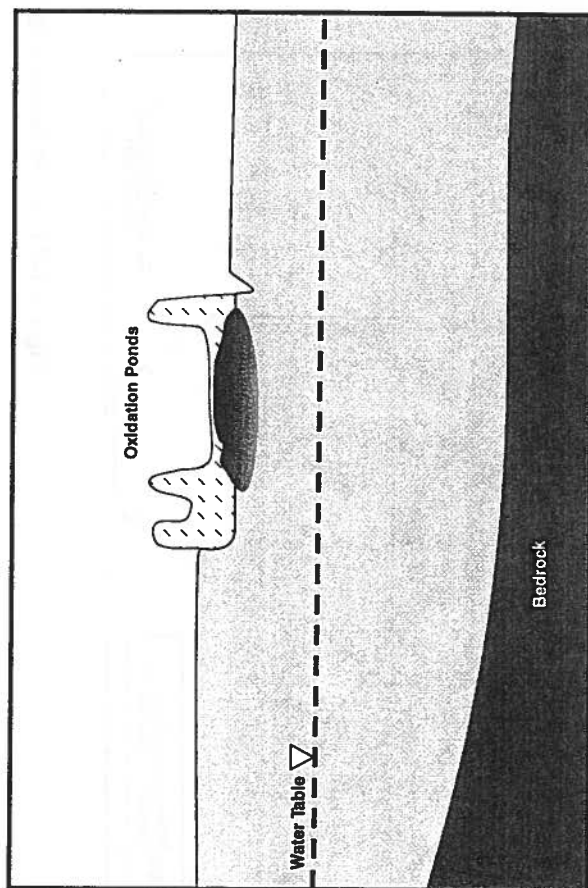


Figure 1-20. RI Summary Information for WP017, Travis AFB

SS029 (MW-329 Area)

Remediation Drivers:

- Human health risk associated with VOCs in groundwater.
- Human health risk associated with SVOCs in soil.
- MCLs exceeded for VOCs.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 1,300 µg/L	5 µg/L
Soil	SVOCs	Benzo(a)anthracene - 0.0393 mg/kg	2.6 mg/kg

Site Characteristics:

- Open field located between abandoned taxiway and Union Creek.

Physical Characteristics:

- Top 10 feet of saturated alluvium is composed of clays and other low permeability material.
- Bottom 10 feet of saturated alluvium is composed of sands and other moderate permeability material.
- Depth to groundwater: 10 feet.
- Depth to bedrock: 30 feet.
- Direction of groundwater flow: southeast.
- Contaminated groundwater area may affect surface water quality of Union Creek

Contaminated Volume Estimates:

- Groundwater - 4,800,000 ft³
- Soil - 2,780 cubic yards (human health risk)

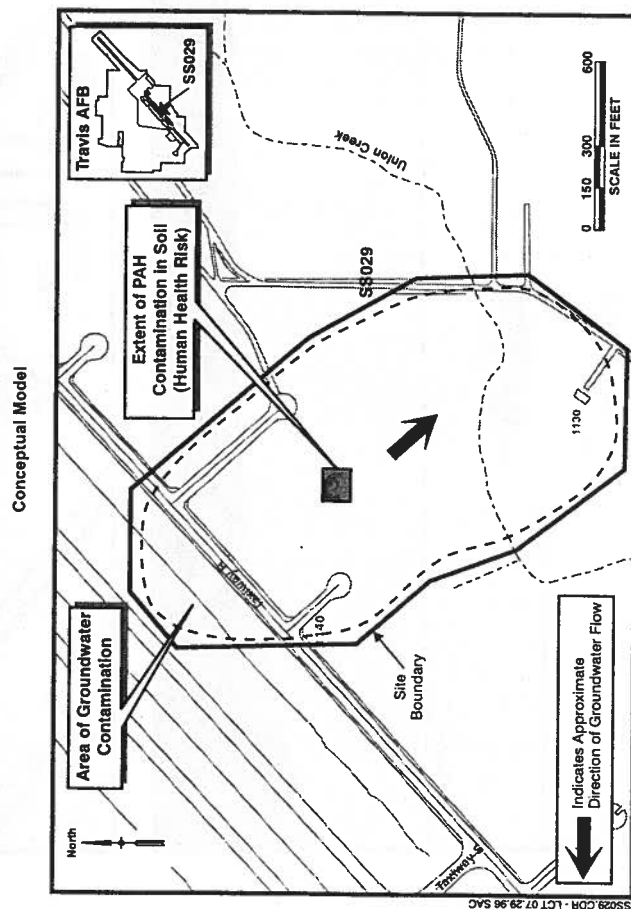
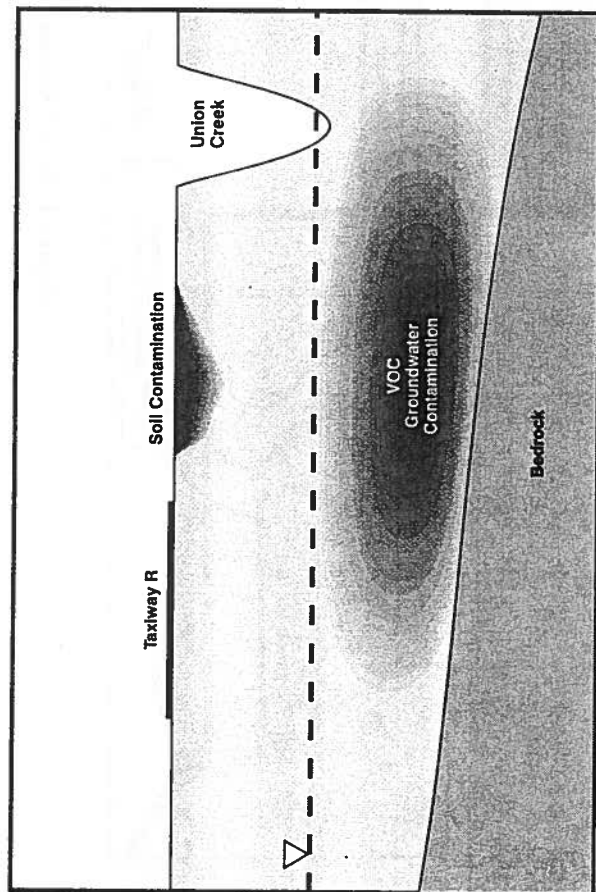
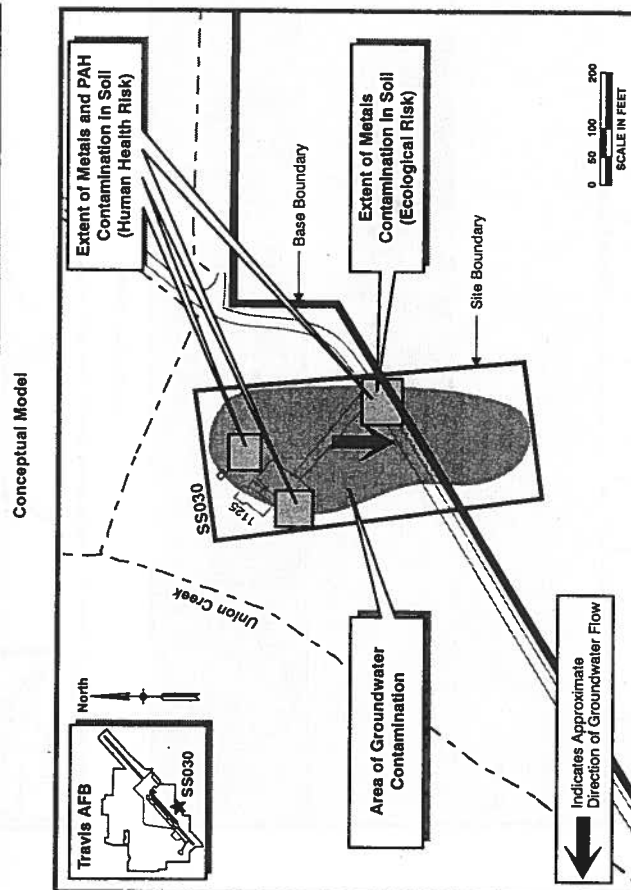
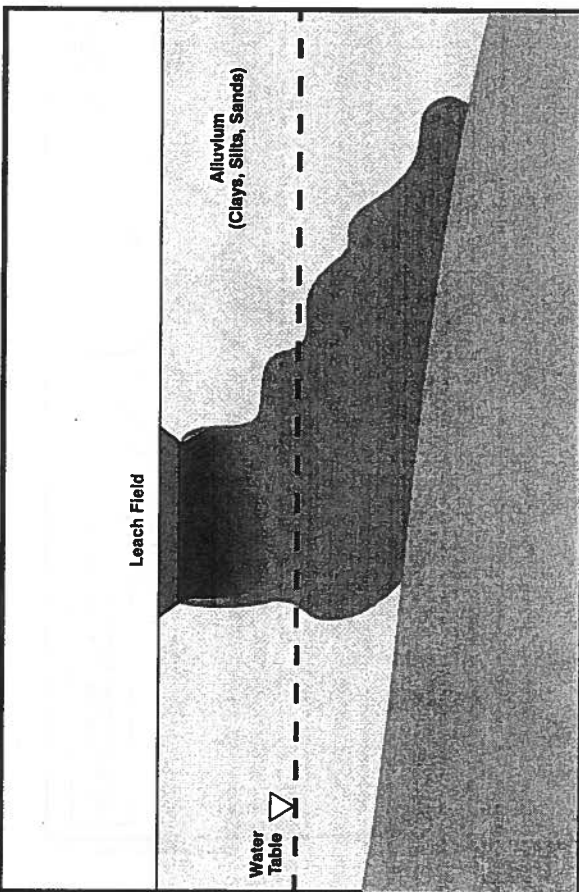


