DEPARTMENT OF THE AIR FORCE

HEADQUARTERS SACRAMENTO AIR LOGISTICS CENTER (AFMC)
McCLELLAN AIR FORCE BASE, CALIFORNIA

DEC 2 3 1992

FROM: SM-ALC/EMR
3200 Peacekeeper Way, Suite 11
McClellan AFB CA 95652-1036

SUBJ: McClellan AFB Management Action Plan (MAP) Submittal

TO: See Distribution

1. We are pleased to submit the initial McClellan AFB Management Action Plan. The MAP is the master planning and strategy document for our environmental restoration and compliance programs. As previously agreed, this submittal will take the place of the Comprehensive CERCLA Workplan (CCW); however, it will not be a primary document in accordance with our Interagency Agreement (IAG).

2. If you have any questions or comments, please contact myself or Beth Volk at (916) 643-0831.

FRANCIS E. SLAVICH
Remedial Project Manager
Environmental Restoration Division
Environmental Management Directorate

1 Atch
MAP

Disclaimer

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Statement A per Francis Slavich
SM-ALC/EMR
McClellan, AFB CA 95652-1036
NWW 12 Jan 92

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Chapter 1

Introduction and Summary

This Management Action Plan ("Action Plan" or "MAP") contains a status summary of the McClellan Air Force Base (McAFB) environmental restoration and compliance programs and presents a comprehensive strategy for implementing response actions necessary to protect human health and the environment. This strategy integrates activities under both the Installation Restoration Program (IRP) and the Environmental Compliance Program (ECP). This Action Plan is a dynamic document that will be updated on a regular basis using the change-a-page looseleaf binder concept for day-to-day revisions along with a subsection at the end of each chapter to highlight any modifications or innovations since the previous major annual review/update. The McAFB Action Plan does the following:

- Describes the objectives of the environmental restoration program and the purpose of this Action Plan, identifies the Project Team formed to conduct the program, and provides a brief history of the installation environmental program (Chapter 1)
- Summarizes the status of the McAFB IRP and environmental compliance programs; accounts for all contaminated sites; and clearly defines the regulatory programs under which each is being addressed (Chapter 3)
- Describes the installation-wide strategy for environmental restoration through definition of operable units (OUs) and the scope of removal and remedial activities associated with (or to be completed for) each; summarizes plans for managing underground tanks via the underground storage tank (UST) program; and summarizes plans for managing responses under other compliance programs (Chapter 4)
- Provides a Master Schedule of planned and anticipated activities to be performed throughout the duration of the environmental restoration program, including restoration-related compliance activities (Chapter 5)
- Describes specific technical and/or administrative issues to be resolved by the McAFB Project Team and a strategy and proposed schedule for their resolution (Chapter 6)

1.1 Environmental Response Objectives

The objectives of the environmental restoration program at McAFB are as follows:

- Protect human health and the environment
- Compiy with existing statutes and regulations
- Conduct all IRP activities in a manner consistent with Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA)
- Meet Interagency Agreement (IAG) deadlines and commitments in other agreements, namely the Federal Facility Site Remediation Agreement (FFSRA) concerning the Davis Site and commitments to the Air Force and the California Environmental Protection Agency (Cal-EPA)
- Continue efforts to identify all potential source areas
- Initiate selected removal actions to control, eliminate, or reduce risks to manageable levels

- Identify and map the environmental condition of installation property, including areas of no suspected contamination (ANSCs), concurrently with remedial investigation (RI) efforts; characterize risks associated with releases of hazardous substances, pollutants, contaminants, or hazardous wastes
- Complete RIs as soon as practicable for each OU, in order of priority
- Develop, screen, and select remedial actions (RAs) that reduce risks in a manner consistent with statutory requirements
- Conduct long-term RAs for groundwater and any necessary five-year reviews for wastes left on-site

1.2 MAP Purpose

This MAP presents, in summary fashion, the status of McAFB's environmental restoration and compliance programs and outlines a comprehensive strategy for environmental restoration and restoration-related compliance activities. It also describes the response action approach to be followed at McAFB. In addition, it defines the status of efforts to resolve technical issues so that continued progress and implementation of scheduled activities can occur.

1.3 Project Team

The McAFB Project Team has been established and is led by Paul Brunner, the Director of Environmental Management, (EM). Project Team meetings are the primary means of resolving technical issues and reaching consensus on decisions with State and Federal regulators. Table 1-1 lists the team members, and specifies their roles and responsibilities.

1.4 Brief History of Installation

McAFB is located approximately seven miles northeast of downtown Sacramento, California. The main base facility includes 2,949 contiguous acres which are bounded by the City of Sacramento to the west and southwest, the unincorporated areas of Rio Linda to the northwest, and North Highlands to the east.

McAFB was authorized by Congress in 1936 as an aircraft repair depot and supply base. Initially named the Sacramento Air Depot, the facility was dedicated in 1939. In the early 1950s, the primary mission of McAFB changed from that of a bomber depot to that of a jet fighter maintenance depot. McAFB currently operates as an installation of the Air Force Materiel Command, and employs approximately 16,800 military and civilian personnel with the primary mission of management, maintenance, and repair of aircraft, electronics, and communication equipment. These activities, and the associated housekeeping and support services, are carried out by units of the Air Force Materiel Command. Additional tenants of the base include both military and civilian entities.

In fulfilling its past and current mission to defend the United States through the operation and maintenance of aircraft, McAFB was, and is, engaged in a wide variety of operations involving the use, storage, and disposal of hazardous materials. These include industrial solvents, caustic

Table 1-1. Current McClellan AFB Project Team Members

CORE TEAM MEMBERS

Name	Title	Phone	Role/Responsibility
Paul Brunner	Environmental Management Director	(916) 643-1250	Director of McClellan EM
Mario Ierardi	Restoration Division Chief	(916) 643-0831	Division Chief
Charles Thorpe	Pollution Prevention Division Chief	(916) 643-2517	Division Chief
Fran Slavich	Remedial Project Manager	(916) 643-0831	McClellan RPM
Katherine Moore	Remedial Project Manager	(415) 744-2407	Lead EPA RPM
Mark Malinowski	Remedial Project Manager	(916) 255-3717	Lead State RPM
Alexander McDonald	Remedial Project Manager	(916) 361-5626	State RWQCB RPM
Patricia Massimini	Group Leader (MITRE)	(703) 883-6490	Systems Engineering Support
David Topaz	Congressional Representative	(916) 551-2846	Congressional District
Chuck Daldorf	Congressional Representative	(916) 978-4381	Congressional District
Andy Bain	Community Relations Representative	(415) 744-2184	EPA Region IX
Sue Sher	Community Relations Representative	(916) 255-3647	State DTSC
Chuck Yarbrough	Community Representative	(916) 922-7906	City of Sacramento
Burl Taylor	Community Representative	(916) 344-8165	Sacramento County
Dayle Lewis	Union Representative	(916) 322-3250	AFGE Local 1857
Ray Martinez	Union Representative	(916) 322-3250	AFGE Local 1857

Table 1-1. Current McClellan AFB Project Team Members (Continued)

OTHER KEY PARTICIPANTS

Name	Title	Phone	Role/Responsibility
Patrick Christman	Team Leader	(916) 643-0531	Program Execution
Bruce Eades	Contracting Officer	(916) 643-0741	Contracts
Bud Hoda	Team Leader	(916) 643-0830	OU B, OU C
Martin Keck	Environmental Attorney	(916) 643-6700	Legal Assistance
Maj. Lee Lewis	Team Leader	(916) 643-1096	EIAP and Planning
Kirk Schmalz	Team Leader	(916) 643-1096	Operations and Maintenance
Jerald Styles	Team Leader	(916) 643-0831	OU A, OU D, Davis Transmitter Site
Marc Garcia	UST Specialist	(916) 643-6585	Compliance Program
Kim Rasmussen	Compliance Specialist	(916) 643-2517	Compliance Program
Patt Robino	Community Relations Specialist	(916) 643-0832	Community Relations
Patrick Haas	Technical Project Manager	(512) 536-5239	AFCEE TPM
Ramon Mendoza	Remedial Project Manager	(415) 744-2410	EPA Project Manager
Richard Russell	Remedial Project Manager	(415) 744-2406	EPA Project Manager
Jim Pinasco	Remedial Project Manager	(916) 855-7874	State Project Manager
Ming Wang	Technical Program Coordinator (MITRE)	(703) 883-7261	Technical Program Support

Table 1-1. Current McClellan AFB Project Team Members (Concluded)

CONTRACTORS

Name	Title	Phone	Role/Responsibility
Starr Dehn	Program Manager (CH2M Hill)	(916) 720-0300	RI/FS Contractor
Geoff Watkin	Program Manager (Jacobs)	(510) 228-9700	RI/FS Contractor
Fred Schafer	Project Manager (Metcalf and Eddy)	(916) 648-1677	GWTP Contractor
Greg Reller	Project Manager (PRC)	(916) 852-8300	EPA Support Contractor
Dave Watson	Project Manager (PTI)	(503) 636-4338	EPA Support Contractor
Bill Corbett	Program Manager (Radian)	(916) 362-5332	RI/FS Contractor
Neil Anderson	Project Manager (USPCI)	(916) 921-2202	RA Contractor

cleaners, electroplating chemicals, heavy metals, polychlorinated biphenyls (PCBs), low-level radioactive wastes, and a variety of fuel oils and lubricants. It is the past use and disposal of some of these materials as well as present environmental practices that form the basis for discussions in this plan.

Important environmental events at McClellan include the following:

- 1978 TCE banned (air pollutant)
- 1979 Groundwater problem identified
  Several production wells closed
- 1981 IRP introduced
- 1981/82 Record search and initial characterization
  - 46 sites
  - Four areas (A, B, C, D), with D being the worst
- 1983 Quarterly sampling of off-base wells begun
- 1984 Further characterization of Area D
  20,000 cubic yards soil/sludge removed from D
  Further characterization of Areas A, B, C
  Epidemiological study—no measurable symptoms
- 1985/86 Area D extraction wells begun
- 1986/87 500 off-base residences connected to municipal water supply system
  Abandoned electroplating facility (Building 666) demolished
- 1987 McAFB placed on National Priorities List (NPL)
  Area C extraction system installed
- 1988 Public health assessment initiated
- 1989/90 IAG signed (154 sites initially identified)
- 1990 Building 666 extraction system installed
- 1991 Environmental Process Improvement Center (EPIC) became operational
- 1992 Current status
  - 258 sites: confirmed site, potential release location, study area
  - 11 Operable Units: A, B, B1, C, C1, D, E, F, G, H, Groundwater
  Air Force developed MAP concept
  FFSRA for Davis Transmitter Site signed

1.5 Environmental Process Improvement Center (EPIC)

EPIC is a cooperative grouping of parties to the IAG. These parties include McAFB, US EPA, and units of Cal-EPA. Proposed by the Air Force, EPIC was formed in October 1991 to help achieve the common goals of pollution prevention and accelerated cleanup of polluted sites, as well as to promote effective environmental protection through innovative management, education, communication, and action. Within this context, McAFB works closely with US EPA and Cal-EPA to apply innovative technologies and to identify efficient implementation strategies for achieving environmental restoration and pollution prevention in a proactive manner.

In comparison with the formal relationship specified in the McClellan IAG, EPIC provides a closer and broader interaction among the three government agencies. Moreover, EPIC goes beyond restoration issues to deal with pollution prevention/compliance matters as well. EPIC provides for effective communication through Working Groups to identify and resolve policy, contracting, and technical issues related to the restoration program at McAFB. In addition, EPIC achieves early resolution of agency conflicts by providing convenient and timely joint involvement of upper management.

Principal EPIC goals include the following:

- Expedite site cleanup, including activities pursuant to the IAG
- Apply pollution prevention/compliance strategies
- Apply innovative technology for remediation and pollution prevention
- Improve environmental contracting mechanisms
- Establish a regional environmental resource center

EPIC is organized into a governing Council and four Working Groups consisting of representatives from the three agencies and interested private parties. Each of the Working Groups focuses upon a different topic, and these are:

Council. The Council consists of project managers and higher management representatives from the three agencies. The Council provides overall policy guidance for the Working Groups. Council discussions ensure that communication among the agencies is effective, and that misunderstandings or disagreements are resolved promptly.

Pollution Prevention. The goal of this Working Group is to develop and introduce cost-effective technologies for cleaning surfaces that will lower or, when possible, eliminate use of hazardous materials and reduce generation of hazardous waste to the greatest extent feasible. The Pollution Prevention Working Group also supports technical initiatives for preventing source emissions to the air, land, and groundwater. Emphasized under this activity are initiatives aimed at enhancing McClellan's air quality credit balance.

Accelerated Cleanup. The goal of this Working Group is to accelerate remediation efforts through innovative and creative approaches. The group advocates using streamlined approaches for cleanup and believes that the overall process should be performance-driven, technically superior, and cost-efficient.

Alternative Technologies. The goals of this Working Group are to develop new technologies for remediating contamination at U.S. west coast facilities, and for site-specific cleanup of sites at the base.

Information Crossfeed. The goal of the Information Crossfeed Working Group is to share success stories with other bases and industries. Information concerns include new technologies applied to IRP sites, industrial innovations, and community relations lessons learned.

1.6 McClellan Concept of Operations Strategy

Overall, the IRP strategy is designed to support the McAFB EM goal: make optimal use of program resources in planning and executing remediation actions to achieve the goal of our customers, i.e., protect human health and the environment through cleaning up hazardous waste contamination. Optimal use of resources involves a complex process of balancing cost, program acceleration, cleanup levels, remedial measure alternatives, and community and regulatory interests to achieve a program that delivers the best possible value for the investment made.

McAFB seeks to optimize its staff and funding resources by implementing ideas that reflect its basic philosophy. These ideas include: foster cooperation and teamwork among the stakeholders; encourage technology development and insertion; promote flexibility and efficiency in program execution; measure and track progress; and empower the staff to succeed.

McAFB has developed four program objectives that support the program goal and reflect McAFB's strategy for implementing the program. These objectives are:

- **Focus Clean Up on Accelerated Risk Reduction.** Near-term removal actions using appropriate technologies can result in large risk reductions, while less problematic sites can be postponed until innovative technology provides more cost-effective means of remediation. Risk-related progress metrics track the advancement of sites from higher to lower risk categories.
- **Enhance Regulatory and Community Participation.** Regulatory and public coordination and cooperation is essential to accelerating efforts to reduce risk.
- **Enhance McAFB's Program Execution Infrastructure.** A comprehensive Environmental Management organization that supplements EM organic skills with matrixed capabilities from several other base offices is in place and growing. By practicing Total Quality Management (TQM) and continual process improvement techniques, McAFB has identified several opportunities to enhance program execution.
- **Share McAFB's Philosophy, Capabilities and Experience.** McAFB's environmental management capabilities are well developed and we have established a good rapport with the regulators in EPA Region IX. The special experiences, insights, and goodwill developed at McAFB can be shared across the Region and throughout the Air Force through a variety of mechanisms as our program continues to mature.

McClellan has developed a program implementation strategy that supports these objectives in a comprehensive way.

1.7 Modifications Since Last Update

Because this MAP document is the first in the series, there are no interim modifications to report.

Chapter 2
Property Disposal and Reuse Plan

This chapter has been left blank intentionally since McClellan is not a closure base at this time.

Chapter 3

Installation-Wide Environmental Program Status

This chapter provides a status summary of the current IRP and ongoing pollution-prevention/ compliance activities at McAFB. It also summarizes the status of community involvement to date and describes the environmental condition of McAFB property.

3.1 IRP Status

In May 1990, the Air Force, EPA Region IX, and the California Department of Health Services (DHS) signed an Interagency Agreement (IAG) pursuant to the following authorities:

- CERCLA §120 (Comprehensive Environmental Response, Compensation and Liability Act, as amended)
- RCRA §6001, 3000(h), 3000(u) and (v) (Resource Conservation and Recovery Act, as amended)
- NEPA (National Environmental Policy Act)
- DERP (Defense Environmental Restoration Program)
- Executive Order 12580
- California Health and Safety Code §102 and 25355.5(a)(1)(c), pursuant to RCRA §3006

The IAG also requires compliance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), CERCLA guidance and policy, RCRA guidance and policy, and applicable state laws.

In a subsequent reorganization by the State, the duties, responsibilities, and authorities of the DHS were transferred to the Cal-EPA.