Figure 1-21. RI Summary Information for SS029, Travis AFB



SS030 (MW-269 Area)

Remediation Drivers:

- Human health risk associated with VOCs and metals in groundwater.
- Human health risk associated with VOCs, PAHs, SVOCs, and metals in soil.
- Ecological risk associated with metals in soil.
- MCLs exceeded in groundwater for VOCs and metals.

Primary Contaminants and Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 2,400 µg/L	5 µg/L
Groundwater	Metals	Nickel - 903 µg/L	100 µg/L
Soil	VOCs	TCE - 0.197 mg/kg	17 mg/kg
Soil	Metals	Lead - 97.4 mg/kg	1,000 mg/kg - 3.3 mg/kg (eco)
Soil	SVOCs	bis(2-Ethylhexyl)phthalate - 1.1 mg/kg	140 mg/kg
Soil	PAHs	Benzo(a)pyrene - 0.0498 mg/kg	0.26 mg/kg

Site Characteristics:

- Approximately 25% of the area is covered by pavement and buildings.
- Site located in an active area of Travis AFB.

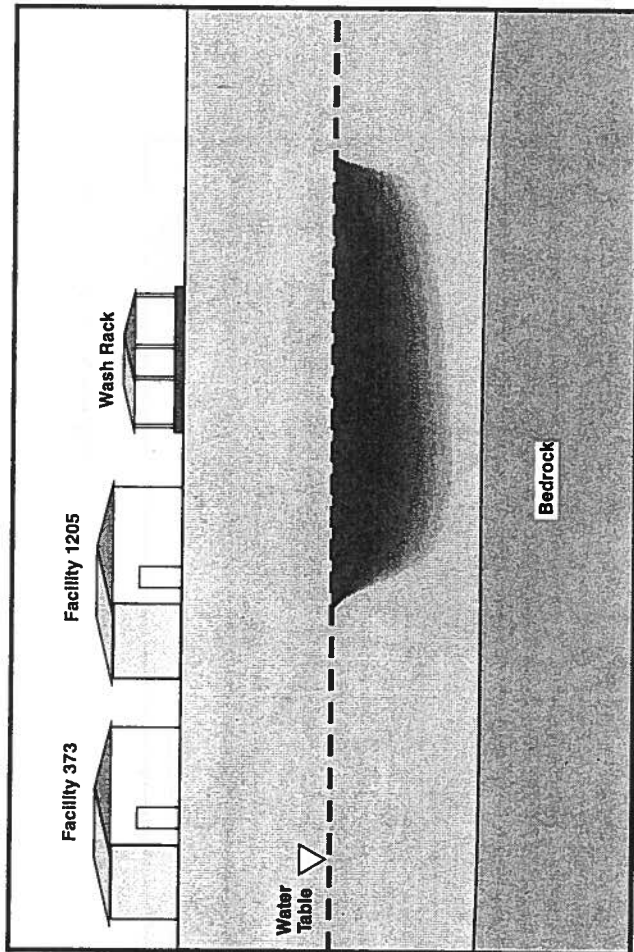
Physical Characteristics:

- Low permeability soils (clay and silt) to a depth of between 15 and 25 feet bgs.
- More permeable material (sands and silts) below 15 to 25 feet bgs.
- Depth to groundwater: 10 to 17 feet.
- Depth to bedrock: 20 to 25 feet.
- Well pumping rates: MW-269 conventional pumping at 0.8 gpm, two phase extraction at 3.7 gpm.
- Direction of groundwater flow: south.