Under Section 6.2 of the IAG, the Air Force agreed to undertake, seek adequate funding for, fully implement, and report on the following tasks:

- Remedial Investigations (RIs) of the Site
- Feasibility Studies (FSs) for the Site
- All response actions including Operable Units (OUs) for the Site
- Operation and maintenance of response actions at the Site

Under Sections 8.2, 8.3, and Appendix A of the IAG, all parties agreed to deadlines for draft primary RI, FS, Proposed Plan (PP) and Record of Decision (ROD) documents for the Site. (The term "Site" with a capital "S" refers to the entire McClellan facility or the off-base Davis facility, while "site" with a lower-case "s" means the individual locations where there has been a spill or release of contamination to the environment.)

At the time of the IAG, the base was effectively divided into 12 Geographic Areas/OUs (A1, A2, A3, B1, B2, C1, C2, D, E, F, G, H). These 12 OUs include the groundwater as well as the surface and the vadose zone. Since then, some of these entities have been consolidated and new breakouts have been created, resulting in 11 OUs. Ten of the 11 OUs have geographic boundaries at the surface or in the vadose zone and are associated with source areas, namely A, B, B1, C, C1, D, E, F, G, H, as indicated in Figure 3-1. (Note that the present B1 and C1 are not the same as the B1 and C1 in the IAG.) An additional OU—the Groundwater (GW) OU, shown in Figure 3-2—separately addresses the groundwater contamination underlying much of the base. Containment and remediation of

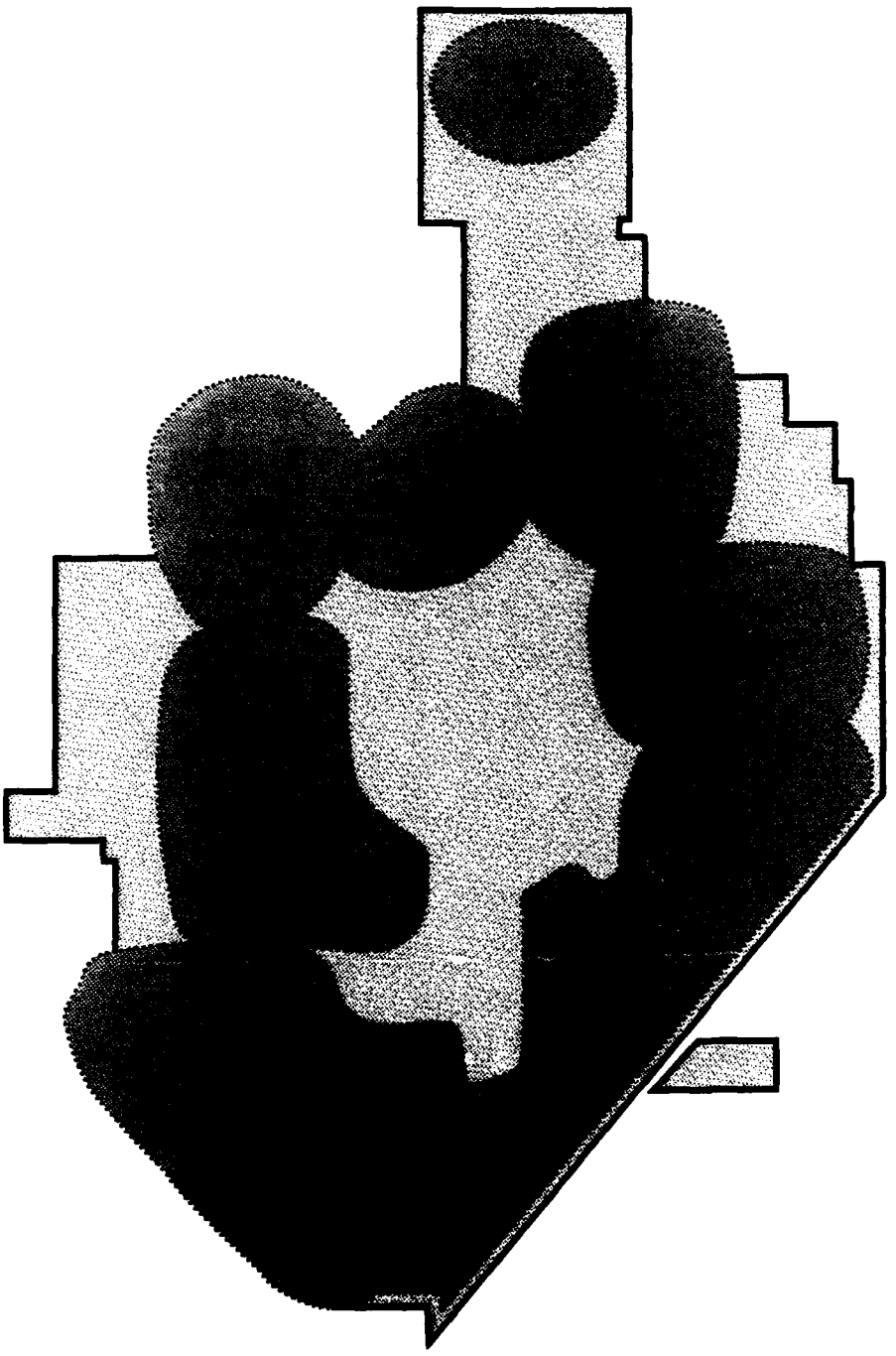


Figure 3-1. McClellan AFB Geographic Source Area Operable Units

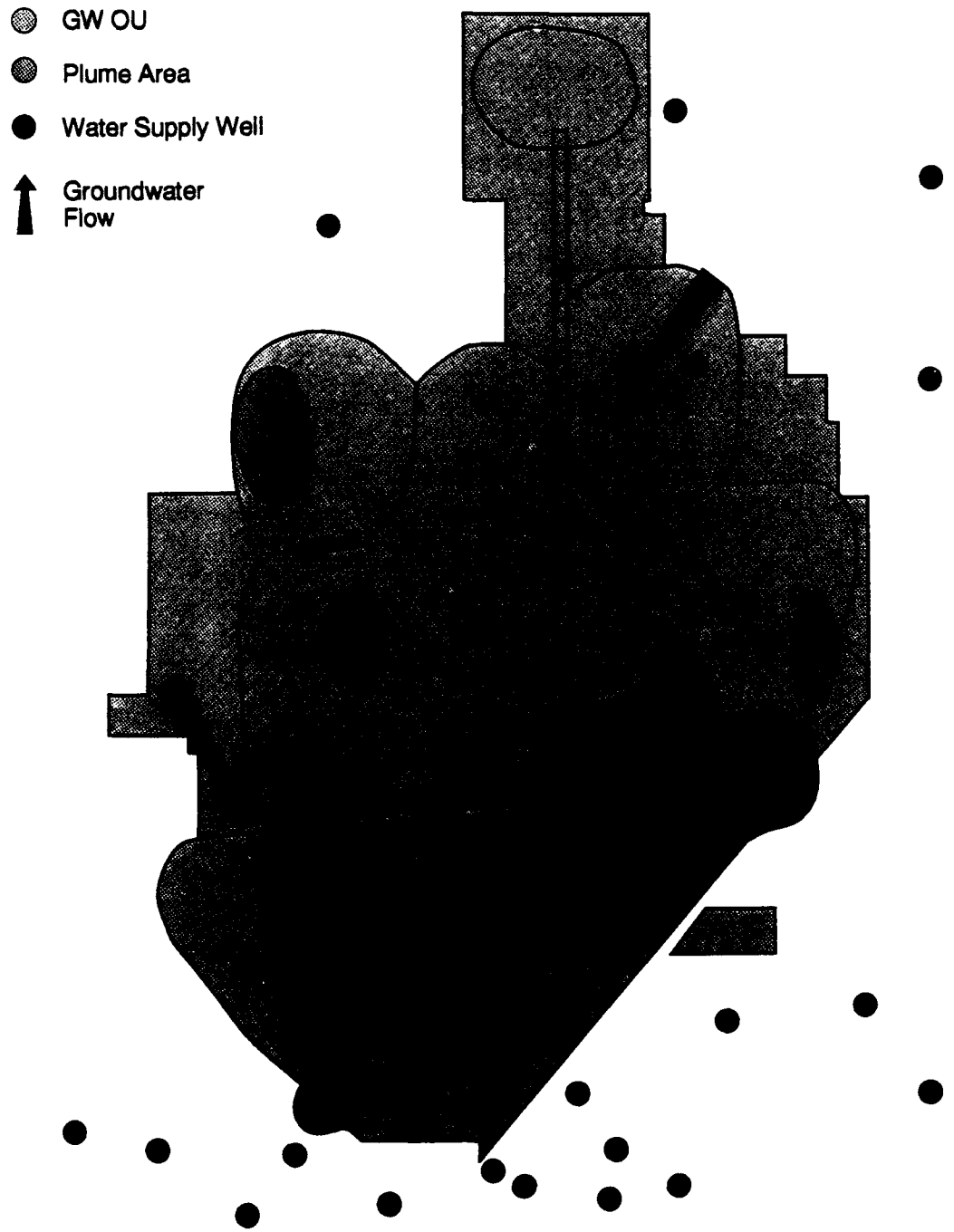


Figure 3-2. Goundwater Operable Unit

groundwater contamination is of critical concern due to the close proximity of residential areas to McAFB, as depicted in the aerial photograph reproduced in Figure 3-3.

In addition to this family of OUs is the Davis Transmitter Site, an off-base property. In August 1992, the Air Force and two State of California organizations—the Department of Toxic Substances Control (DTSC) and the Regional Water Quality Control Board (RWQCB), Central Valley Region—signed a Federal Facility Site Remediation Agreement (FFSRA). The purpose of the agreement is to promote the full cooperation of these parties in accelerating and streamlining the remediation process at the Davis Transmitter Site. Locations of the Davis Transmitter Site and other McAFB off-base properties in the Sacramento area are shown in Figure 3-4.

3.1.1 IRP Sites

There are currently 258 sites distributed among the OUs. Five sites are located off base, as indicated in Figure 3-3. The remaining 253 are distributed among the 10 base OUs as indicated below:

OU	Number of Sites
A	121
B	47
B1	2
C	42
C1	6
D	15
E	2
F	1
G	9
H	8

A more detailed listing of these sites giving information on identification numbers, site description, material disposed of, dates of operation, and status/regulatory mechanisms may be found in Table 3-1. The general location of these sites can be seen in Figure 3-5 without identification of any particular site. Labeling for particular sites is provided in a series of maps found in Appendix A.

Table 3-1 lists 19 sites whose regulatory mechanism is given as UST (underground storage tank program under RCRA Title I) plus seven sites described as CERCLA/UST. For these latter sites, further characterization of the contaminants is necessary to determine the relevant regulatory mechanism.

The status of removal and interim actions is shown in Table 3-2.

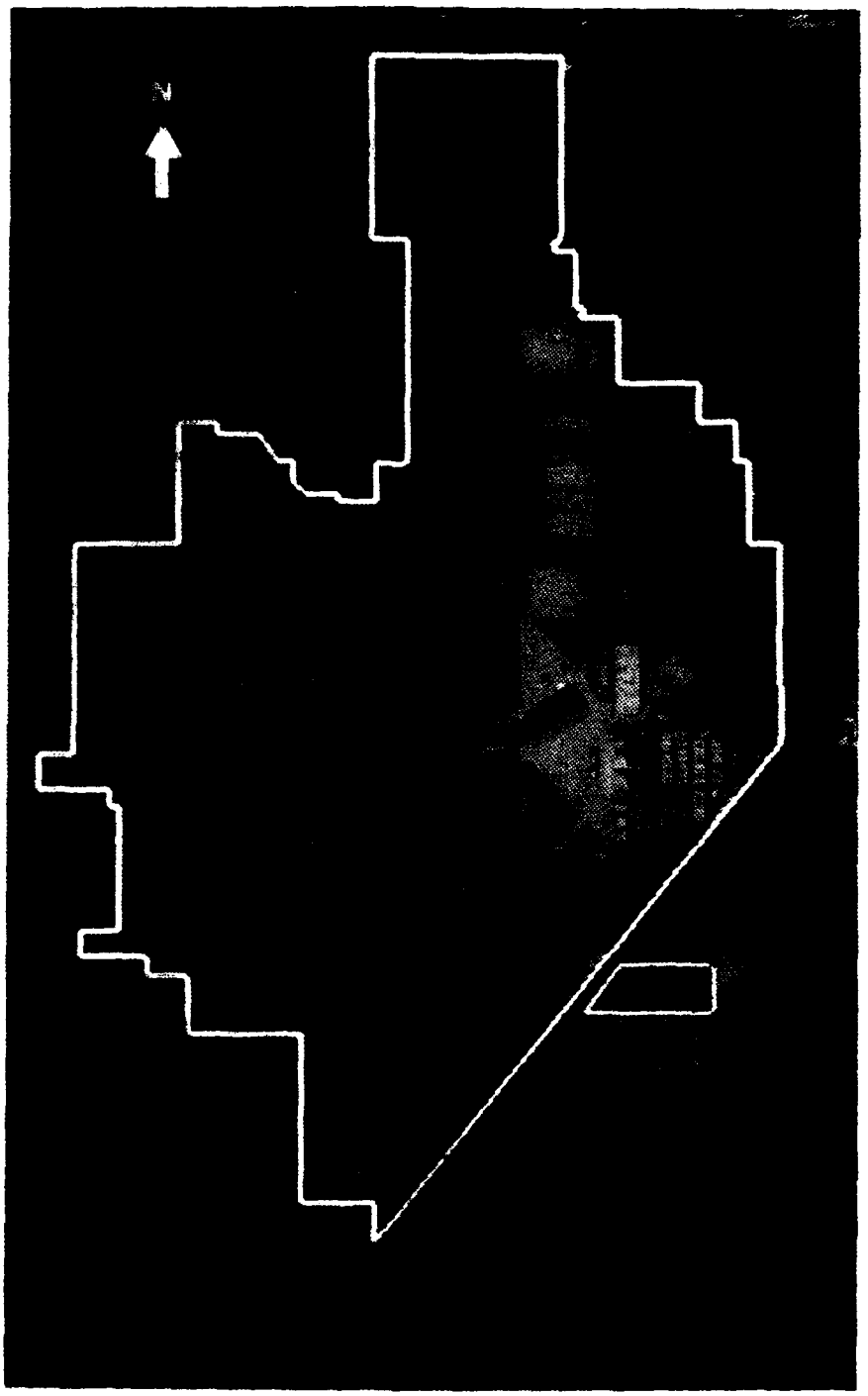


Figure 3-3. McClellan AFB and Its Environs

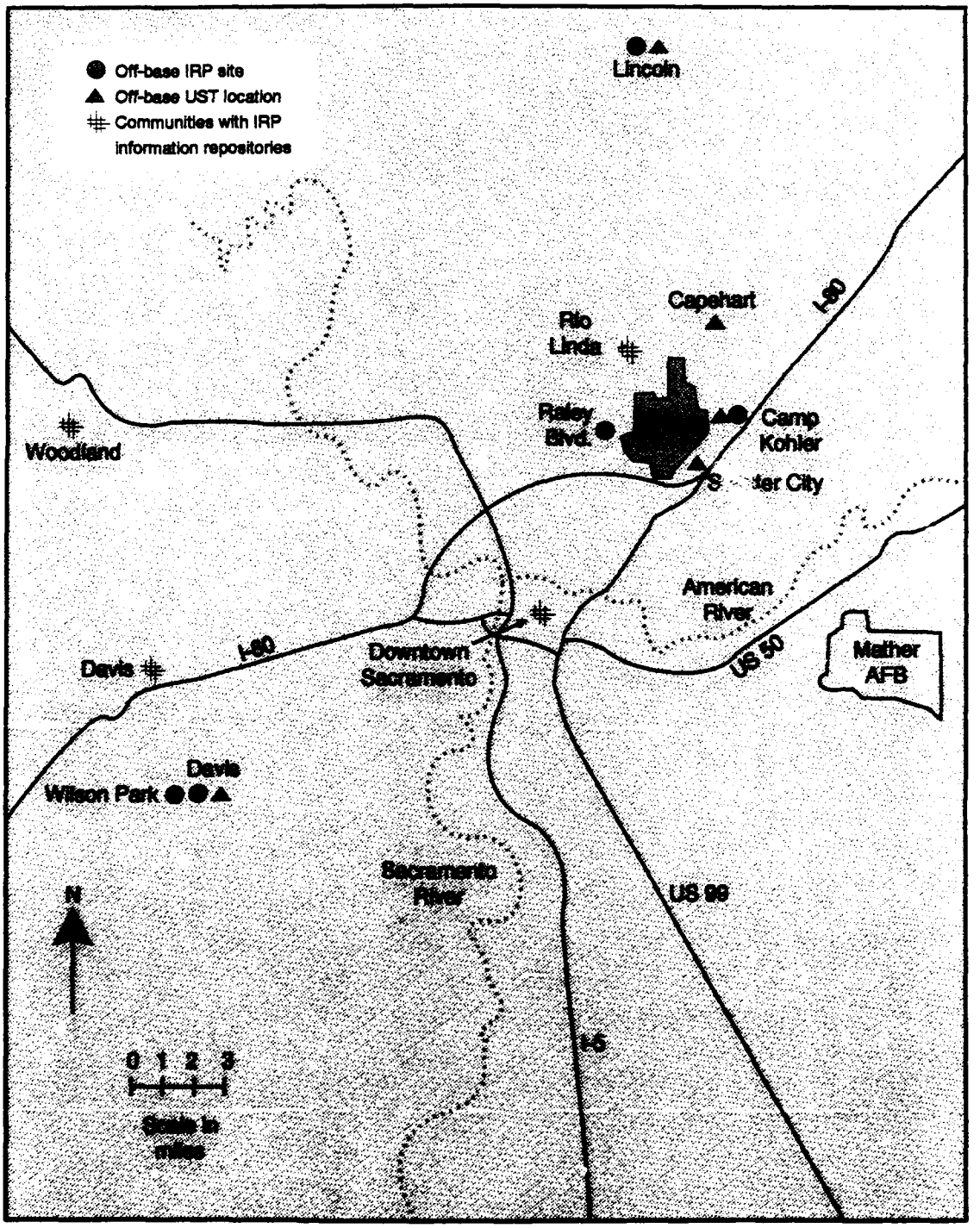


Figure 3-4. Sacramento, California and Vicinity

Table 3-1. Site Summary Table

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
A	1	LF024	CS 024	CS 24	Landfill	Prip	41,000	1964-1969	CERCLA
	2	LF025	PRL 025	PSPRL 25	Landfill	Unknown	110,000	Late 40s, early 50s	CERCLA
	3	ST034	CS 034	PSPRL 34	Waste sol. storage tanks	Prip	100	--	CERCLA
	4	LF037	CS 037	PSPRL 37	Landfill	Sol, POL	125,000	1940-1957	CERCLA
	5	LF038	CS 038	CS 38	Engine Repair Shop	Sol, Prip, Met	240,000	--	CERCLA
	6	LF039	PRL 039	PSPRL 39	Landfill	Unknown	100,000	Before 1941-1946	NFI, REG-CON
	7	WP040	CS 040	PSPRL 40	Indus. wastewater sludge	Sol	21,000	1943-1972	CERCLA
	8	DP070	PRL B-002	UPRL B-2	Spoil pit/borrow pit	Unknown	189,000	--	NFI, REG-CON
	9	LF071	PRL B-003	UPRL B-3	Landfill	Sol, POL	--	--	NFI, REG-CON
	10	WP072	PRL B-004	UPRL B-4	Sludge drying bed	Sol, Met	2,500	1941	NFI, REG-CON
	11	LF073	CS B-005	UPRL B-5	Landfill	POLs, Sol	12,500	1962	CERCLA
	12	WP079	PRL P-003	UPRL P-3	Oil pit	Sol, POL	6,270	1946-1987	CERCLA
	13	WP080	PRL P-004	UPRL P-4	Sump	Sol, POL	3,360	Early 1940s-1989	CERCLA
	14	SD081	CS-P005	UPRL P-5	Open Ditch	Sol, Other	2,200	1940-1965	CERCLA
	15	SD082	CS P-006	UPRL P-6	Open Ditch	Sol, Other	2,200	1943-1989	CERCLA
	16	WP084	PRL P-008	UPRL P-8	Acid and cyanide pit	Acetone, Met	38,000	1955	CERCLA
	17	OT086	PRL S-001	UPRL S-1	Plating shop	Sol, CN, Met	12,000	1944-1957	CERCLA
	18	SS087	PRL S-002	UPRL S-2	Chemical warehouse	Sol	9,400	1943	CERCLA
	19	SS088	PRL S-003	UPRL S-3	Acid storage warehouse	Acetone	5,600	1942-1975	CERCLA
	20	SS089	PRL S-004	UPRL S-4	Treat. plant/sludge beds	Sol, Met, POL	13,000	1943-1989	CERCLA
	21	WP091	PRL S-006	UPRL S-6	IWTP #1	Sol, Met	4,200	Late 1930s-1989	CERCLA
	22	WP092	CS S-007	UPRL S-7	IWTP #3	Sol, Other	8,100	1940-1989	CERCLA
	23	SS094	PRL S-009	UPRL S-9	Asbestos storage	Asbestos	10,000	Oct-Dec 1987	CERCLA
	24	SD099	PRL S-014	UPRL S-14	Paint shop/spray booths	Sol, POL	8,400	1938-1989	CERCLA
	25	SD101	PRL S-016	UPRL S-16	Sol./paint spray booths	POL, Sol	250,000	1937-1989	CERCLA
	26	SD102	PRL S-017	UPRL S-17	Repair shop/spray booths	Sol, POL	27,000	1937-???	CERCLA
	27	SD103	PRL S-018	UPRL S-18	Repair shop/clean shop	Sol, POL	27,000	1937-1989	CERCLA
	28	SS104	PRL S-019	UPRL S-19	Entomology storage area	Pesticides	3,600	1940-1970s	CERCLA
	29	SD105	PRL S-020	UPRL S-20	Photo lab	Met, SOL	14,000	1941	CERCLA
	30	SD106	CS S-021	UPRL S-21	Degreaser/spray booths	Sol, POL	28,000	1943-1989	CERCLA

Table 3-1. Site Summary Table (Continued)

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
A	31	SD107	PRL S-022	UPRL S-22	Repair shop/spray booths	Sol, POL	10,000	Late 1930s	CERCLA
	32	SD108	PRL S-023	UPRL S-23	Plating shop	Sol, Met, CN	14,000	1942	NFI, REG-CON
	33	SD109	CS S-024	UPRL S-24	Depaint washrack	POL, Sol	25,000	1940-1989	CERCLA
	34	SD110	PRL S-025	UPRL S-25	Transformer shop	POL, PCB, Sol	27,000	1943-1989	CERCLA
	35	SD111	CS S-026	UPRL S-26	Maint. shop/spray booth	POL, Sol	38,000	1942	CERCLA
	36	SD112	CS S-027	UPRL S-27	Solvent recovery stills	Sol	7,200	1941	CERCLA
	37	SS121	PRL S-036	UPRL S-36	Oil drum storage	Sol, POL	27,000	1943-1989	CERCLA
	38	SS122	PRL S-037	UPRL S-37	Oil drum storage	Sol, POL	27,000	1946-1988	CERCLA
	39	SS123	PRL S-038	UPRL S-38	Drum storage	Sol	15,000	1943-1989	CERCLA
	40	ST131	PRL T-006	UPRL T-6	UST	Sol	3,100	1952-1980	CERCLA
	41	ST132	PRL T-007	UPRL T-7	Sol pit/waste thinner tank	Sol	14,000	1952-1989	CERCLA
	42	ST134	PRL T-010	UPRL T-10	Solvent tank	Sol	56,000	1938-1989	CERCLA
	43	ST136	CS T-012	UPRL T-12	Waste oil/solvent tank	Sol	2,400	1943-1989	CERCLA
	44	ST137	PRL T-015	UPRL T-15	Tank Farm 1	Sol, POL	25,000	1943-1989	UST
	45	ST138	CS T-016	UPRL T-16	Tank Farm 2	Sol, POL	--	Late 40s/Early 50s	UST
	46	ST139	CS T-017	UPRL T-17	Tank Farm 3W	POL	2,800	1943-1987	UST
	47	ST140	PRL T-018	UPRL T-18	Tank Farm 4	POL	5,400	1940-1989	UST
	48	ST141	PRL T-019	UPRL T-19	Tank Farm 5	POL	5,400	Early 40s-Late 60s	UST
	49	ST142	CS T-020	UPRL T-20	Tank Farm 6	Sol, POL	20,000	1941-1989	CERCLA
	50	ST143	CS T-021	UPRL T-21	UST	Sol, POL	10,000	1943-1989	CERCLA
	51	ST144	CS T-030	UPRL T-30	UST	Sol	3,600	1940-1954	CERCLA
	52	ST148	CS T-036	UPRL T-36	UST	Sol	6,700	1943-1989	CERCLA
	53	ST149	CS T-037	UPRL T-37	UST	Sol	6,700	1943-1989	CERCLA
	54	SD156	CS T-047	UPRL T-47	Oil/water separator	POL	6,700	1940-1989	CERCLA
	55	OT159	PRL L-002	--	IWL	Unknown	--	--	CERCLA
	56	OT160	PRL L-003	--	IWL	Unknown	--	--	CERCLA
	57	OT161	PRL L-004	--	IWL	Unknown	--	--	CERCLA
	58	OT169	CS T-057	--	IWL drain at Bldg. 431	Sol, VOC	--	--	CERCLA
	59	ST170	CS T-059	--	UST	Fuel Oil	--	--	UST
	60	ST172	CS T-061	--	UST	Fuel Oil	--	--	UST
	61	ST198	SA 035	--	UST	Diesel	--	1942-1992	UST
	62	SS199	SA 037	--	Motor pool	Unknown	--	--	CERCLA
	63	ST200	SA 038	--	UST	Fuels	--	1938-1991	UST
	64	SS201	SA 040	--	Chemical storage area	Unknown	--	--	CERCLA
	65	SS202	SA 041	--	Metal fabrication	Unknown	--	--	CERCLA

Table 3-1. Site Summary Table (Continued)

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
A	66	SS203	SA 043	--	Average fluids	Unknown	--	--	CERCLA
	67	WP204	SA 044	--	Sump	Unknown	--	--	CERCLA
	68	SS2-5	SA 045	--	Soil contamination	Unknown	--	--	CERCLA
	69	ST206	SA 046	--	UST	Diesel	--	1954-1989	UST
	70	SD207	SA 047	--	Washrack 254	Unknown	--	--	CERCLA
	71	ST208	SA 048	--	Warehouse	Paints, Sol	--	--	CERCLA
	72	ST209	SA 049	--	UST	Diesel	--	1941-1992	UST
	73	ST210	SA 052	--	Blowdown Tanks	Met., Anions	--	1946-1990	CERCLA
	74	WP211	SA 053	--	Washrack	Unknown	--	--	CERCLA
	75	ST212	SA 054	--	Aboveground storage tank	Unknown	--	--	CERCLA
	76	SS213	SA 055	--	Laboratory	Unknown	--	--	CERCLA
	77	SD214	SA 056	--	Wastewater	Unknown	--	--	CERCLA
	78	SS215	SA 058	--	Chemical storage tank	Unknown	--	--	CERCLA
	79	ST216	SA 059	--	UST	Diesel	--	1952-1988	UST
	80	WP217	SA 060	--	Indus. wastewater drain	Unknown	--	--	CERCLA
	81	SD218	SA 061	--	Solvent spray booth	Unknown	--	--	CERCLA
	82	SS219	SA 064	--	Chemical storage	Unknown	--	--	CERCLA
	83	OT220	SA 065	--	IWL	Unknown	--	--	CERCLA
	84	SS221	SA 066	--	Motor pool	Unknown	--	--	CERCLA
	85	SS222	SA 067	--	Soil contamination	Unknown	--	--	CERCLA
	86	SS223	SA 068	--	Spills	Unknown	--	--	CERCLA
	87	WP224	SA 069	--	Steam Fac./UST	Met/Fuels	--	1942-1993	CERCLA/UST
	88	OT225	SA 070	--	IWL	Unknown	--	--	CERCLA
	89	SS226	SA 071	--	Hazardous mat. storage	Unknown	--	--	CERCLA
	90	WP227	SA 073	--	Sump	Unknown	--	--	CERCLA
	91	ST228	SA 074	--	AGT, UST	Diesel	--	1943-1989	UST
	92	OT229	SA 075	--	IWL	Unknown	--	--	CERCLA
	93	SS230	SA 076	--	Hazardous mat. storage	Unknown	--	--	CERCLA
	94	ST231	SA 077	--	Aboveground storage tank	Unknown	--	--	CERCLA
	95	SD232	SA 078	--	Locomotive washrack	Unknown	--	--	CERCLA
	96	ST233	SA 079	--	Fuel Test Fac.	Sol	--	--	CERCLA
	97	SS234	SA 080	--	Contractor staging	Unknown	--	--	CERCLA
	98	ST235	SA 081	--	Fuel lines	Unknown	--	--	CERCLA
	99	OT236	SA 084	--	Spray booth	Unknown	--	--	CERCLA
	100	WP237	SA 085	--	Oil/Water Separator	Sol	--	--	CERCLA

Table 3-1. Site Summary Table (Continued)

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
A	101	WP238	SA 086	--	Engine Test/UST	Sol, VOC	--	--	CERCLA
	102	ST239	SA 087	--	UST	POL	--	1944-1986	UST
	103	SS240	SA 088	--	Soil contamination	Unknown	--	--	CERCLA
	104	SS241	SA 089	--	Open storage area	Unknown	--	--	CERCLA
	105	SD242	SA 090	--	Washrack	Unknown	--	--	CERCLA
	106	SS243	SA 091	--	Soil contamination	Unknown	--	--	CERCLA
	107	RW244	SA 093	--	Radionuclide	Unknown	--	--	CERCLA
	108	ST245	SA 094	--	Open storage area	Unknown	--	1964-	CERCLA
	109	ST246	SA 095	--	UST	Fuel Oil	--	1946-1957	UST
	110	WP247	SA 096	--	UST	Unknown	--	1943-?	CERCLA
	111	SD248	SA 097	--	Tank farm	Unknown	--	--	CERCLA
	112	SS249	SA 098	--	Spray booths	Unknown	--	--	CERCLA
	113	ST250	SA 099	--	Sewage Treat/UST	Sewage, Diesel	--	1950-	CERCLA/UST
	114	ST251	SA 100	--	Doc. Destruct./UST	Sol, Diesel	--	1973-	CERCLA/UST
	115	WP252	SA 101	--	Sump	Unknown	--	--	CERCLA
	116	SS253	SA 103	--	Soil contamination	Unknown	--	--	CERCLA
	117	SS254	SA 105	--	Laboratory	Unknown	--	--	CERCLA
	118	ST255	SA 106	--	Salvage yard/UST	Soil, Diesel	--	--	CERCLA/UST
	119	SS256	SA 107	--	Soil contamination	Unknown	--	--	CERCLA
	120	SD257	SA 108	--	Aircraft fluids	Unknown	--	--	CERCLA
	121	SD258	SA 109	--	Magpie Creek contam.	Unknown	--	--	CERCLA
B	122	LF023	CS 023	CS 23	Landfill	Prip	24,000	1966-1989	CERCLA
	123	DP030	CS 030	PSPRL 30	Radio/chem lab/landfill	Sol, Met	39,000	1957-1988	CERCLA
	124	OT031	CS 031	PSPRL 31	Incinerate ash burial pit	Met, POL	53,000	1963-1968	CERCLA
	125	SS036	CS 036	PSPRL 36	Open storage area	Sol, CN	30,000	1958-1980	CERCLA
	126	OT045	CS 047	CS 47	Abandoned plating shop	Sol, Met	44,000	1957-1982	CERCLA
	127	WP046	CS 048	CS 48	Abandoned IWTP	Unknown	--	--	CERCLA
	128	OT066	--	--	Base Well 18	Unknown	--	--	CERCLA
	129	DP035	PRL 035	PSPRL 35	Scrap metal burial pit	Unknown	35,000	World War II	NFI, REG-CON
	130	LF069	PRL B-001	UPRL B-1	Landfill	Unknown	109,200	--	NFI, REG-CON
	131	LF076	PRL B-009	UPRL B-9	Landfill	Unknown	50,400	Unknown	NFI, REG-CON
	132	SD078	PRL P-002	UPRL P-2	Waste pond	POL, Sol	18,820	1962-???	CERCLA
	133	SD085	PRL P-009	UPRL P-9	Open drainage ditch	Sol, Met	1,700	1956 to mid-1960s	CERCLA
	134	WP090	PRL S-005	UPRL S-5	Abandoned IWTP	Unknown	5,900	--	CERCLA
	135	SS097	PRL S-012	UPRL S-12	PCB storage	Unknown	20,000	Mid 1940s	NFI, REG-CON

Table 3-1. Site Summary Table (Continued)