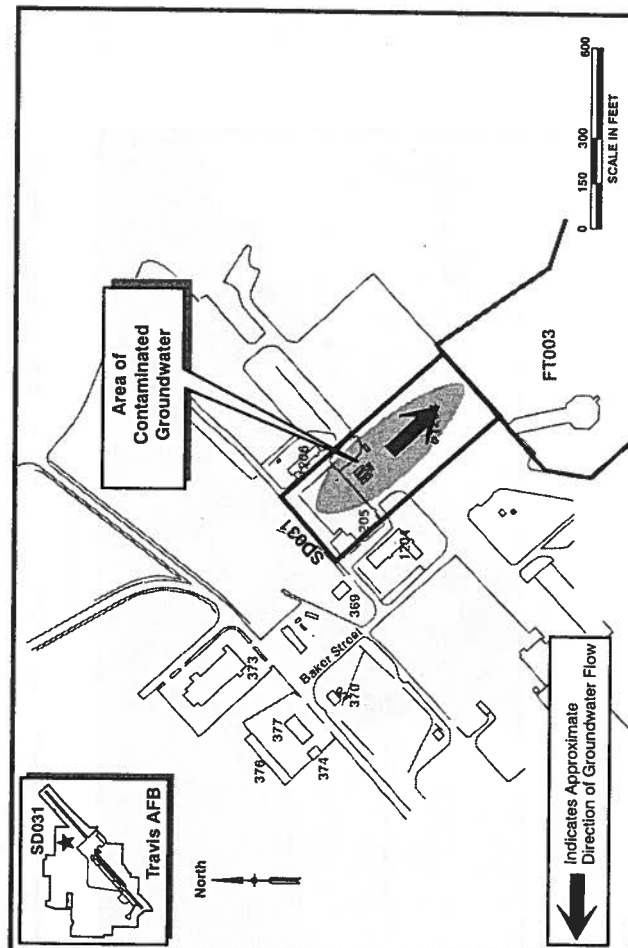
Contaminated Volume Estimates:

- Groundwater - 300,000 ft³
- Soil - estimate pending

Figure 1-22. RI Summary Information for SS030, Travis AFB



Conceptual Model



SD031: CDR - LCT 06.08.96 5AC

SD031 (Facility 1205)

Remediation Drivers:

- Human health risk associated with VOCs and metals in groundwater.
- MCLs exceeded for VOCs and metals in groundwater.

Primary Contaminants and Affected Medium:

Medium	Contaminant Type	Maximum Concentration	IRG (MCL)
Groundwater	VOCs	Benzene - 6.75 µg/L	1 µg/L
Groundwater	Metals	Nickel - 2,050 µg/L	100 µg/L
Groundwater	VOCs	TCE - 8,100 µg/L	5 µg/L
Groundwater	VOCs	cis-1,2-DCE - 3,600 µg/L	6 µg/L
Groundwater	VOCs	1,1-DCE - 7,300 µg/L	6 µg/L

Site Characteristics:

- Active generator maintenance shop, oil/water separator, and wash racks.
- Paved access road.
- 75% paved area.

Physical Characteristics:

- Depth to groundwater: 5 to 15 feet.
- Silt and clay to 10 feet bgs with some fill.
- Silty sand with minor gravel from 10 to 25 feet bgs.
- Depth to bedrock: 25 feet.
- Direction of groundwater flow: south/southeasterly.

Contaminated Volume Estimates:

- Groundwater - 330,000 ft³

Figure 1-23. RI Summary Information for SD031, Travis AFB

ST032 - Areas MW-107 and MW-246

Remediation Drivers:

- Human health risk associated with VOCs and SVOCs in groundwater.
- Human health risk associated with VOCs, PAHs, pesticides, PCBs, and metals in soil.
- MCLs exceeded for VOCs and SVOCs in groundwater.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG (MCL)
Groundwater	VOCs	Benzene - 5,040 µg/L	1 µg/L
Groundwater	VOCs	TCE - 64 µg/L	5 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 153 µg/L	4 µg/L
Soil	VOCs	Benzene - 12.6 mg/kg	3.2 mg/kg
Soil	PAHs	Benzo(a)pyrene - 0.034 mg/kg	0.26 mg/kg
Soil	Pesticides	alpha-Chlordane - 0.000356 mg/kg	1.5 mg/kg
Soil	PCBs	Aroclor-1260 - 0.0292 mg/kg	0.066 mg/kg
Soil	Metals	Arsenic - 14.9 mg/kg	2.4 mg/kg

Site Characteristics:

- Grassy, open area between a runway and an abandoned taxiway.
- Proximity to runway severely restrict land use (and potential remedial actions).
- 20% of MW-107 area covered by runway and taxiway.
- 10% of MW-246 area covered by runway and taxiway.
- TPH (4,440 mg/kg) in soil.

Physical Characteristics:

- Depth to groundwater: 7-10 feet.
- Depth to bedrock: 30 feet.
- Direction of groundwater flow: south.

Contaminated Volume Estimates:

- Groundwater - 1,000,000 ft³
- Soil - 8,100 cubic yards (human health risk)(no additional volume).

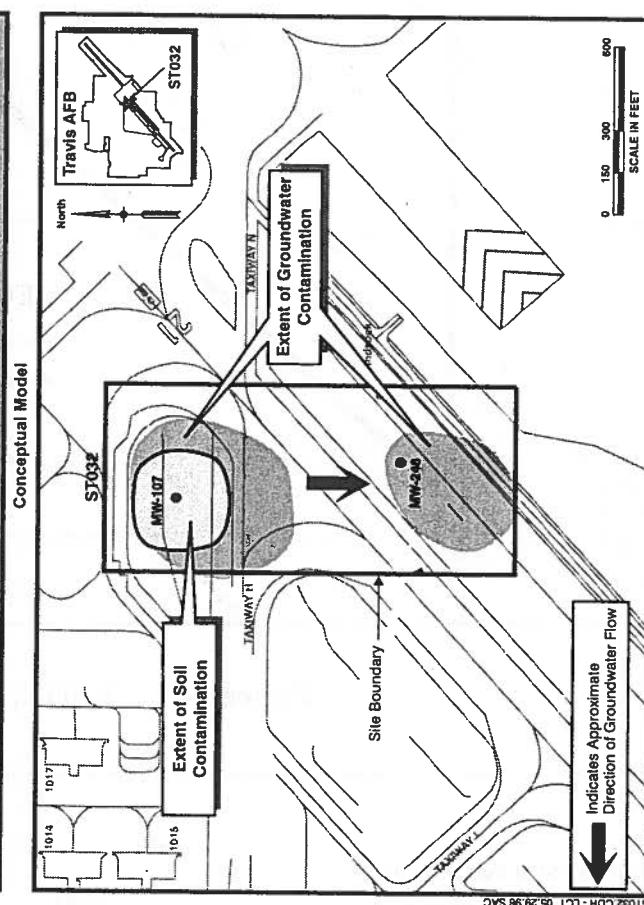
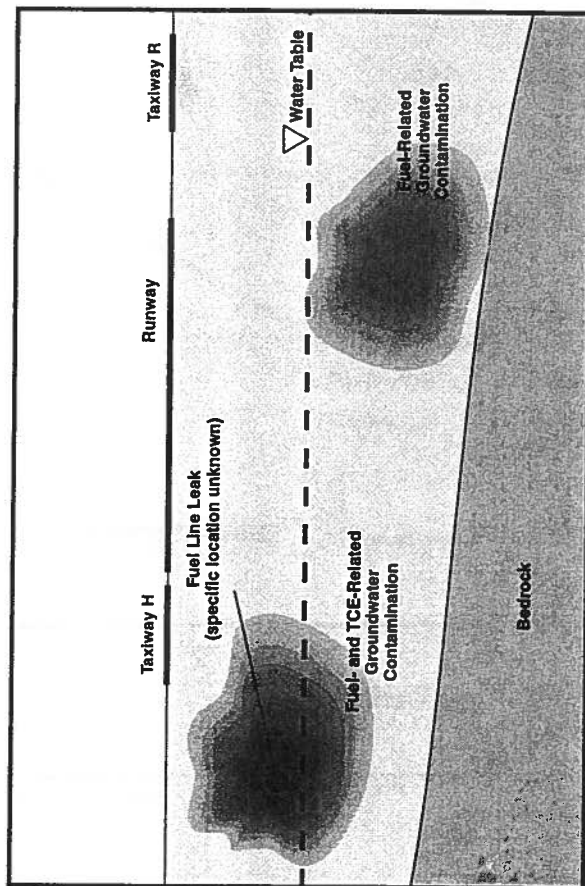
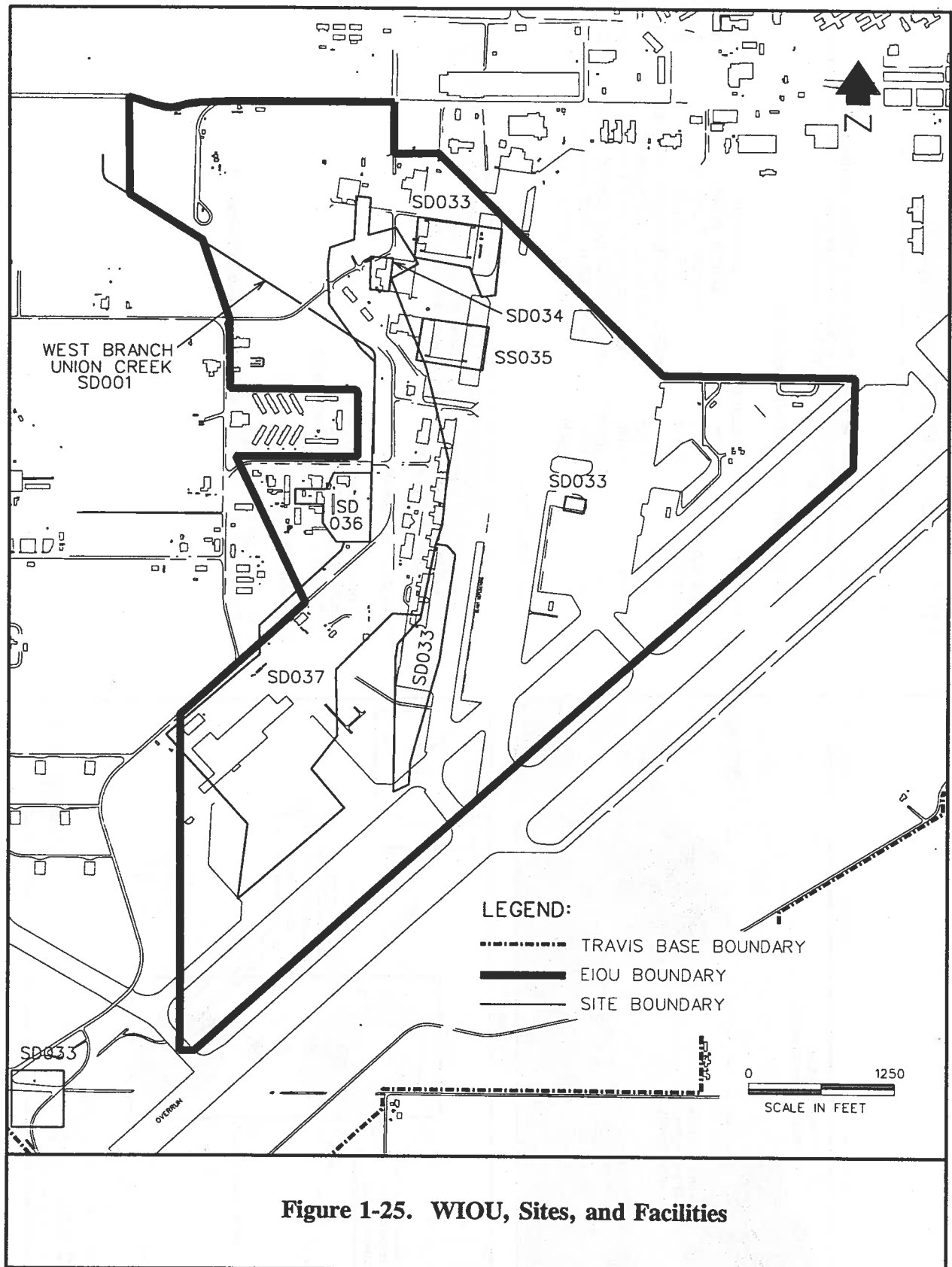


Figure 1-24. RI Summary Information for ST032, Travis AFB



TRAVIS5 WIOUSIT SAC VR

SD033 (Storm Sewer System II/Facilities 810 and 1917, South Gate Area, and West Branch of Union Creek)

Remediation Drivers:

- Health risks associated with VOCs in groundwater.
- SVOCs in sediment along the storm sewer system exceed IRG cleanup criteria.
- Ecological risks associated with metals in surface water and sediments.