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
B	136	SS098	PRL S-013	UPRL S-13	Open storage	Sol	120,000	1955-1989	CERCLA
	137	SS113	PRL S-028	UPRL S-28	Oil/paint storage	POL	5,000	9168-1987	CERCLA
	138	SS114	PRL S-029	UPRL S-29	PCB storage	PCB	190,000	--	CERCLA
	139	SD115	PRL S-030	UPRL S-30	Depaint washrack	Sol, POL	15,000	1951-???	CERCLA
	140	SS118	PRL S-033	UPRL S-33	Hazardous mat. storage	Sol, Other	84,000	1953	CERCLA
	141	SD119	PRL S-034	UPRL S-34	Degreaser/paint booth	Other, Sol	35,000	--	CERCLA
	142	SD120	PRL S-035	UPRL S-35	Solvent spray booth	Sol, Other	25,000	1946-49; 1965	CERCLA
	143	SD126	PRL S-041	UPRL S-41	MAT K storage	Jet Fuel	125,000	1955-1989	NFI, REG-CON
	144	OT162	PRL L-005	--	Indus. wastewater line	Unknown	--	--	CERCLA
	145	OT163	PRL L-006	--	Indus. wastewater line	Unknown	--	--	CERCLA
	146	ST133	PRL T-008	UPRL T-8	Fuel Tank	Unknown	16,000	--	CERCLA
	147	SD154	PRL T-045	UPRL T-45	Oil/water separator	POL, TCE, PCE	3,600	--	CERCLA/UST
	148	SD155	PRL T-046	UPRL T-46	Defuel Fac. Tanks	POL, TCE, PCE	6,700	Before 1968-??	CERCLA/UST
	149	SD157	PRL T-048	UPRL T-48	Oil/water separator, UST	POL, TCE, PCE	6,700	1968-Present	CERCLA/UST
	150	ST171	PRL T-060	--	UST	POL	--	--	UST
	151	WP179	SA 001	--	Surface disposal	Unknown	--	--	CERCLA
	152	SS180	SA 002	--	Laboratory	Unknown	--	--	CERCLA
	153	SD181	SA 003	--	Washrack	Unknown	--	--	CERCLA
	154	SS182	SA 004	--	Paint shop	Unknown	--	--	CERCLA
	155	SS183	SA 005	--	Paint storage	Unknown	--	--	CERCLA
	156	ST184	SA 006	--	Gas station	MOGAS	--	1954-1991	UST
	157	SD185	SA 007	--	Washrack	Unknown	--	--	CERCLA
	158	ST186	SA 008	--	UST	POL	--	--	UST
	159	SS187	SA 009	--	Hazardous mat. storage	Unknown	--	--	CERCLA
	160	SS188	SA 010	--	Sump	Herbicides	--	--	CERCLA
	161	ST189	SA 011	--	UST	Diesel	--	--	UST
	162	SS191	SA 013	--	Chemical storage area	Unknown	--	--	CERCLA
	163	SD192	SA 014	--	Storm water drainage	Unknown	--	--	CERCLA
	164	SS193	SA 015	--	NW corner lot 10 spill	Unknown	--	--	CERCLA
	165	SD194	SA 016	--	Chemical storage area	Unknown	--	--	CERCLA
	166	SS195	SA 017	--	Oil storage yard	Unknown	--	--	CERCLA
	167	SS196	SA 018	--	Oil storage yard	Unknown	--	--	CERCLA
	168	SD197	SA 019	--	Spray booth	Unknown	--	--	CERCLA
B1	169	OT029	PRL 029	PSPRL 29	Landfill	Unknown	120,000	1950s-1960s	CERCLA
	170	SS190	SA 012	--	DRMO storage area	Unknown	--	--	CERCLA

Table 3-1. Site Summary Table (Continued)

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
C	171	SD007	CS 007	CS 7	Sludge/oil pit	Prip, sol, PCB, POL	35,000	--	CERCLA
	172	LF008	PRL 008	PSPRL 8	Sludge refuse/landfill	Prip, Sol, POL	59,000	--	CERCLA
	173	LF009	PRL 009	PSPRL 9	Landfill	Unknown	30	--	CERCLA
	174	LF010	CS 010	CS 10	Lnadfill	PCB, Prip	32,000	--	CERCLA
	175	LF011	CS 011	CS 11	Landfill	Prip	32,000	--	CERCLA
	176	LF012	CS 012	CS 12	Landfill	Prip	55,000	--	CERCLA
	177	LF013	CS 013	CS 13	Landfill	Prip	54,000	--	CERCLA
	178	LF014	CS 014	CS 14	Landfill	Prip	54,000	--	CERCLA
	179	DP015	PRL 015	PSPRL 15	Sodium valve trench	Unknown	30	--	CERCLA
	180	DP016	PRL 016	PSPRL 16	Sodium valve trench	Unknown	30	--	CERCLA
	181	LF017	PRL 017	PSPRL 17	Landfill	Sol	40,000	--	CERCLA
	182	LF018	PRL 018	PSPRL 18	Landfill	Unknown	40,000	1957-1959	CERCLA
	183	LF019	PRL 019	PSPRL 19	Landfill	Unknown	40,000	1957-1959	CERCLA
	184	DP020	PRL 020	PSPRL 20	Sludge/oil pit	Sol, POL	50,000	1956-1957	CERCLA
	185	DP021	PRL 021	PSPRL 21	Sludge/oil pit	VOC, Sol	50,000	1956-1957	CERCLA
	186	DP028	PRL 028	PSPRL 28	Sludge pit	Prip	3,000	--	CERCLA
	187	SS032	PRL 032	PSPRL 32	Rad./hazardous wastes	Prip	160	1955-1974	CERCLA
	188	LF043	CS 043	CS 43	Burn pit	Prip	20,000	--	CERCLA
	189	LF047	PRL 049	PSPRL 49	Landfill	Unknown	45,000	Before 1971	CERCLA
	190	WP048	PRL 050	PSPRL 50	Settling pond	Unknown	11,000	1946-1971	CERCLA
	191	WP049	PRL 051	PSPRL 51	Holding pond	Unknown	180,000	1982-1989	CERCLA
	192	DP050	CS 052	CS 52	Burn pit	Prip	20,000	--	CERCLA
	193	WP051	PRL 053	PSPRL 53	Settling pond	Sol	96,000	1958?	CERCLA
	194	SS052	PRL 054	PSPRL 54	Storage area	Unknown	6,300	Circa 1970	CERCLA
	195	SS053	PRL 055	PSPRL 55	Acid storage area/landfill	Sol	900	1951-1989	CERCLA
	196	SS054	PRL 056	PSPRL 56	Storage area	Unknown	100,000	1957-1974	CERCLA
	197	LF055	PRL 057	PSPRL 57	Landfill	Unknown	29,000	1956	CERCLA
	198	WP056	PRL 060	PSPRL 60	Holding pond	Unknown	80,000	--	CERCLA
	199	WP057	PRL 061	PSPRL 61	Chemical waste pit	Unknown	900	Early 1950s	CERCLA
	200	WP058	PRL 062	PSPRL 62	Chemical waste pit	Unknown	500	Early 1950s	CERCLA
	201	SD059	PRL 063	PSPRL 63	Unlined ditch	Unknown	20,000	--	CERCLA
	202	SD060	PRL 064	PSPRL 64	Unlined ditch	Unknown	--	--	CERCLA
	203	LF061	PRL 065	PSPRL 65	Landfill	Unknown	--	--	CERCLA
	204	WP062	PRL 066	PSPRL 66	Ditches and pond	Unknown	--	1946-1989	CERCLA
	205	WP063	CS 067	CS 67	Landfill	Prip, POL	40,000	--	CERCLA

Table 3-1. Site Summary Table (Continued)

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
C	206	WP068	--	--	Groundwater treat. plant	Unknown	--	--	CERCLA
	207	SS096	PRL S-011	UPRL S-11	BCE/PCE storage	PCB, POL, Sol	47,000	1941-1989	CERCLA
	208	SD116	PRL S-031	UPRL S-31	Aircraft paint hanger	Paints, POL, Sol	47,000	1968-1989	CERCLA
	209	SS117	PRL S-032	UPRL S-32	Paint storage area	Paints, POL, Sol	10,080	1968-1989	CERCLA
	210	SD165	PRL P-010	--	Magpie Creek	VOC	--	--	CERCLA
	211	OT166	PRL S-046	--	Unknown	Unknown	--	--	CERCLA
	212	OT168	PRL S0048	--	W of Bldg. 720	Unknown	--	--	CERCLA
C1	213	LF022	CS 022	CS 22	Burn pit/landfill	Prip, Sol, PCB, POL	40,000	1946-1968	CERCLA
	214	LF041	PRL 041	PSPRL 41	Landfill	Prip	106,000	--	CERCLA
	215	LF042	CS 042	CS 42	Oil storage/landfill	Prip, PCB, POL	11,000	1946-1960s	CERCLA
	216	WP064	PRL 068	PSPRL 68	Sludge ponds	Prip	13,000	--	CERCLA
	217	DP065	CS 069	CS 69	Burn pit	Prip	--	--	CERCLA
	218	OT164	PRL L-007	--	Indus. wastewater line	Unknown	--	--	CERCLA
D	219	LF001	CS 001	CS 1	Landfill	Prip	10,500	--	OSD/NVZ
	220	LF002	CS 002	CS 2	Sludge/oil pit	POL, Prip, Sol	20,000	--	OSD/NVZ
	221	LF003	CS 003	CS 3	Sludge/oil pit	Prip	50,700	--	OSD/NVZ
	222	DP004	CS 004	CS 4	Sludge/oil pit	Prip, Sol, POL	15,000	--	OSD/NVZ
	223	DP005	CS 005	CS 5	Sludge/oil pit	Prip	15,600	--	OSD/NVZ
	224	DP006	CS 006	CS 6	Oil burn pit	Sol, Met. POL	7,500	--	OSD/NVZ
	225	LF026	CS 026	CS 26	Sludge/oil burn pit	Sol, Met	40,000	--	OSD/NVZ
	226	DP027	PRL 027	PSPRL 27	Sodium valve trench	Unknown	100	Late 40s-Early 50s	OSD/NVZ
	227	WP003	PRL 033	PSPRL 33	IWTP sludge landfarm	Sol	2,000,000	1972	CERCLA
	228	SD083	PRL P-007	UPRL P-7	Open ditch	POL, Sol	5,000	--	CERCLA
	229	ST135	PRL T-011	UPRL T-11	Bldg. 1093	Sol	1,000	--	CERCLA
	230	DP151	CS A	CS A	Sludge disposal pit	Sol, Met, Prip	--	--	OSD/NVZ
	231	DP152	CS S	CS S	Fuel/solvent/oil burn pit	Sol, POL, Prip	9,200	--	OSD/NVZ
	232	DP153	CS T	CS T	Fuel/solvent sludge pit	Sol, POL, Prip, Met	8,400		OSD/NVZ
	233	DP178	--	--	Vadose Zone Contam.	VOC	600 acres	Late 40s-Early 50s	CERCLA
E	234	LF044	PRL 045	PSPRL 45	Paint waste landfill	Unknown	150,000	--	CERCLA
	235	SS095	PRL S-010	UPRL S-10	Storage area	Sol, Rad	63,000	--	CERCLA
F	236	LF074	PRL B-006	UPRL B-6	Waste area	Unknown	627,200	--	CERCLA

Table 3-1. Site Summary Table (Concluded)

OU[a]	Site No.[b]	WIMS Site ID[c]	Aliases[d]		Description[e]	Contaminants[f]	Size of Site[g]	Dates of Operation	Status/Regulatory Mechanism[h]
G	237	SD127	PRI S-042	UPRL S-42	Hobby shop/washrack	Sol, POL	8,100	--	CERCLA
	238	SD128	PRL S-043	UPRL S-43	Aircraft washrack	POL, Sol	49,000	--	CERCLA
	239	SD129	PRL S-044	UPRL S-44	Aircraft maintenance area	Sol, POL	275,000	--	CERCLA
	240	ST145	PRL T-031	UPRL T-31	UST	Sol	12,500		CERCLA
	241	ST146	PRL T-032	UPRL T-32	UST	Sol	12,500	--	CERCLA
	242	ST147	PRL T-033	UPRL T-33	UST	Sol	12,500	--	CERCLA
	243	ST150	PRL T-044	UPRL T-44	Stoddard sovlent tank	Sol	10,000	--	CERCLA
	244	OT158	PRL L-001	--	Indus. wastewater line	Unknown	--	--	CERCLA
	245	ST173	PRL T-062	--	UST	Unknown	--	--	CERCLA
H	246	LF075	PRL B-007	UPRL B-7	Spoil area	Unknown	627,200	1943-1989	CERCLA
	247	SD077	PRL P-001	UPRL P-1	Drainage ditch/ponds	Sol, POL	56,400	1943-1964	CERCLA
	248	OT093	PRL S008	UPRL S-8	Electroplating shop	Sol, CN, Met	35,000	--	CERCLA
	249	SD100	PRL S-015	UPRL S-15	Degreaser/spray booths	Sol, POL	290,000	--	CERCLA
	250	OT124	PRL S-039	UPRL S-39	New museum site	Sol	94,000	--	CERCLA
	251	OT125	PRL S-040	--	S-40 Troop Issue area	Unknown	19,000	1946-1968	CERCLA
	252	SD130	PRL S-045	UPRL S-45	Aircraft maintenance area	POL, Sol	615,000	1941-???	CERCLA
	253	OT167	PRL S-047	--	Unknown	Unknown	--	--	CERCLA
--	254	OT067	--	--	Off-base wells, Raley Blvd.	Unknown	--	--	CERCLA
--	255	OT174	--	--	Davis	Unknown	--	--	AF IRP
	256	ST175	--	--	Lincoln	Unknown	--	--	AF IRP
	257	LF176	--	--	Wilson Park	Unknown	--	--	NFI
	258	ST177	--	--	Camp Kohler	Unknown	--	--	AF IRP

Footnotes to Table 3-1

a. The 10 OUs on base.

b. This site number is just a means of sequencing this listing. If new sites are found, the sequencing could change.

c. Work Information Management System-Environmental Subsystem (WIMS-ES) identification (ID) number. The first two letters denote the type of site (e.g., LF=landfill), while the three digits represent a sequencing from 001 to several hundred (in the case of McClellan). The numerical portion is unique at each AFB; for example, there is only one 034 representation; in this case it is preceded by an ST as a descriptor. Thus, there is no LF034 or WP034. Other alpha descriptor codes are as follows:

DP	Disposal pits
FT	Fire training areas
OT	Other, ordnance, burn areas, buildings
RW	Radioactive wastes
SD	Surface runoff, ditches, washracks, oil/water separators
SS	Spills, storage areas
ST	Underground tanks, above ground tanks, POL lines
WP	Waste pits, sumps, lagoons, waste treatment, evaporation pits

d. Some sites have several identifying numbers from different studies or documents. The first column represents those numbers used in the 1992 Comprehensive CERCLA Work Plan (CCWP) while the numbers in the second column are from Attachment A in the 1990 IAG.

CCWP Terminology		IAG Terminology	
CS	= Confirmed Site	CS	= Confirmed Site
PRL	= Potential Release Location	PSPRL	= Partially Studied Potential Release Location
SA	= Study Area	UPRL	= Unstudied Potential Release Location

e.

PCB	=	Polychlorinated Biphenyl
IWL	=	Industrial Waste Line
IWTP	=	Industrial Wastewater Treatment Plant
MAT K	=	Maintenance Apron Terminal No. K
UST	=	Underground Storage Tank

f.

CN	=	Cyanide	Prip	=	Primary Pollutant
Met	=	Metals	Sol	=	Solvents
PCE	=	Perchloroethylene (or Tetra)	TCE	=	Trichloroethylene
POL	=	Petroleum, Oil, and Lubricants			

g. Area in square feet (unless otherwise noted).

h. **Status**—Generally speaking, the status (stage) of sites on base is taken as RI/FS, with most off-base sites in the PA/SI stage (however, Davis is RI/FS). Exceptions to this rule are those 10 sites which are NFI (no further investigation) with regulatory concurrence (REG-CON). OSD/NVZ, which applies to 11 sites, indicates an old site designation, now included in the Vadose Zone site (DP-178).

Regulatory Mechanism—All of the 253 on-base sites are being addressed under CERCLA. Twenty-three UST sites containing POL (petroleum, oil, lubricants) or fuels have been identified for transfer to the UST program under RCRA, Title I, pending regulatory concurrence. Three other sites that need further investigation of contaminants to determine whether CERCLA or UST prevails are listed under the heading CERCLA/UST. Five sites are off-base. One of the off-base sites is being handled under CERCLA, while the other four sites are non-CERCLA, but subject to standard AF IRP procedures.