Primary Contaminants and Affected Media:

Medium	Contaminant Type (Most Significant)	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 941 µg/L	5 µg/L
Surface Water	Metals	Barium - 0.135 mg/L	20-60 mg/L (eco)
Sediment	SVOCs	Benzo(b)fluoranthene - 7.7 mg/kg	52 mg/kg (eco)
Sediment	Metals	Cadmium - 13.0 mg/kg	1.2 mg/kg (eco)
Sediment	Metals	Nickel - 63.6 mg/kg	21 mg/kg (eco)
Surface Soil	Metals	Lead - 433 mg/kg	275 mg/kg (eco)

Site Characteristics:

- Storm sewer system/Facility 810 active.
- Contamination in sediment, surface soil, groundwater, and surface water.
- Flow in Union Creek is derived from surface runoff, and at times from groundwater.
- VOC (chloromethane) detected in ambient air samples.
- High concentrations of TCE (54,000 ppbv) and TPH (2,700,000 ppbv) detected in soil gas.

Physical Characteristics:

- Subsurface geology beneath storm sewer system varies.
- In general, low permeability alluvium underlies the area with discontinuous permeable layers.
- Weathered sandstone and shale of low to moderate permeability beneath the alluvium.
- Depth to groundwater: 13-18 feet.
- Direction of groundwater flow: southwest.

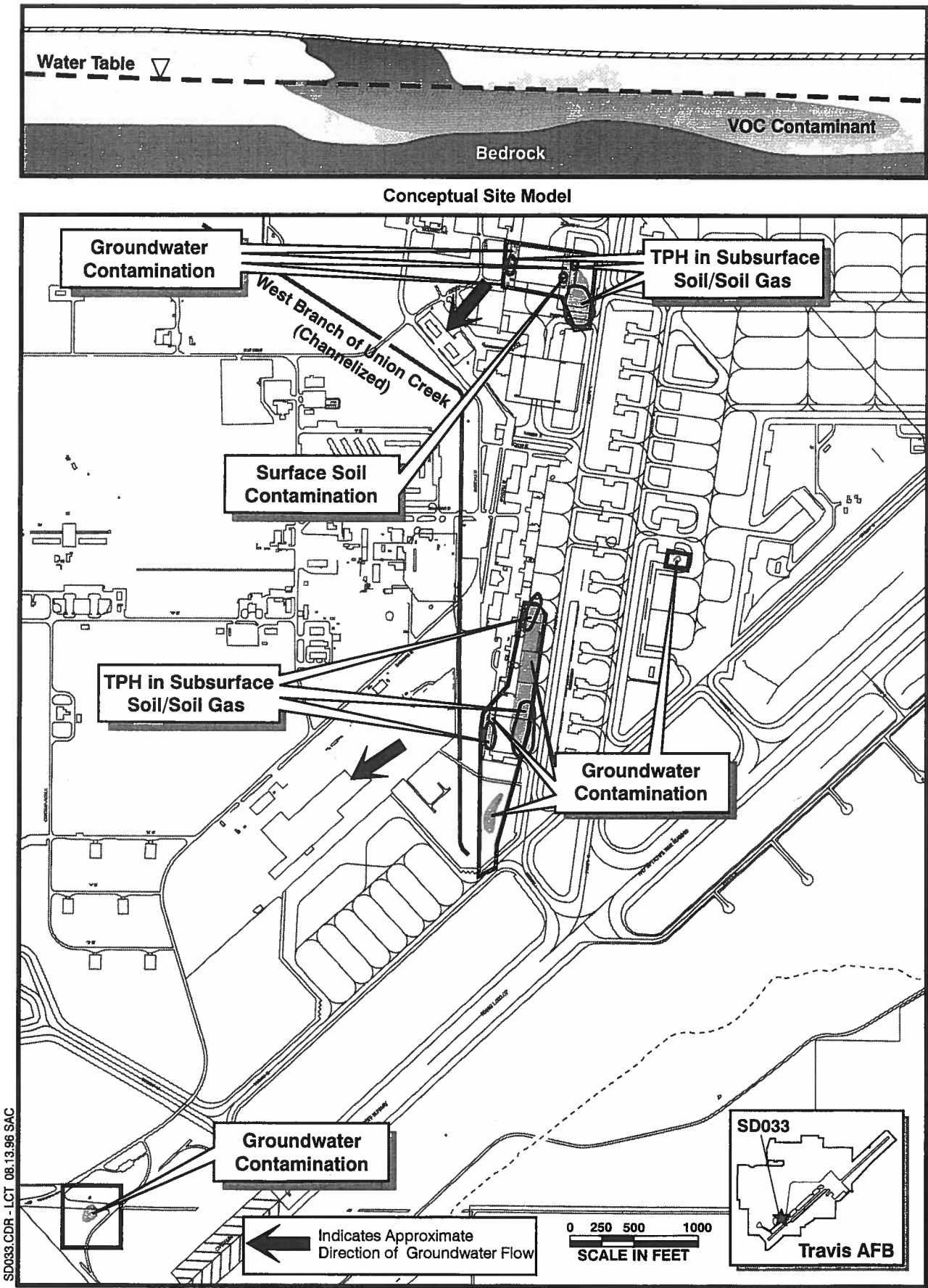
Interim Actions:

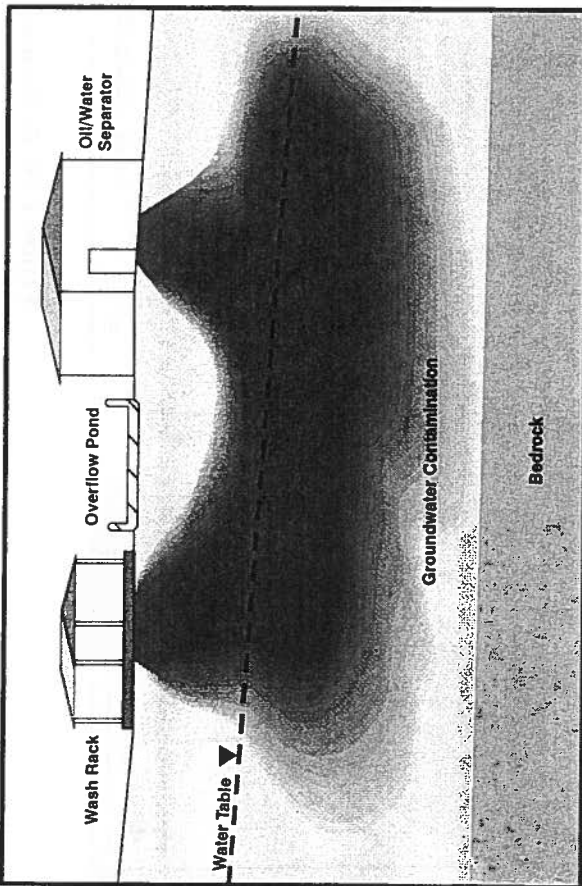
- USTs removed from various locations throughout SD033