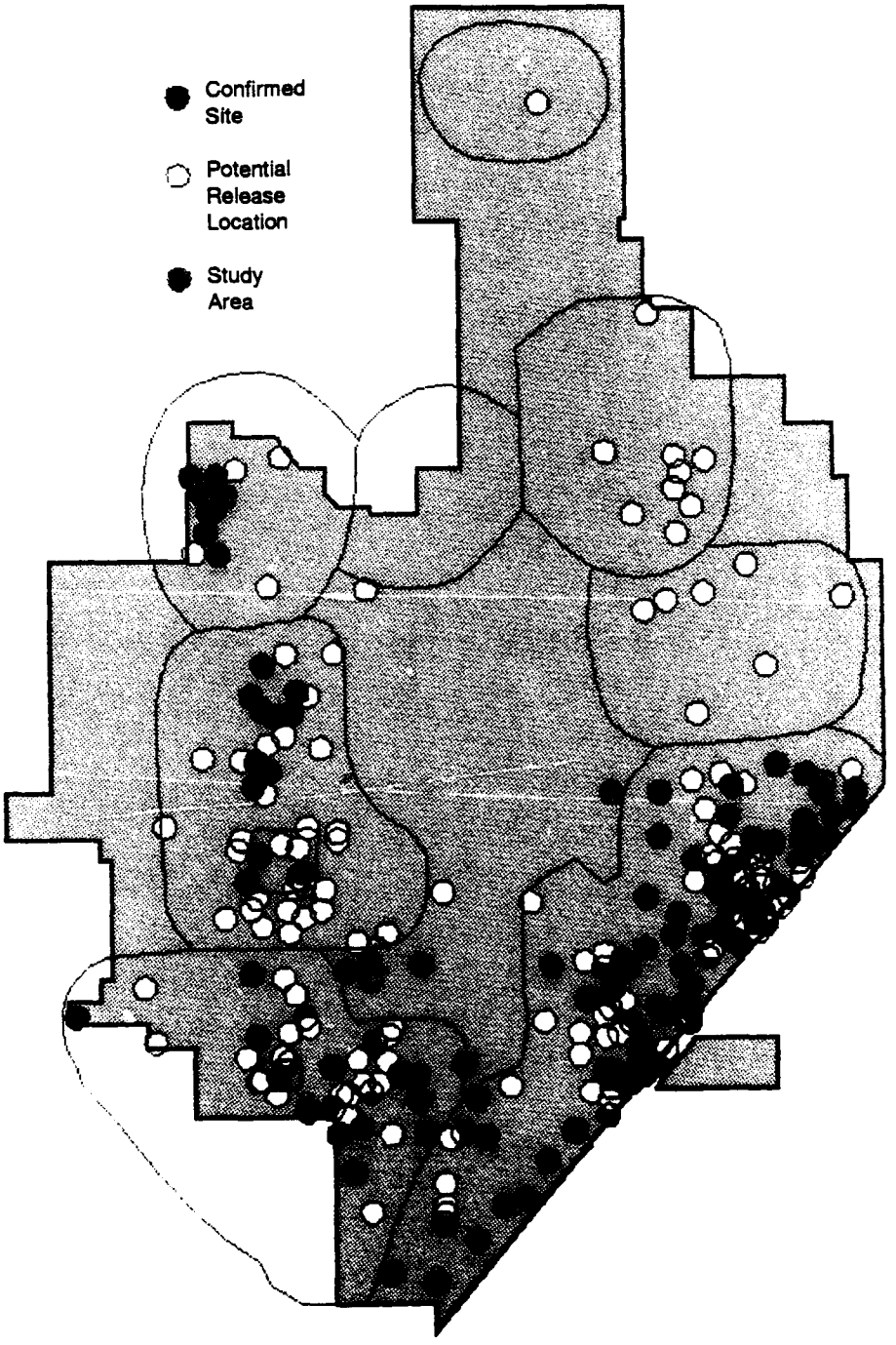


Figure 3-5. Generalized Site Locations

Table 3-2. Removal and Interim Action Status

Location	Action	Purpose	Status
OU A Bldg. 252	Emergency removal	Clean up mercury contamination	• Final emergency action completed 1991 • Area will be investigated further in RI/FS
OU B Bldg. 666	Demolition and removal of electroplating facility building, cap the sumps	Remove source of electroplating and other hazardous wastes	• Final action completed in 1988 for structure • Remediation of remaining contamination and removal of foundation and sumps will be completed in future expedited response action or in the RD/RA process
OU B	GW extraction system	• Prevent off-base migration of contaminated plume • Protect Base Well No. 18 • Monitor off-base GW	• ERA in operation; two wells and a carbon filter system (1991) • Three more wells and a pipeline to GWTP in progress
OU C	GW extraction system	Remove and treat contaminated GW	• Initial project in operation—extracted GW being treated and released from GWTP • Complete system to be evaluated and upgraded as part of OU GW
OU D	• Remove contaminated soil and cap the area • GW extraction system • Soil vapor extraction	• Limit infiltration of precipitation • Extract contaminated GW from 6 wells and pipe to GWTP • Treat and discharge GW • Remove contaminants from vadose zone	• RD and implementation completed in 1987 • Wells and GWTP in operation • O&M plans have been prepared and are being implemented
B/W	Soils holding area	Manage soils and debris pending future treatment and/or disposal	Currently in operation

Table 3-2. Removal and Interim Action Status (Concluded)

Location	Action	Purpose	Status
B/W	Abandonment of base and city production wells and some monitoring wells	• Eliminate potential for contaminant cross migration between aquifers	• "Well Closure Methods and Procedures" report published in 1990
		• Eliminate monitoring wells where the GW level has dropped below monitoring zone	• Production and monitoring well abandonment completed
B/W	Repair of industrial wastewater line (main line only)	• Determine integrity of the pipeline	• Minor cracks and holes sealed with grout in 1988
		• Prevent further leakage from pipeline	• Sections that could not be patched were lined with cure-in-place grout (1988)
OFFB	Residential alternative water supply	• Hook up 548 residences west of base to municipal water supply	• RD and implementation completed in 1987
		• Provide bottled water until hookups complete	• Hookup of 548 residences completed in 1987
		• Monitor private wells until hookups complete	
		• Continue sampling off-base monitoring wells	• Sampling of monitoring wells continues
		• Resume sampling off-base private wells if contaminant levels outside the remedial action area exceed state or federal action levels	

B/W = Basewide
ERA = Emergency Removal Action
GW = Groundwater
GWTP = Groundwater Treatment Plan
OFFB = Off Base
O&M = Operations and Maintenance
RD = Remedial Design
RD/RA = Remedial Design/Remedial Action
RI/FS = Remedial Investigation/Feasibility Study

3.1.2 Installation-Wide Source Discovery/Assessment Status

Appendix A to the IAG lists 154 sites. Since then 104 more sites have been added to the list. This effect can be most clearly seen in the "Aliases" columns in the Site Summary Table in Table 3-1. Those entries in the first column represent sites appearing in the recent (August 1992) CCWP, while the numbers in the second column are for sites in the IAG. Of the 104 added sites, three are now CS in OU A, three are special cases—Base well 18, the Groundwater Treatment Plant, and Vadose Zone Contamination, five are off-base, thirteen are PRL, and the remainder are study areas (SAs).

For the most part, the Project Team is satisfied with its PA/SI and RI efforts. However, there are areas in OU C where work is underway to determine if new sites may be discovered. Moreover, areas identified in the Environmental Condition of Property maps as "unevaluated" are being reviewed in order to further define uncontaminated areas.

3.2 Compliance Program Status

Pollution prevention/compliance activities at McAFB are conducted in coordination with environmental restoration conducted under the IRP since all IRP activities must comply with applicable health, safety, and environmental protection requirements. Pollution prevention and compliance activities at McClellan address storage tanks, hazardous materials management, closure of active RCRA units, air quality management, water discharges, asbestos, radon, and PCB inspection and removal. The status of these activities is outlined below and summarized in Table 3-3.

3.2.1 Underground Storage Tanks (USTs)

A total of 156 USTs have been removed, abandoned in place, replaced, or are in use at McAFB. An additional 17 USTs are located at off-base properties under McClellan jurisdiction. A summary of the status of the USTs is presented in Table 3-3 and a detailed inventory is provided in Appendix B.

A preliminary review of the 253 IRP sites on base has been made to determine which of these sites can be handled under the UST program. At this time, 23 sites in OUs A and B have been tentatively identified for transfer to the UST program pending regulatory concurrence.

3.2.2 Hazardous Materials/Waste Management, RCRA Closures, Air Quality, Water Discharges, Asbestos, Radon, and PCB Programs

Pollution prevention/compliance programs at McAFB include the following:

- **Hazardous Materials/Waste Management.** Includes materials tracking, storage facility development, closure of active units, personnel training, and emergency planning.
- **Air Quality Management.** Integrated "Air Quality Bank Account" to secure emissions credits for restoration projects.
- **Water Discharges.** Integrated sampling and compliance program for base operations and IRP projects/activities. Long-range program to eliminate the Industrial Waste Line (IWL).
- **Asbestos Testing/Removal.** Basewide survey and abatement/removal project planning and implementation.
- **Radon Testing.** Basewide survey and notification.
- **PCB Storage, Inspection/Removal.** Basewide survey (completed in 1986) and storage facility development.

Table 3-3. Pollution Prevention/Compliance Projects

Project	Status	Regulatory Program
Underground Storage Tanks	• USTs in use: 32 • USTs scheduled for removal in FY93: 17 • New, state-of-the-art USTs in use: 7 • USTs abandoned in place: 9 • USTs removed: 120	California RCRA Program, Sacramento County
Hazardous Materials/Waste Management	• All base fire personnel trained to California standards • McClellan SARA Title III Coordinator represents DOD installations in planning local Emergency Planning Committee • Voluntary compliance with EPCRA • New storage facility under development (DRMO) • New comprehensive tracking, usage, and reporting system in place by January 1993	RCRA, OSHA, EPCRA
Closure of Active RCRA Units	• Three with Part B permits • New storage facility under development, to be completed April 1993 • Six facilities may be subject to Part B review	California RCRA Program
Air Quality Management	• 150 permits • Zero notices of violation (NOVs) • Add credits to air quality bank account	CAA, Sacramento Metropolitan Air Quality Management District
Asbestos	• 36 projects identified with potential for remediation of asbestos or lead • 27 priority 1 asbestos buildings	TSCA
Radon Testing	• 34 sites tested, all found to be below four picocuries per liter • Occupants notified of results, no further action required	OSHA
PCB Storage Inspection/ Removal	• Basewide survey completed in 1986 • New storage facility, 1993 • Two transformers scheduled for retrograde	TSCA
NPDES Inspection	• Three permits, including GWTP • Completing 5-year program to eliminate IWL • All discharges in compliance	CWA, County Requirements

CAA Clean Air Act
CWA Clean Water Act
DRMO Defense Reutilization and Marketing Office
EPCRA Emergency Planning and Community Right-to-Know Act
NPDES National Pollutant Discharge Elimination System
OSHA Occupational Safety and Health Act
RCRA Resource Conservation and Recovery Act
TSCA Toxic Substances Control Act

3.3 Status of Community Involvement

McAFB conducts a comprehensive community involvement effort to inform the public and involve them in the environmental decision-making process. Central to McAFB's community relations program is the following six-point strategy:

1. Emphasize open communications and free information flow with regulators, media, and the public
2. Emphasize community involvement in decision processes
3. Be responsive to real community needs
4. Press to solve problems quickly
5. Seek to attain fair media coverage
6. Maintain credibility with the media, regulators, and the public

Community relations activities that have taken place at McAFB and the Davis Site to date include the following:

- **Interagency Agreement (IAG).** The Air Force, US EPA, and the Cal-EPA have negotiated an interagency agreement, which includes requirements for community relations activities based on provisions in federal (and where applicable, state) statutes, regulations, and guidelines.
- **Federal Facility Site Remediation Agreement (FFSRA).** The Air Force and two State of California agencies—the Department of Toxic Substances Control and the Regional Water Quality Control Board—have agreed to requirements for public participation according to applicable Federal and State law and relevant provisions in the NCP.
- **Administrative Record/Information Repository.** An Administrative Record of information that has been used to support Air Force decision-making related to the IRP has been established at the McAFB Library and is staffed full time by members who are in the process of converting more than ten years of documentation to microfilm. In addition, public information repositories for the relevant portion of the Administrative Record and its index have been established at the Sacramento Central Library and the Rio Linda Branch Library. Additional repositories on the Davis Global Communications Site (an annex to McAFB) are being established in Davis and Woodland, California.
- **Community Relations Plan (CRP).** The first McAFB CRP was approved in August 1985 and revised in 1988. A further revision was prepared in January 1991. This CRP is currently being implemented under the direction of the Air Force RPM, and is being updated, based on the continued monitoring of community concerns and a series of community interviews conducted in August, September, and October 1992. A separate plan for the Davis Site is expected to be finalized in March 1993.
- **Technical Review Committee (TRC).** The TRC has met quarterly since October 1990. In addition to Air Force, EPA, state, and congressional representatives, the TRC includes representatives from the County and City of Sacramento and the local American Federation of Government Employees (AFGE) union. TRC meetings provide updates on all IRP activities for the previous quarter, indicate plans for the upcoming quarter, and allow representatives a forum for discussion of progress and plans. A similar TRC exists for the Davis Site.

- **Mailing List.** A mailing list of all interested parties in the community is maintained by the installation and updated regularly. The mailing list has grown from 200 names in 1984 to 2,600 names in 1992. This mailing list has also been used by the Agency for Toxic Substances and Disease Registry (ATSDR) to distribute information on public health studies. The Davis Site has its own mailing list.

- **Fact Sheets and Newsletters.** Newsletters describing the status of the IRP at the installation have been distributed to the mailing list since May 1984. Up to four fact sheets per year have been published and distributed on an as-needed basis. Fact Sheet No. 13 was issued in July 1992.

- **Open Houses.** Informational meetings on the status of IRP efforts at the installation have been held with the public at least twice a year since 1983 or more frequently as required by current events, and these meetings are properly publicized by the media. The meetings are used to answer the public's concern and to update them as to the progress of the IRP.

- **Press Releases.** Press releases have been issued on an as-needed basis for activities, decisions, updates, and milestones associated with the clean-up effort. In addition, environmental programs are frequently the subject of articles in the base newspaper, *The Spacemaker,* which is available to all workers and visitors to the base.

- **Environmental Community Relations Steering Committee (ECRSC).** The ECRSC has met quarterly since October 1987 to monitor issues that affect the public and recommend community relations activities. Members include congressional, agency, public, and Air Force representatives.

- **Videotape and Brochure.** An Environmental Management videotape and a brochure have been prepared and distributed to describe IRP goals and progress at McAFB.

3.4 Environmental Condition of Property

Characterization of the degree and extent of contamination at McAFB has been ongoing since 1979. Due to concern about contaminated groundwater migrating off base, early efforts focused on characterizing groundwater plumes and mitigating the effects of groundwater contamination by installing pump and treat systems and city water supply lines in areas of contaminated groundwater. Soil sampling efforts were limited to those required to perform a preliminary assessment of potential source areas. Thus, the condition of water bearing strata has been characterized in greater detail than the condition of the soil and vadose zone. The condition of groundwater in and around the base and at the Davis Site is discussed in Section 3.4.1. The condition of soils on base is discussed in Section 3.4.2.

Both groundwater and soils have been categorized into three types of areas, based on current knowledge of the environmental conditions:

- **Areas of known contamination** are areas where contaminants have been detected via environmental sampling and analysis. Action levels have not yet been defined at McAFB.

- **Areas of suspected contamination** are areas that have not been fully investigated to date and require further examination to ascertain whether or not there is contamination. The possibility of contamination arises from historical activities in these areas.

- **Areas of no suspected contamination** (ANSC) are areas where PA-level efforts (records searches, interviews, as well as limited sampling and analysis, if available) indicate that no hazardous substances, pollutants, contaminants, or petroleum, petroleum products or derivatives were stored (for a period of one year or more), released, or disposed of. Therefore, there is no reason to suspect any problem and there are no plans to perform any further investigations.

3.4.1 Environmental Condition of Groundwater

Eleven contaminants have been consistently detected in groundwater at levels above the federal drinking water standards. They are:

- Benzene
- Carbon tetrachloride
- Chloroform
- 1,2-Dichlorobenzene
- 1,2-Dichloroethane
- 1,1-Dichloroethene
- Total 1,2-Dichloroethene
- Tetrachloroethene
- 1,1,1-Trichloroethene
- Trichloroethene
- Vinyl chloride

Five other contaminants for which there are no federal drinking water standards are regularly detected in groundwater samples. They are:

- Acetone
- 2-Butanone
- 1,1-Dichloroethane
- 4-Methyl-2-Petanone
- Toluene

Two contaminants are consistently detected, but in concentrations below the drinking water standards. They are:

- Bromodichloromethane
- Trichloroflouromethane

Contaminants have been detected in the A (shallow), B (intermediate) and C (deep) aquifers (see Figure 3-6) for a general view of the depths involved). The extent of contamination is greatest in the A aquifer. The contaminant with the greatest spatial extent is trichloroethene (TCE). The extent of TCE contamination in the A aquifer (the plume of greatest spatial extent) is shown in Figure 3-7. Approximately 400 acres is underlain by a plume that exceeds the federal drinking water standard of 5 parts per billion (ppb). Approximately 520 acres is underlain by a plume that exceeds 1 ppb, and may be subject to the State of California's "no degradation" policy.

3.4.1.1 Areas of Known Groundwater Contamination

As shown in Figure 3-7 approximately 520 acres of McClellan Air Force Base, is underlain by a groundwater plume with TCE concentrations greater than 1 ppb, while 70 acres off base are underlain by groundwater where the concentration of TCE exceeds 1 ppb. This represents the worst case estimate of groundwater contamination, since the TCE plume in the shallow aquifer is the plume of greatest spatial extent. Considering the areal extent of the plumes and the depths of the three aquifers involved (Zones A, B, and C in Figure 3-6), it is estimated that there may be some 10 billion gallons of contaminated water underlying McAFB.

The TCE plumes underlying the Davis Transmitter Site in the B and C zones (aquifers) have been combined pictorially in a plan view representation of the target area for remediation as shown in Figure 3-8.

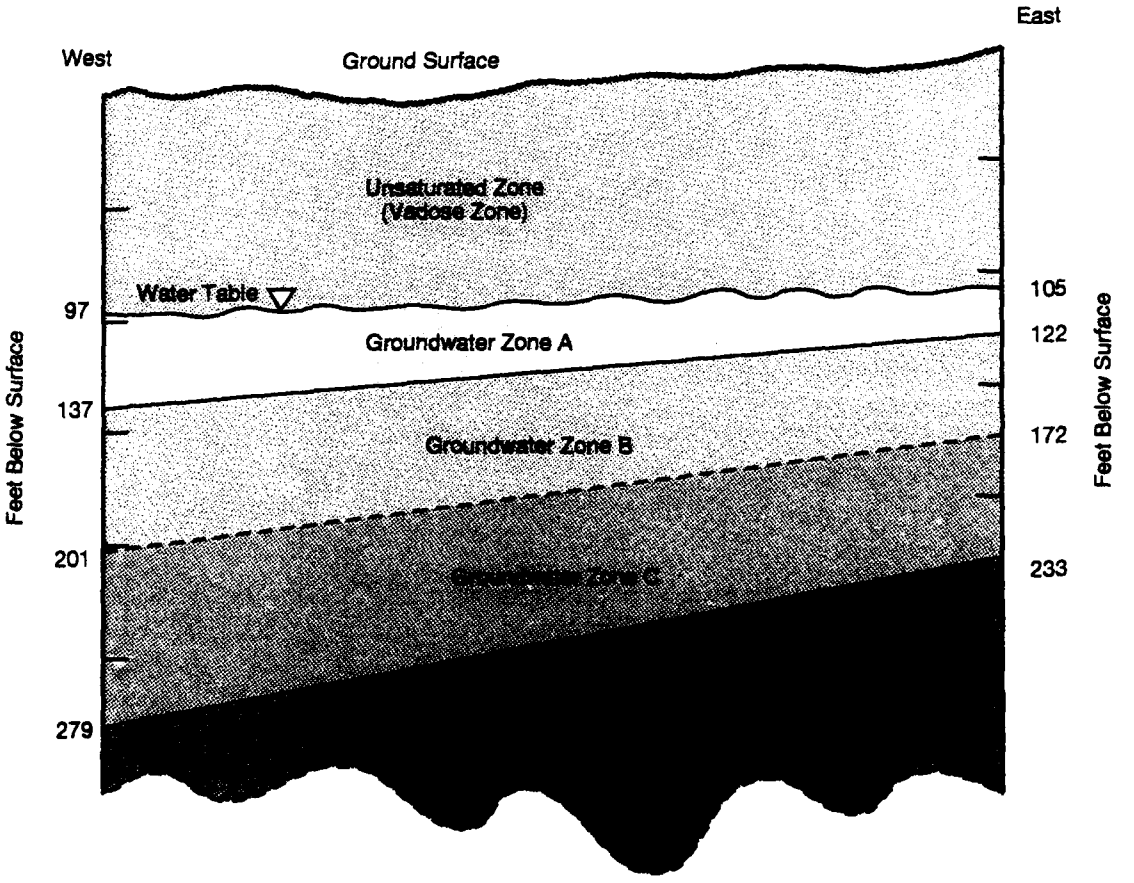


Figure 3-6. Generalized Hydrogeologic Cross Section of McAFB

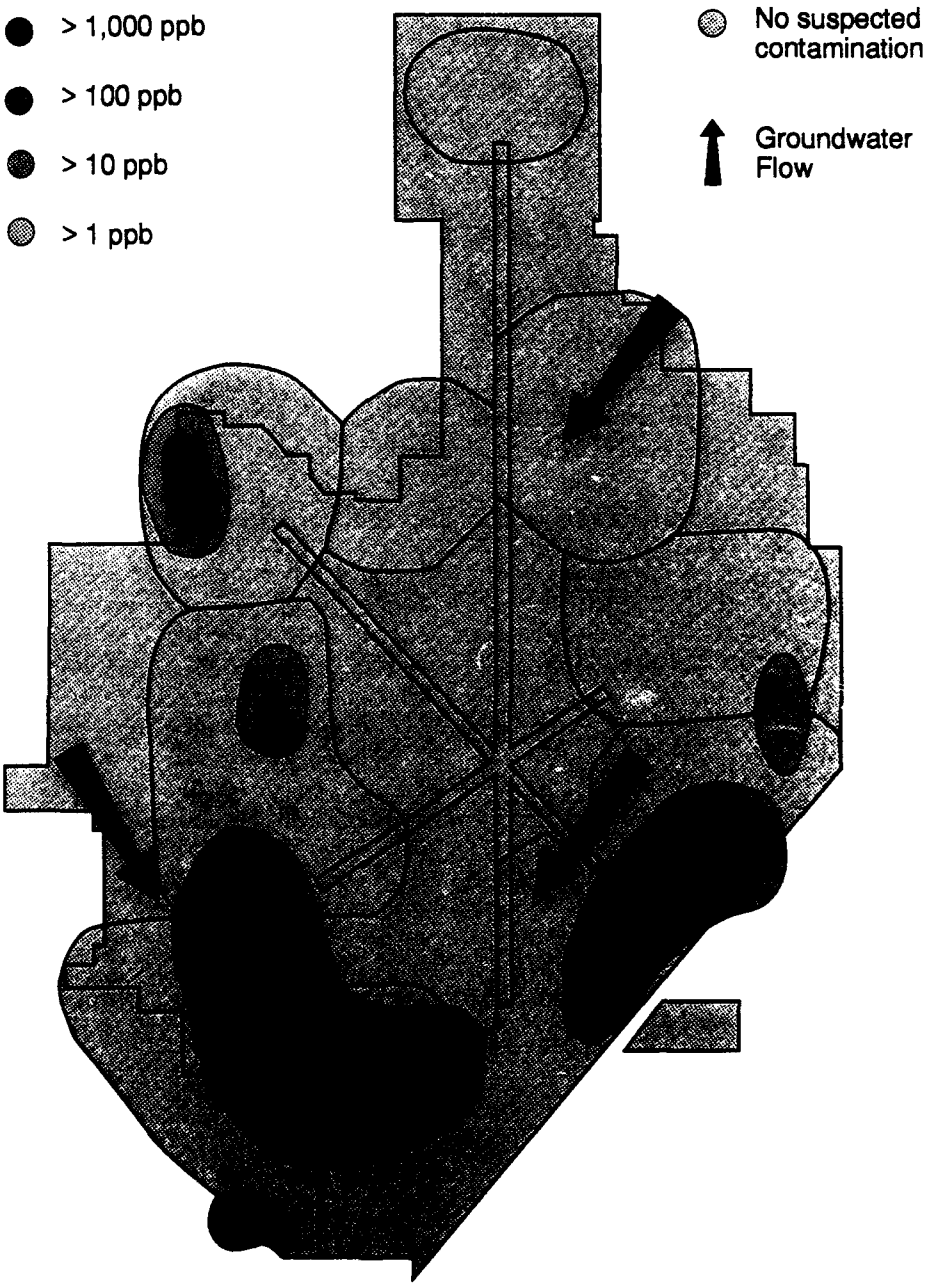


Figure 3-7. Environmental Condition of Property—Groundwater

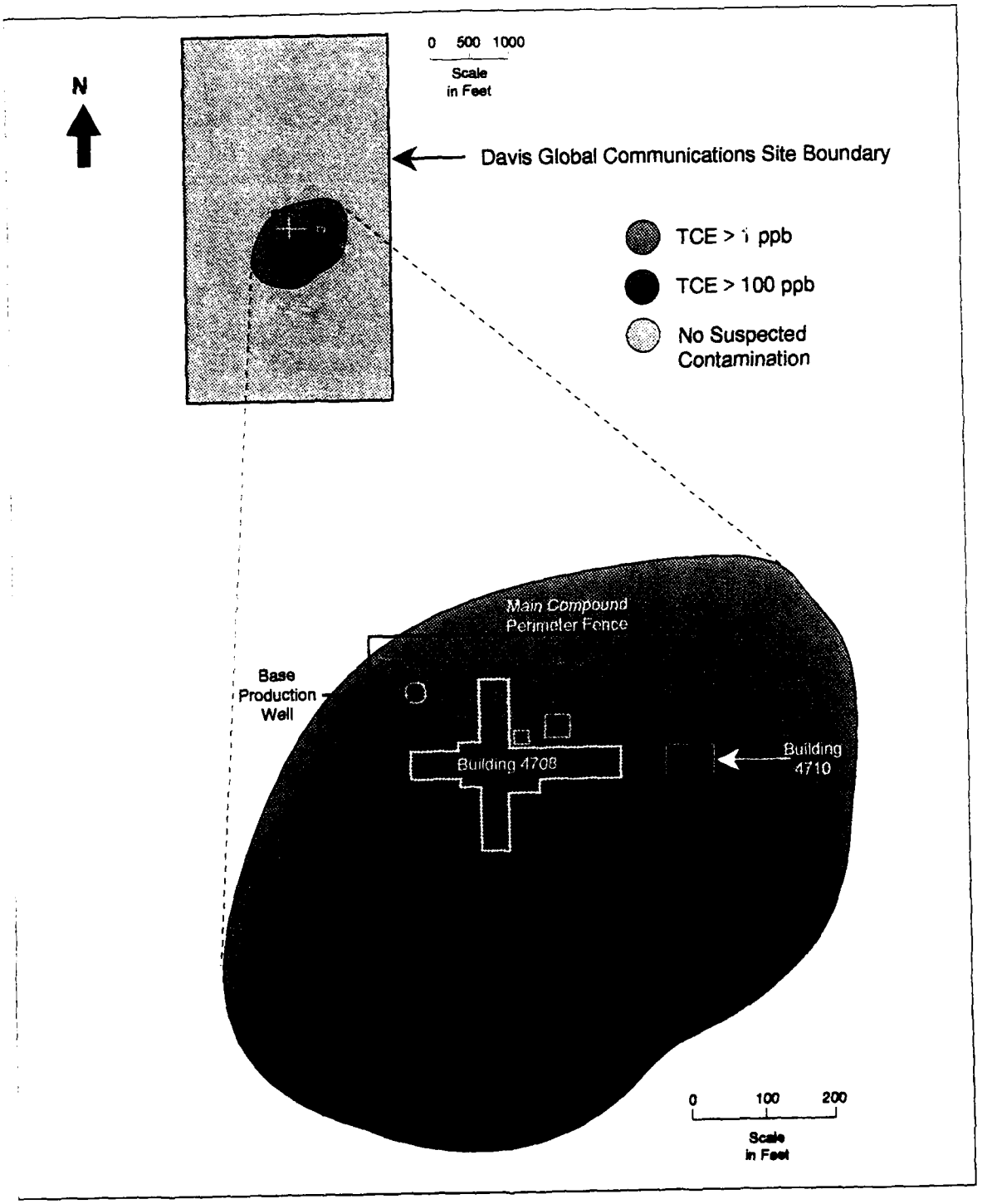


Figure 3-8. Davis Transmitter Site--Target Area for Interim Groundwater Remediation

3.4.1.2 Areas of No Suspected Groundwater Contamination.

Areas of no suspected contamination are represented as blue areas in Figure 3-7. They constitute 2410 acres, or 85% of the total area of McAFB. In some of these areas (1930 acres), the sampling is dense enough to detect groundwater contamination, but no contamination has been detected. For other areas (480 acres) situated near the active runway, current information suggests that there is no reason to suspect that there are source areas over these sections of the aquifers.

3.4.1.3 Response Actions for Groundwater

Figure 3-9 shows the location of extraction well fields and the zones of influence of those extraction well fields currently in operation.

Groundwater extraction is currently taking place in OUs B, C, and D. Two wells in OU B and two wells in OU C are operating and are connected to the GWTP. Two other wells, in the eastern part of OU B, are connected to portable carbon treatment systems and together pump 6 to 7 gallons per minute (gpm). Three extraction wells were recently installed in OU B and are scheduled to begin operating in 1993 in conjunction with the GWTP. Thus, there are nine wells in OUs B and C, six of which are currently operating.

Since July of 1987, a groundwater extraction system has been operating in OU D and currently consists of six wells pumping 60 to 80 gpm from zones A, B, and C.

3.4.2 Environmental Condition of Soils

Figure 3-10 shows the environmental condition of soils at McAFB. The areal extent of known sites is shown in red. The locations of PRLs and study areas (SAs) are represented as yellow and blue dots. The areal extent of PRLs and SAs are not shown, since the PRLs and SAs have not been characterized in sufficient detail. The areal extent of known sites is approximately 45 acres, or 1.6 percent of McAFB.

3.4.2.1 Areas of Known Soil Contamination

Areas of known soils contamination (confirmed sites) are shown in red in Figure 3-10. The red areas represent the spatial extent of confirmed sites. Currently, the spatial extent is indicated by administrative boundaries (e.g., the boundary of a building where an activity took place, rather than the extent of contaminated soil resulting from the activity). Under these conditions, the area underlain by confirmed sites is said to constitute approximately 1.6% of the total area of the base. Ongoing investigations of vadose zone soil gas plumes will better define the spatial extent of contamination and are likely to result in larger estimates of spatial extent. Extensive soil sampling took place in the summer of 1992 in OU B, and will continue in the fall of 1992 in OUs A and C. Figure 3-10 will be updated to indicate the spatial extent of contaminated soils as the data from the ongoing source area characterizations are interpreted.

3.4.2.2 Areas of Suspected Contamination

PRLs and SAs, indicated by yellow and blue symbols, respectively, in Figure 3-10, have not been sufficiently characterized to be classified as either areas of known contamination, or areas of no suspected contamination. They will be progressively subdivided into these two categories as the data from ongoing source area characterization efforts are interpreted.