Contaminated Volume Estimates:

- Groundwater - 490,000 ft³
- Sediment - 1370 cubic yards
- Soil - 10,870 cubic yards
- Surface Water - 1500 gpm maximum flow

Figure 1-26.
RI Summary Information
for SD033, Travis AFB





Conceptual Model

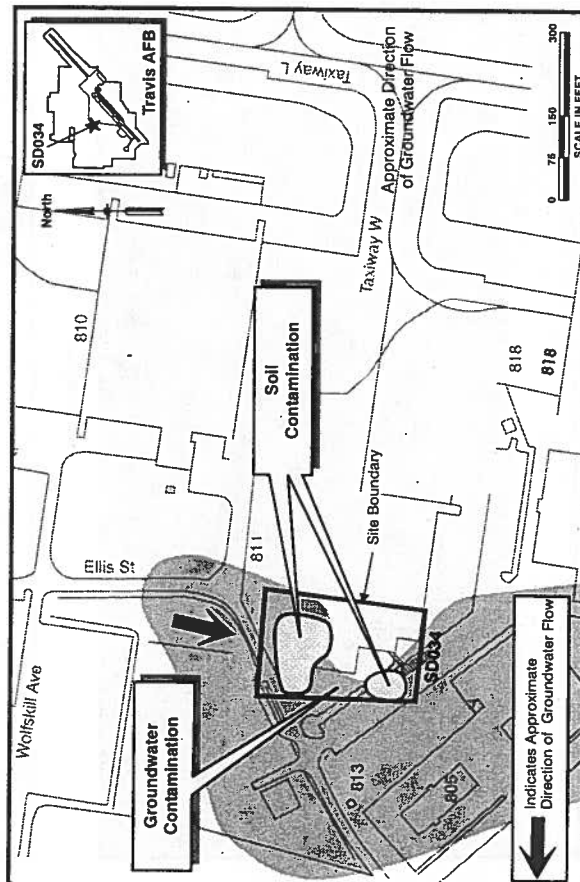


Figure 1-27. RI Summary Information for SD034, Travis AFB

SD034 (Facility 811)

Remediation Drivers:

- Human health risk associated with VOC and SVOC concentrations in groundwater

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 740 µg/L	5 µg/L
Groundwater	VOCs	Vinyl Chloride - 2.38 µg/L	0.5 µg/L
Groundwater	VOCs	Benzene - 6.8 µg/L	1 µg/L
Groundwater	VOCs	cis-1,2-DCE - 496 µg/L	6 µg/L
Groundwater	SVOCs	bis(2-Ethylhexyl)phthalate - 6,390 µg/L	4.8 µg/L
Soil	VOCs	TPH-gasoline - 15,900 mg/kg	10 mg/kg
Soil	SVOCs	TPE - 11,600 mg/kg	100 mg/kg

Site Characteristics:

- Includes an indoor washrack, an oil/water separator, and a concrete-lined overflow pond.
- Approximately 75% of the area is covered with roadbase and asphalt.
- TPH (15,900 mg/kg) detected in soil.
- High concentrations of DCE (3,500 ppbv) detected in soil gas.
- Site is adjacent to SD037; groundwater plumes are mixed.
- Floating product (PD-680) detected.

Physical Characteristics:

- Depth to sandstone bedrock: 16 feet bgs.
- Depth to groundwater: 10 feet.
- Direction of groundwater flow: southwest.

Contaminated Volume Estimates:

- Groundwater - 657,000 ft³
- Soil - 20,900 cubic yards (human health risk)

SS035 (Facility 818/819)

Remediation Drivers:

- Human health risk associated with PCBs in surface soil and VOCs in groundwater.
- Chlorinated solvents in soil gas.

Primary Contaminants and Affected Media:

Medium	Contaminant Type	Maximum Concentration	IRG
Surface Soil	PCBs	Aroclor-1260 - 0.523 mg/kg	0.34 mg/kg
Groundwater	VOCs	TCE - 21.0 µg/L	5.0 µg/L
Groundwater	SVOCs	TPH-E - 160 µg/L	TBD

Site Characteristics:

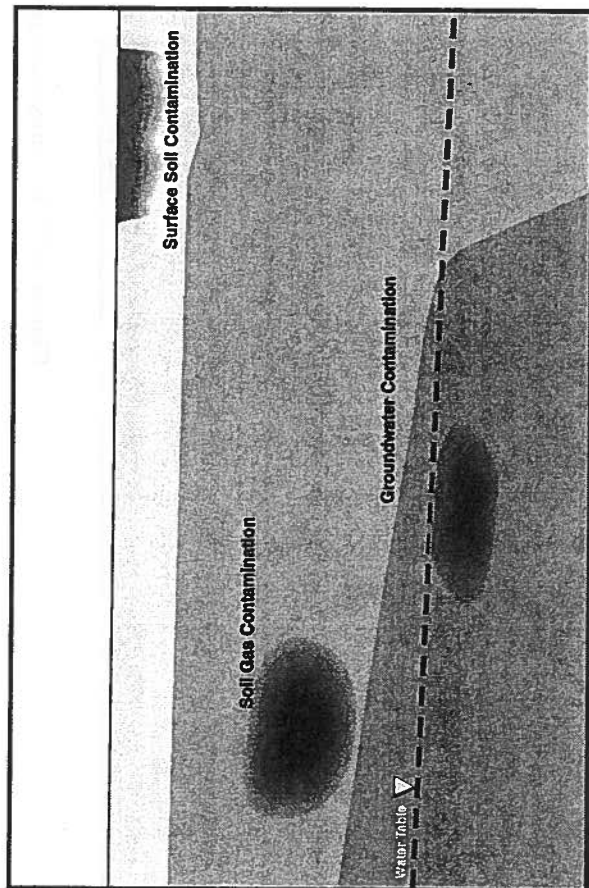
- Asphalt and roadbase cover most of the site. PCBs detected in area of soil and grass storage area, and hazardous material accumulation area.
- TCE in soil gas detected @ 1,100 ppbv, associated with groundwater Vinyl chloride detected @ 74 ppbv in soil gas.

Physical Characteristics:

- Low permeability soils (clay and silt) to about 15 feet bgs.
- More permeable material (sand lens) encountered at boring 818-B07.
- Depth to groundwater: 15 feet.
- Depth to bedrock: 14 feet.
- Direction of groundwater flow: south.

Contaminated Volume Estimates:

- Soil - 1800 cubic yards (human health risk)
- Groundwater - 12,000 ft³



Conceptual Model

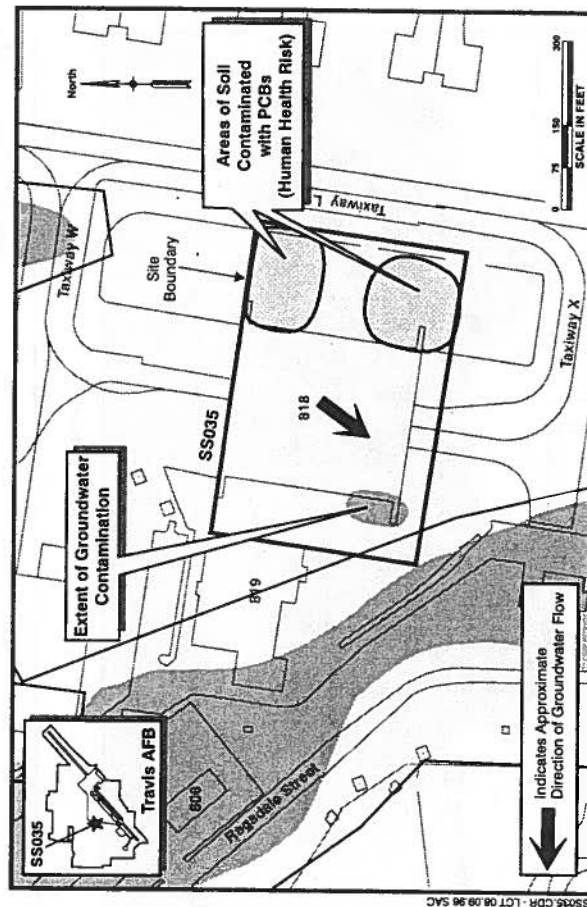


Figure 1-28. RI Summary Information for SS035, Travis AFB

SD036 (Facilities 872/873/876)

Remediation Drivers:

- Health risks associated with VOCs in groundwater.
- SVOCs groundwater contaminants exceed interim remediation goals.

Primary Contaminants and Affected Media:

Medium	Contaminant Type (Most Significant)	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 308 µg/L	5 µg/L
Groundwater	VOCs	Benzene - 3.87 µg/L	1 µg/L
Groundwater	VOCs	Vinyl Chloride - 198 µg/L	0.5 µg/L
Groundwater	VOCs	1,2-DCE - 3870 µg/L	6 µg/L
Soil	VOCs	TPH-gasoline - 292 mg/kg	10 mg/kg
Soil	SVOCs	TPH-E - 621 mg/kg	100 mg/kg

Site Characteristics:

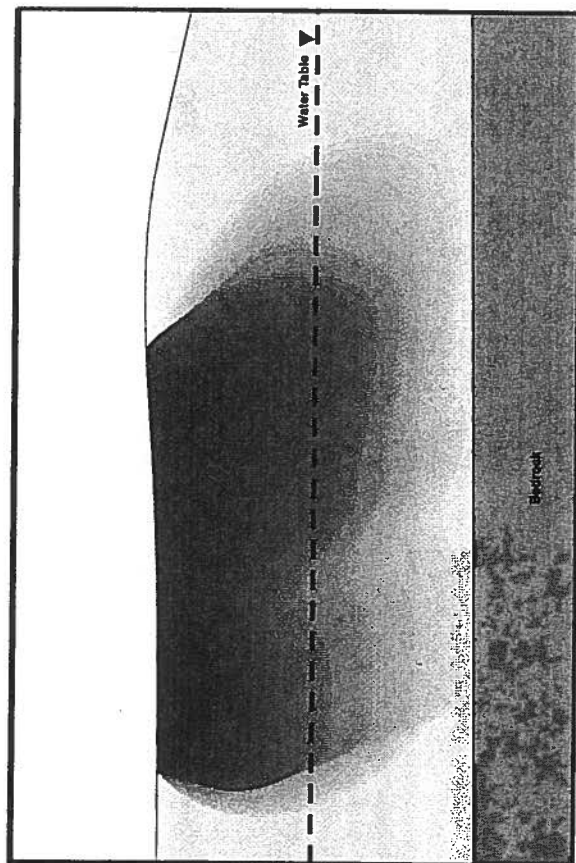
- The site is paved and is within a cluster of buildings.
- The site is active.
- Site is adjacent to SD037 - groundwater plumes are mixed.
- VOCs also detected in soil gas.

Physical Characteristics:

- Two to four feet of asphalt and road base material.
- Low permeability alluvium (clay) from 4 to 9.5 feet bgs.
- Moderate permeability alluvium (clayey sand) from 8 to 18 feet bgs.
- Thick, discontinuous sand units.
- Depth to bedrock: > 30 feet.
- Direction of groundwater flow: south.

Contaminated Volume Estimates:

- Groundwater - 600,000 ft³
- Soil - 2,300 cubic yards (human health risk)



Conceptual Model

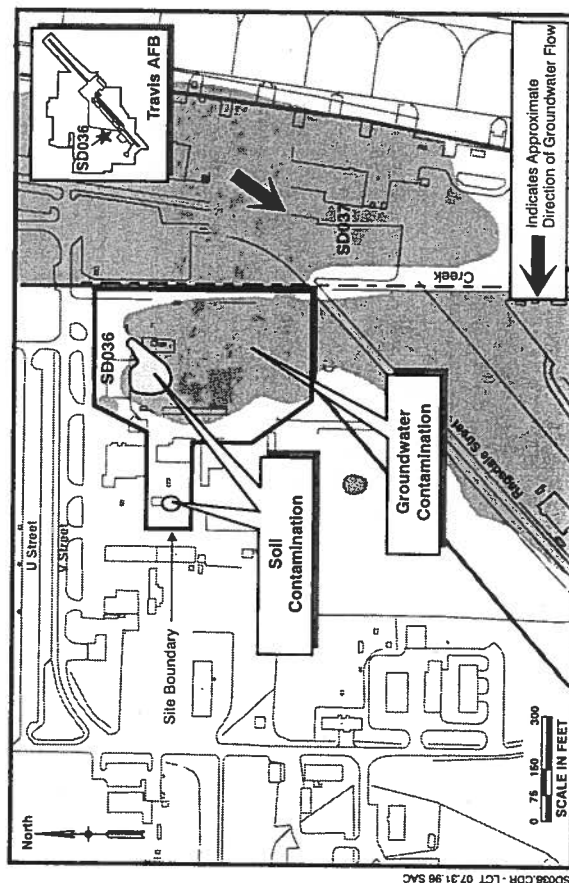


Figure 1-29. RI Summary Information for SD036, Travis AFB

SD037 (Sanitary Sewer System, Facilities 837, 838, 919, 977 and 981, Area G Ramp and Ragsdale/V Area)