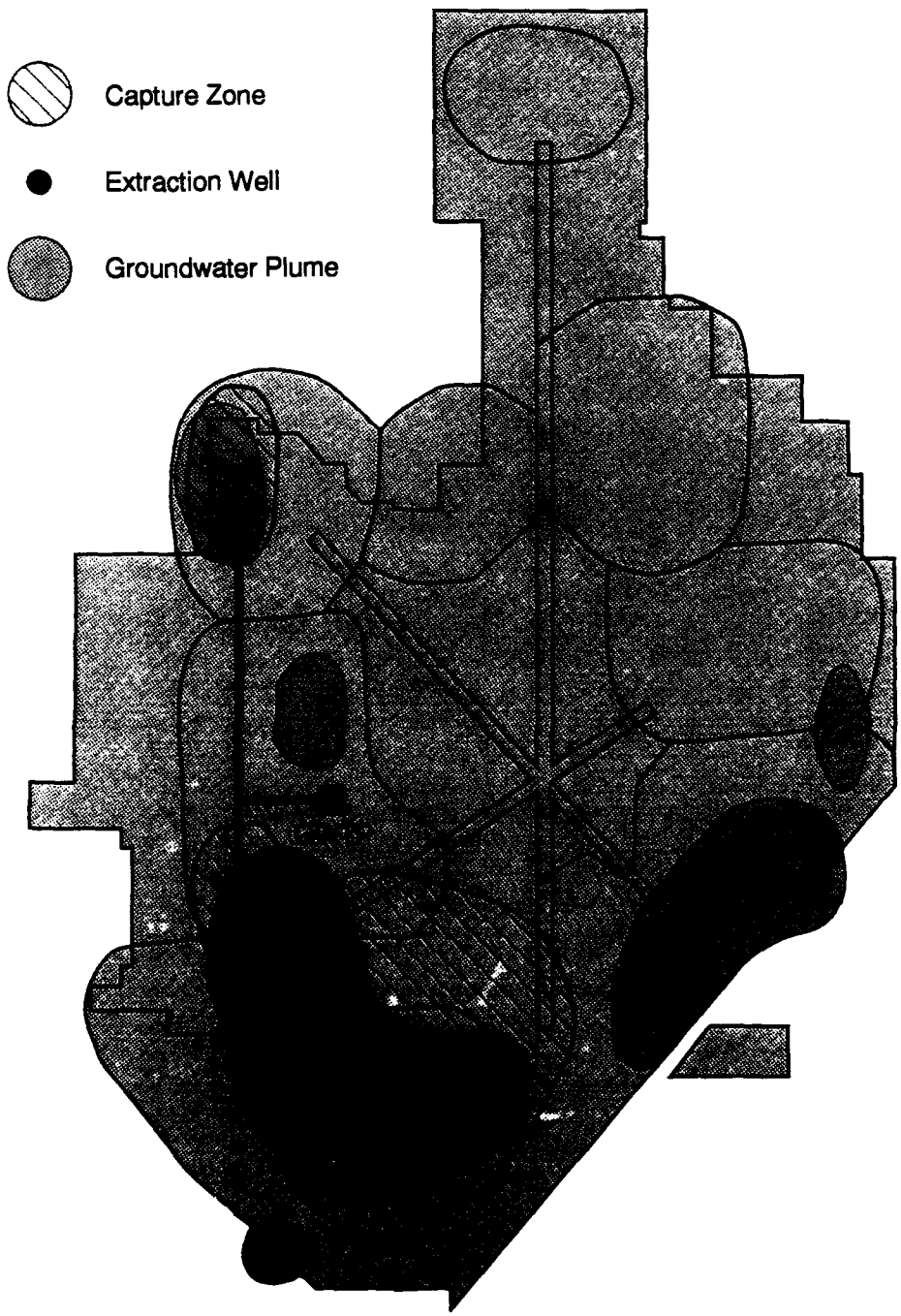


Figure 3-9. Groundwater Response Actions

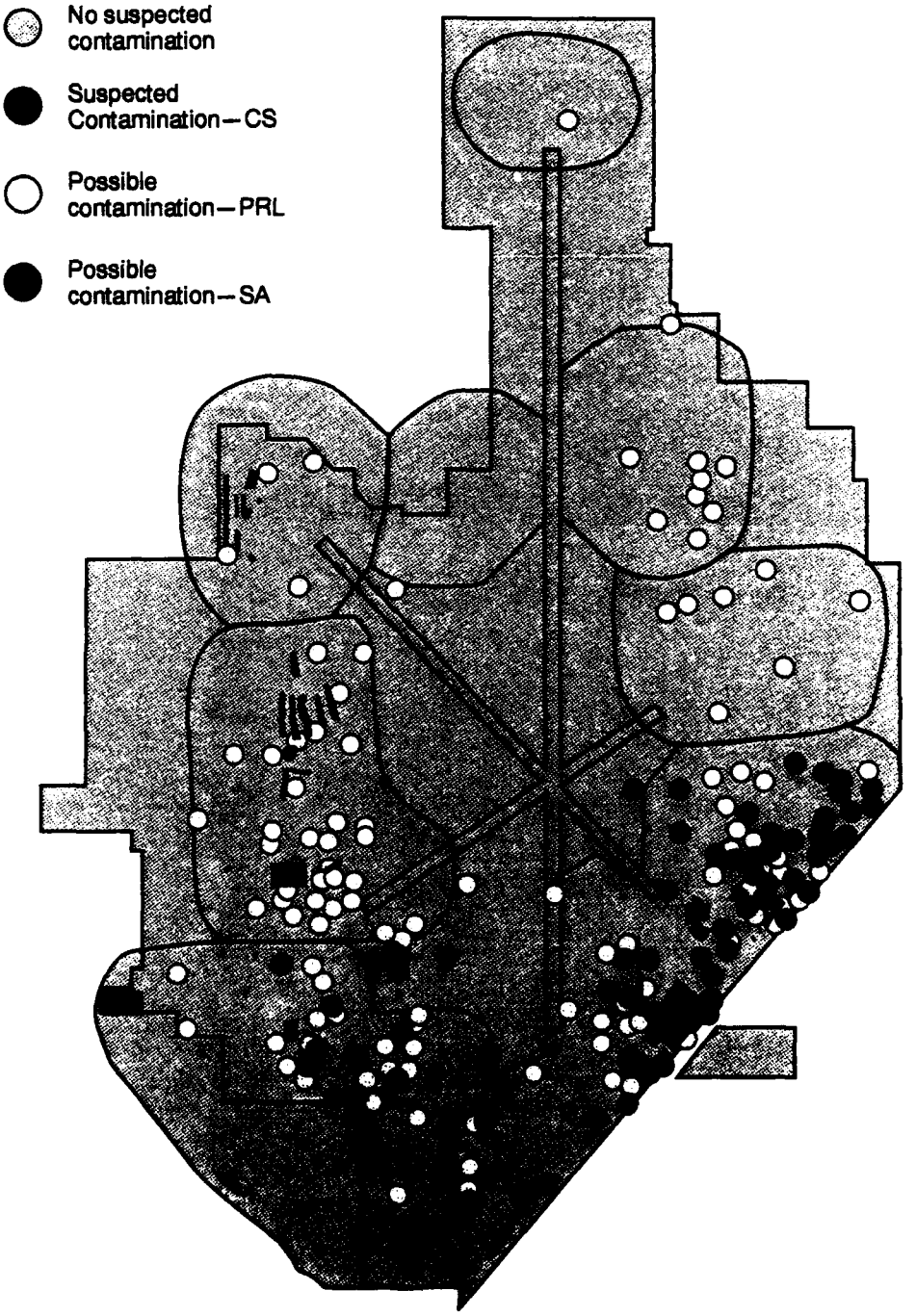


Figure 3-10. Environmental Condition of Property—Soils

3.4.2.3 Areas of No Suspected Soil Contamination

ANSCs are shown in green in Figure 3-10. ANSCs are delineated based on the preliminary assessment process. Records searches, interviews with base employees, inspection of aerial photographs, and limited soil sampling associated with PA/SI and RI/FS efforts did not yield any evidence of potential contamination.

The area bordering the active runway is also classified as an ANSC since field activities have been extremely limited in that area. This area constitutes 480 acres, or 17% of the total area of the base.

3.5 Modifications Since Last Update

Because this MAP document is the first in the series, there are no interim modifications to report.

Chapter 4

Installation-Wide Strategy for Environmental Restoration

The purpose of this chapter is to summarize the installation-wide environmental restoration and compliance strategy for McAFB.

4.1 OU Designation and Strategy

4.1.1 Zone Designations

Not applicable, since McClellan's IRP efforts were already past the "zone" development stage (with a reasonably well developed set of OUs) by the time that the MAP protocols were issued.

4.1.2 OU Designations

The McClellan IRP program considers more than 250 sites, all but a handful of which are within the confines of the base boundary (see Figure 3-3 and Table 3-1, sites 254-258). For the purpose of managing the many investigations and developing efficient and coordinated response actions and remedial strategies, McAFB has been divided into ten OUs with discernible boundaries as shown in Figure 3-1. These OUs generally correspond to areas where specific industrial operations and waste management activities have historically occurred at McClellan and are referred to as geographic source area or vadose zone OUs. This initial division into OUs is viewed as a starting point for site investigation. As data regarding the extent and magnitude of contamination become available, it is likely that some sites will be identified as needing early remedial action to prevent the further spread of contamination or to reduce risk. The strategy is to group these sites into separate OUs and to accelerate the investigation and remediation schedule for them. In addition, an eleventh OU (OU GW) has been designated on the basis of developing an integrated, installation-wide remediation approach to groundwater contamination underlying much of the base. A twelfth area (the Davis Site) has been created for the off-base Davis facility (see Figure 3-2).

As additional data are collected regarding possible surface or soil gas contamination, modification of these OUs may be required to take into account different pathways of contaminant migration. It should be noted that the current OUs (except for OU GW) are based primarily on geographic source and considerations.

4.1.3 Sequence of OUs

Given the complex mix of sources and existing contamination, it is clear that remediation will require multiple steps over a long period, and that not all areas can be remediated at the same time. It is also clear that some areas are of higher immediate priority than others. The IAG parties agreed to investigate the eight original OUs in the following order of priority:

- OU B: high priority due to concern about off-base movement of contaminated groundwater
- OU D: high priority due to concern about an off-site plume of volatile organic compounds (VOC)
- OU A: somewhat less priority for investigation, but of concern due to the large number of sites
- OU C: also of concern due to the large number of sites
- OU E, F, G, H: lower priority since there is no evidence that the sites in these OUs are the sources of significant groundwater contamination

As described in the previous section, it is possible that the investigation of these OUs may indicate the need for early action to remediate hot spots, as in the case of OUs B and C leading to the identification of OUs B1 and C1 for accelerated remedial actions. In such cases, the priorities for remediation can be greater than those for investigation according to the original schedule. The IAG parties have balanced the concerns of the local community, statutory environmental obligations, and Air Force Materiel mission requirements to generate the schedules shown in Appendix C. This schedule has changed in response to new information from investigation, and the IAG parties will continue to evaluate it.

Using the date of the final ROD (see Figure 4-1) as an indicator of priority (except for OU GW which has a continuing high priority), the current priorities are: B1, D, B, Davis Site, C1, A, C, E-H.

4.1.4 Removal Actions and Treatability Studies

Removal actions and treatability studies planned as part of the McAFB environmental restoration strategy are summarized in Table 4-1.

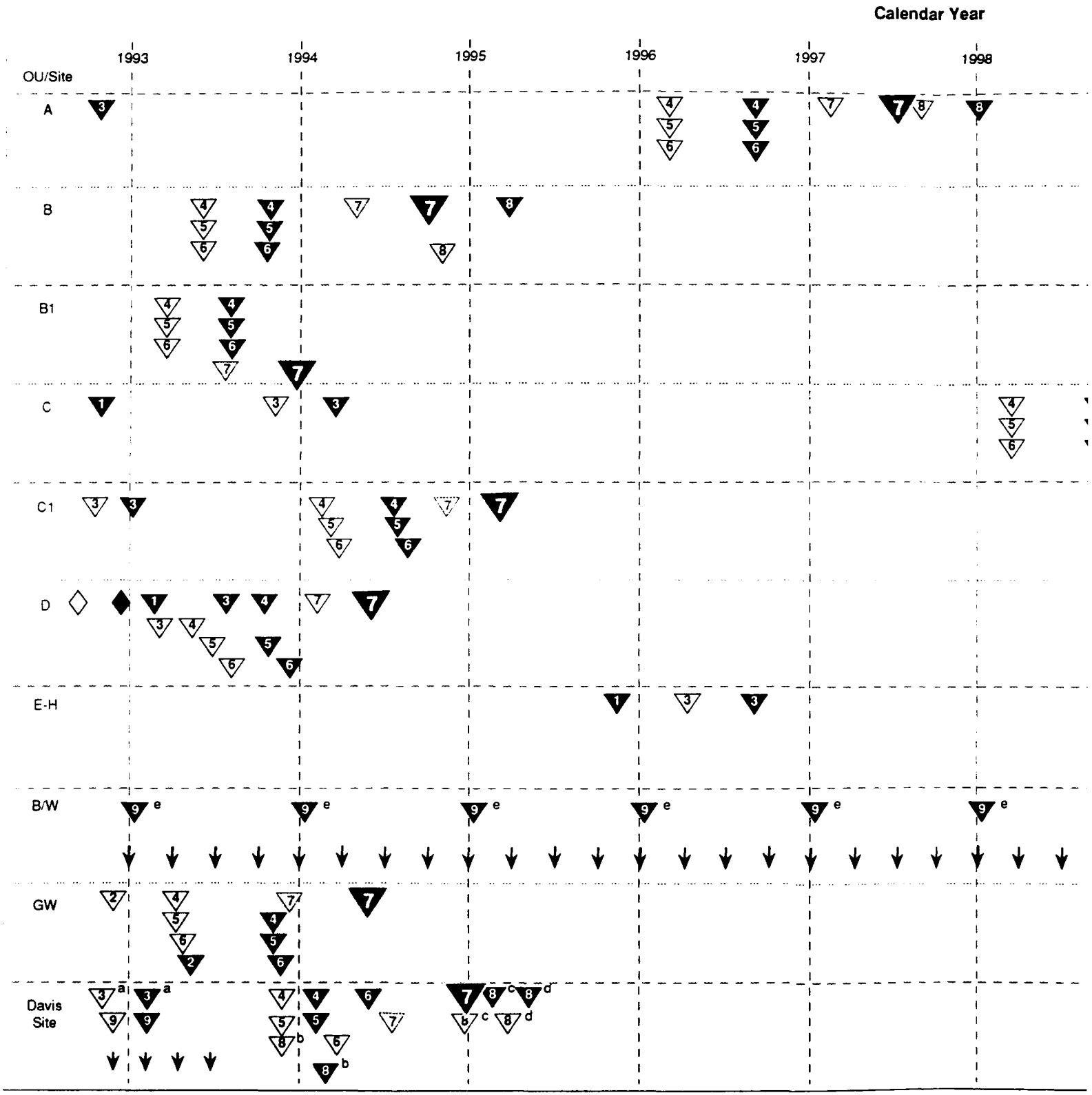
4.1.5 Community Relations Strategy

The principal features of the McAFB strategy for community relations are the early involvement of the community in the planning process and subsequent coordination as the program is implemented. The McAFB Project Team has adopted the following strategy to support a proactive community relations program at the installation:

- Update the Community Relations Plan (CRP) through community interviews on an annual basis. The CRP is currently being updated, and as part of that process specific strategies and activities will be planned and scheduled for implementation.
- Update and maintain the on-base Administrative Record at the McAFB Library; update the publicly accessible Administrative Record at the information repositories at the Sacramento Central Library and the Rio Linda Branch Library.
- Develop Proposed Plans (PPs) in fact sheet format and issue public notice two weeks in advance of the public comment periods on these plans.
- Hold 30-day public comment periods on PPs and respond to all comments in a responsiveness summary; all commentators will be sent a copy of the responsiveness summary.
- Publish fact sheets as needed and quarterly newsletters on the progress of environmental restoration programs.
- Coordinate with news media on activities, decisions, updates, and milestones associated with the cleanup program and other environmental issues.