Remediation Drivers:

- Human health risks from contaminants in groundwater, soil and sediment.
- Ecological risks from contaminants in soil.

Primary Contaminants and Affected Media:

Medium	Contaminant Type (Most Significant)	Maximum Concentration	IRG
Groundwater	VOCs	TCE - 6,990 µg/L	5 µg/L
Groundwater	VOCs	Benzene - 1.93 µg/L	1 µg/L
Groundwater	VOCs	Vinyl Chloride - 60.2 µg/L	0.5 µg/L
Sediment	Metals	Cadmium - 1.53 mg/kg	1.2 mg/kg (eco)
Soil	SVOCs	Benzo(a)anthracence - 1.68 mg/kg	0.11 mg/kg
Soil	TPH	Gasoline - 909 mg/kg	10 mg/kg

Technology Limiting Compounds:

- Vinyl chloride has been detected above MCLs near Facility 919.
- Mixed fuel and solvent contamination in several areas.
- VOCs (vinyl chloride 1,3-butadiene and benzene) have been detected in ambient air samples

Site Characteristics:

- The sanitary sewer system includes approximately 22,000 feet of piping, as well as associated oil water separators, sumps, and wash racks.

Physical Characteristics:

- Subsurface geology beneath the SD037 varies.
- In general, low permeability alluvium underlies the area with discontinuous permeable layers.
- Weathered sandstone and shale interbed to form bedrock layer beneath the alluvium.
- Depth to groundwater: 7 to 24 feet.
- Direction of groundwater flow: southeast.

Interim Action:

- USTs removed from various locations throughout SD037

Contaminated Volume Estimates:

- Groundwater - 4,500,000 ft³

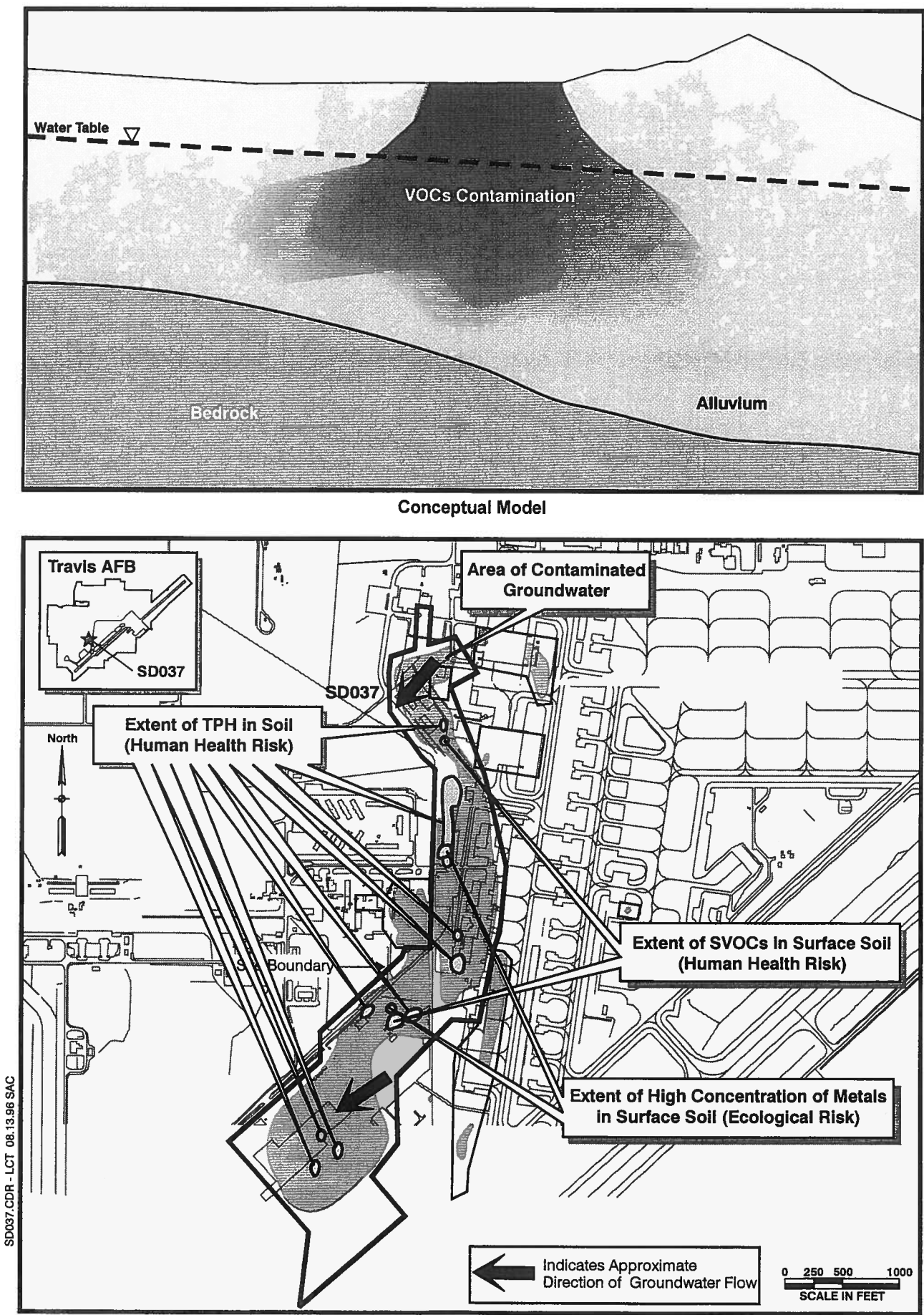


Figure 1-30.
RI Summary Information
for SD037, Travis AFB