4.1.6 Remediation Strategy and Remedy Selection Approach

McAFB has complex geology and widespread contamination, as described in Section 3.4. If McAFB were to comply with the NCP using traditional regulatory approaches and remediation technologies, the cleanup costs could be larger than necessary. Moreover, with the current approach for measuring the success of an environmental remediation program (e.g., the number of sites closed out and the rate of budget obligation), there are no clear incentives within the Air Force to first address sites that pose the most risk. McAFB has reoriented its program to make optimal use of its resources in planning and executing remediation actions, while achieving the goal of protecting human health and the environment. McAFB is building its program to take full advantage of the regulatory


Calendar Year
1993
1994
1995
1996
1997
1998
OU/Site
A
B
B1
C
C1
D
E-H
B/W
GW
Davis Site

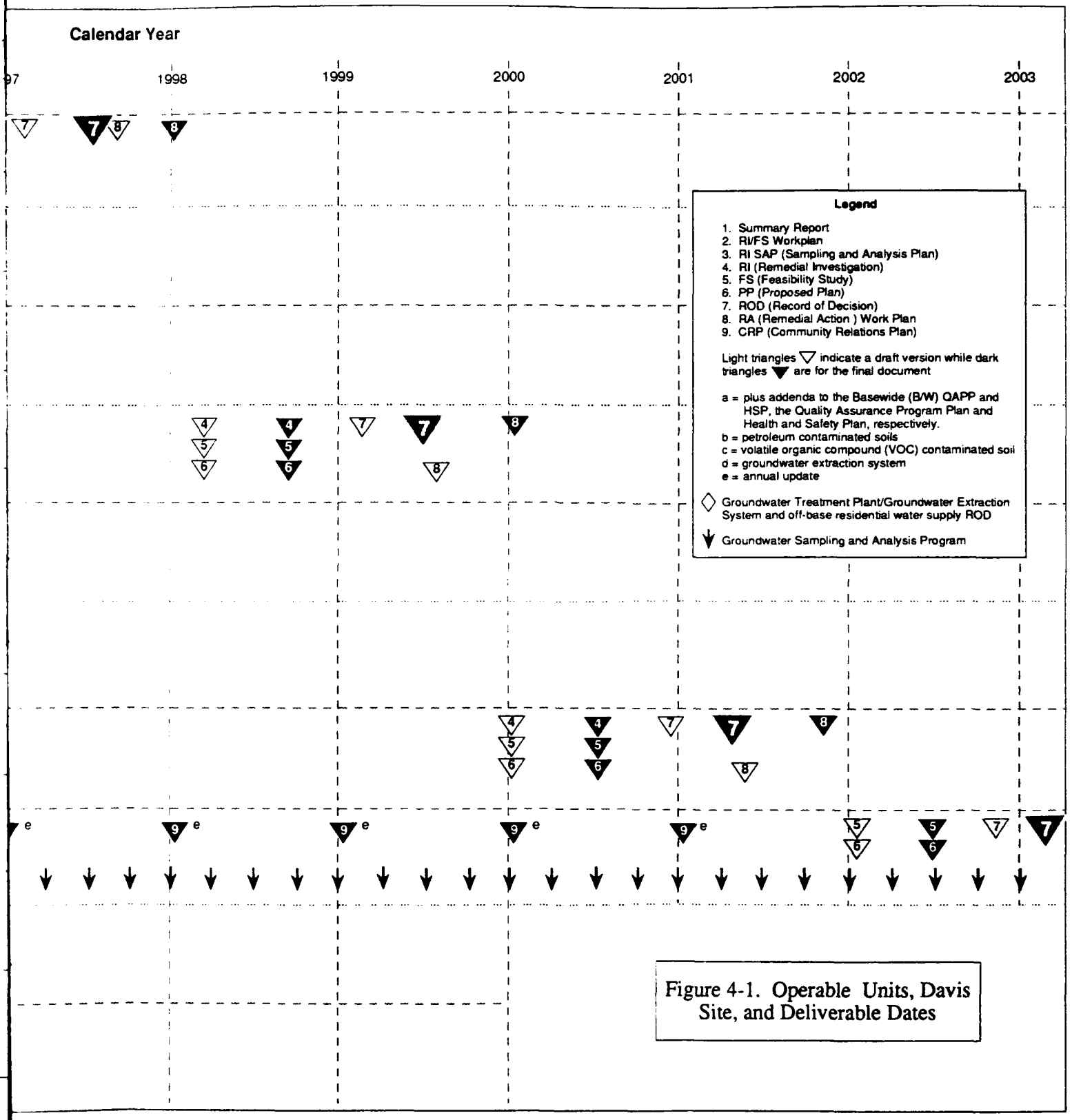


Figure 4-1. Operable Units, Davis Site, and Deliverable Dates

Table 4-1. Planned Removal Actions and Treatability Studies

Location	Removal Action	Objective	Time Frame
OU A	SVE application to Group 1 sites	To clean up VOC hot spots and prevent further degradation of groundwater	1993/94
OU B	Groundwater removal involves three extraction wells and a pipeline to the Groundwater Treatment Plan SVE application to ICs 1, 6, 7, and 8	To control migration to the northern TCE and 1,2-DCE plumes To remove VOC from those areas with high soil gas concentrations and prevent further degradation of groundwater	1993/94
OU C1	SVE application	To remove and remediate high VOCs in the vadose zone and possibly including *other contaminants (e.g., semi-VOCs and* metals) as needed	1993/94
OU D	SVE application to off-base plume and its sources	To remediate and prevent further migration of the off-base plume	1993/94

Table 4-1. Planned Removal Actions and Treatability Studies (Concluded)

Location	Treatability Study	Objective	Time Frame
OU B Building 666	SDW: Solar detoxification of water. Photocatalytic process to initiate the complete oxidation of organic chemicals	To treat groundwater contaminated with low levels of chlorinated solvents (e.g., TCE)	Detox unit constructed by Feb. 1993 and field tests completed by Oct. 1993
OU B1 SA-12	APEG-PLUS: Alkaline polyethylene glycol reaction with PCBs to form much less toxic byproducts BCDP: Base-catalyzed decomposition process for complete dechlorination of PCB	To evaluate the effectiveness of the two technologies to dechlorinate PCB, dioxin, and furan compounds in soil and reduce concentrations of other contaminants (e.g., halogenated VOCs, semi-VOCs, and metals).	1993
OU C1	SIVE: Steam injection/vapor extraction. Contaminants are vaporized, extracted, condensed, and treated	To determine if and by how much the addition of steam enhances the vapor extraction process for accelerating the GW cleanup, and to evaluate NAPL removal	Treatability Test Lab Summary Memo, Feb 1993 Predesign Report, June 1993
OU C1	S/S: Solidification/stabilization. Contaminants are stabilized in place	To reduce the mobility and toxicity of contaminants by using additives (e.g., adsorbents, cements) or chemical/physical processes (e.g., vitrification)	Additive screening, Jan. 1993; Pilot scale evaluation, July 1993 (if necessary)
OU D	SVE: Soil vapor extraction. Vapors are vacuum extracted from wells screened in the soil zone.	To assess volatile organic compound removal rate as a function of vacuum pressure and flow rate under ambient and heated air conditions	Pilot system install and Site Characterization, begin Sept. 1992, finish May 1993
Basewide	BIO: Bioremediation process. Biodegradation is enhanced by heat, nutrients, air, and other factors	To determine achievable cleanup levels for underground storage tank soils and IDW (investigative derived waste) by trying several bioremediation techniques.	Slurry reactor pilot study completed, Dec. 1992; Bio study report submitted, May 1993

opportunities offered by EPA's Superfund Accelerated Cleanup Model and it is incorporating the lessons learned from remediation efforts at other federal facilities and private parties. In addition, McAFB has initiated efforts to improve its program execution infrastructure to support the remediation activities.

Technical and Administrative Elements of the Remediation Strategy

McAFB's remediation strategy starts with two fundamental premises:

- The most important factor in prioritizing a site for removal or interim remedial action (referred to as "early action") is reducing risk.
- After risk is reduced by early action and the immediate threat to public health and safety and the environment is eliminated, it may not be advantageous to press for site closeout immediately, especially if the standard remediation technologies are inordinately expensive. Programs to foster development and application of innovative technology could result in more cost-effective means of remediation and have the potential for very large savings.

These premises lead logically to the conclusion that early action is preferred for sites that pose the highest risk, and that there is less need for immediate action at sites of low to moderate risk or at sites that have only residual risk after early actions have taken care of the most immediate problem.

The McAFB strategy balances a bias for early action at high-risk sites with consideration of the inherent uncertainties in site characteristics and technology performance. This translates into a strategy that restricts removal or interim remedial actions to cases in which it is clear that the actions will achieve short-term goals and be compatible with long-term actions to reduce residual risk. There are two key features of this element of the strategy:

- Site characterization must be sufficient to ensure that a site is appropriate for early action and the remediation technology being considered for application. The approach here is not necessarily to expand the site characterization effort, but to focus it on the decision to take early action.
- Technology development must be sufficient to ensure that it will be effective for the site under consideration. McAFB's approach is to aggressively pursue field-testing in treatability studies and demonstration projects for proven technologies that have not been fully tested under similar conditions and for technologies that might be classified as innovative. As soon as preliminary data regarding cost-effectiveness become available, the technologies are applied in removal and interim remedial actions, and more information regarding cost and performance is generated.

The technical approach summarized above and described in more detail in the following sections is complemented at McAFB with equal emphasis on streamlining the administrative process associated with remediation. McAFB is actively planning to apply the EPA Superfund Accelerated Cleanup Model through innovations to the Engineering Evaluations/Cost Analysis (see more detailed discussion below). McAFB also will pursue other regulatory approaches that streamline the administrative process. As indicated in Table 4-2, performance-based RODs currently are being developed for application in cases where the complete information for a traditional ROD is not available. A performance-based ROD would allow for consideration of new data and modification of the selected remedy using predetermined decision criteria. This would not require an amendment to the ROD, thus saving time in approving the ROD initially and in accommodating unexpected site conditions unless a new remedy is indicated. It also would permit new technologies to be considered at predetermined review points after the original ROD is approved.

Another approach that is being considered for final remedy selection is the application of presumptive remedies. This will require additional data on technology performance, which may be generated in EPA or Air Force studies. Application of presumptive remedies should result in reduction or elimination of many activities related to site investigation, risk assessment, and evaluation

Table 4-2. Technical Elements of Remediation Strategy

Technical Elements of Remediation Strategy	Legal/Regulatory Considerations	Consensus Statements	Other
Early action at high-risk sites to reduce risk	Incorporation of new Superfund paradigm Continued close relationship with regulators through EPIC EE/CAs for non-time-critical removal actions, modified to allow for basewide application of specific technologies (SVE to be developed first) Performance-based RODs to allow early action to proceed in the presence of uncertainty regarding ultimate effectiveness of a technology Presumptive remedies as they become available		Improvements in remediation technology by enhancing current technologies, using information from treatability studies and removal actions; and by providing field test opportunities for innovative technologies Generation and analysis of cost and performance data from treatability studies and early actions
Cleanup level determination supported by a Technology Information Base	Agreement to consider technical feasibility and cost-effectiveness in establishing cleanup levels	Groundwater nondegradation policy	Analysis of cost and performance data from treatability studies and removal actions to provide input for decisions on cleanup levels
Long-term remediation to remove residual contamination	Relaxation of IAG schedule to allow delay in long-term remediation		
Phased sampling and site prioritization based on risk	Flexible interpretation of current regulations and guidance	Risk assessment Background level Soil gas sampling	Maximum use of historical data Phased sampling and analysis that specifies DQOs and incorporates risk screening Use of Technical Information System

of cleanup alternatives. For example, McAFB will apply an Air Force initiative on bioventing for POL sites. Eight POL sites have been selected to test this technology and generate a large data base to support other bioventing applications.

McAFB and the regulatory agencies are also in the process of developing a set of consensus statements to improve the quality and streamline IRP decisions. Consensus statements are short summaries of agreements among remedial project managers (RPMs) from all parties to the IAG.

These statements are used to document programmatic decisions that lead to RODs, provide continuity to the program, and minimize duplication of effort and rework. The consensus statements are intended to be flexible documents that can be amended by the RPMs to reflect new information or changes in the regulatory environment. The areas that have been identified for consensus statements include the use of soil gas surveys and soil gas data, risk assessment framework and approach, basewide background level for soils, groundwater non-degradation policy, and RPM work load distribution. A more detailed description of the issues and the schedule for completion of the consensus statements can be found in Section 6.

The technical elements of the McAFB remediation strategy—early action at high-risk sites, cleanup level determination supported by a technology information base, long-term remediation to remove residual contamination, and phased sampling and site prioritization based on risk—are summarized in Table 4-2 and described in more detail below.

Early Action at High-Risk Sites

Selection of remediation technology is as important as selection of sites for early action. The very large cost for remediation using conventional technologies such as incineration has led McAFB to encourage continual improvement of existing technologies and to facilitate development and application of innovative remedial technologies. It is highly likely that some of the emerging technologies being considered for use at McAFB will be equally effective as current technologies and much less expensive. Although there will be an initial cost to demonstrate pilot-scale technologies, the rewards could be very large, especially if the technologies are applied at other Air Force bases once they are demonstrated at McAFB. McAFB is engaged in efforts to advance innovative technologies, including treatability studies on soil vapor extraction (SVE), solidification, steam injection/vacuum extraction, and electron beam destruction (see Section 4.1.4). Critical information on performance of the technologies and the effects of various site conditions are being generated and analyzed.

In parallel with efforts to select sites and technologies for early action, McAFB is developing an administrative mechanism to allow remedial action using specific technologies to be taken quickly when predetermined criteria are met. A new variant of EPA's Engineering Evaluation/Cost Analysis (EE/CA) is being developed with the regulators as a prototype decision document for the new Superfund paradigm. This EE/CA will be written for basewide use to allow non-time-critical removal actions using SVE to be taken at certain high-risk sites. With its focus on a single technology rather than on a single site, it should allow for wider application of chosen technologies. The first EE/CA will be directed toward SVE since this technology has been demonstrated to be very cost effective in removing the VOCs, contaminants of concern at a variety of McAFB's sites. The early application of SVE at highly-contaminated sites will provide more performance data than treatability studies and should assist in decisions regarding long-term remediation and cleanup levels.

The draft version of the first EE/CA is scheduled for spring 1993, with regulatory approval by fall 1993. When a site is identified for early action, an Action Memorandum or a focused EE/CA will be written to describe how the generic SVE removal action will be implemented for that specific site. With this approach, the generic elements of the site and technology would be addressed in the

basewide EE/CA, while the unique elements of specific sites would be addressed in action memoranda. Both the EE/CA and the subsequent action memoranda will be primary documents with schedules in the McClellan AFB Interagency Agreement

Cleanup Level Determination Supported by a Technology Information Base

McAFB's efforts to specify final cleanup levels are focused on generating information regarding performance and cost-effectiveness of remedial technologies to provide the basis for realistic cleanup levels. It is recognized that final cleanup levels will be very important factors in the overall cost of remediation. Of particular concern at McAFB is the California policy that no degradation of groundwater will be allowed from environmental contaminants. This is likely to be the most limiting requirement in establishing soil cleanup levels. It probably is not feasible to achieve this goal at McAFB using current technology. In light of this, EPA and the state of California have agreed to consider technical feasibility and cost-effectiveness in establishing cleanup levels for groundwater and soil.

McAFB will generate and analyze cost and performance data from its treatability studies and early actions. This information is likely to play a key role in the decisions on cleanup levels.

Long-Term Remediation to Remove Residual Contamination

McAFB's strategy for addressing long-term remediation of low-level or residual risk differs from the short-term strategy described above. After early actions reduce risk, remaining contamination can be controlled through containment or other measures until site characterization is completed and a permanent remedy is developed for the site.

Remediation for groundwater contaminated with DNAPLs (dense non-aqueous phase liquids) is now widely acknowledged as a long-term effort. Since the enactment of CERCLA, there have been hundreds of pump and treatment remediation systems installed nationwide. These systems have been successful in containing the plume, but few, if any, are successful in cleaning up the groundwater to health-based levels. Therefore, the technical and legal communities are urging the EPA to consider alternative management approaches. It is expected that this issue will be a major focus in the upcoming CERCLA revision of 1994.

The goals of groundwater remediation at the McAFB are to reduce risk and to apply innovative technologies to reduce the cost and duration of the remediation effort. The base is developing a practical and logical strategy that takes into consideration the changing technical and regulatory environment. The base will continue to operate the existing pump and treat systems until a better containment and treatment alternative can be identified. The existing systems cannot be terminated because they were installed for plumes that had reached, or posed imminent threat to, drinking water wells. Those plumes not captured by existing systems will also be hydraulically contained with extraction wells to completely eliminate any threat to nearby communities. These additional extraction wells will be placed and operated to optimize the removal of contaminants from groundwater. Moreover, there will be an intensive effort to identify and apply more effective means to remove and treat contaminants from groundwater. The remedial system selected will be not only effective but also flexible so as to incorporate appropriate innovative technologies in the future.

Phased Sampling and Site Prioritization Based on Risk

The traditional approach for site characterization is to gather detailed information with stringent quality controls so that it can be used for a wide variety of applications, including risk assessment. McAFB has developed an alternative approach to data collection that currently is being applied. This alternative approach focuses data collection on decisions and does not necessarily require the quality and quantity of data that might be needed to support detailed risk assessment. Figure 4-2 illustrates the phased data collection effort, which builds on historical data and makes maximum use of tools

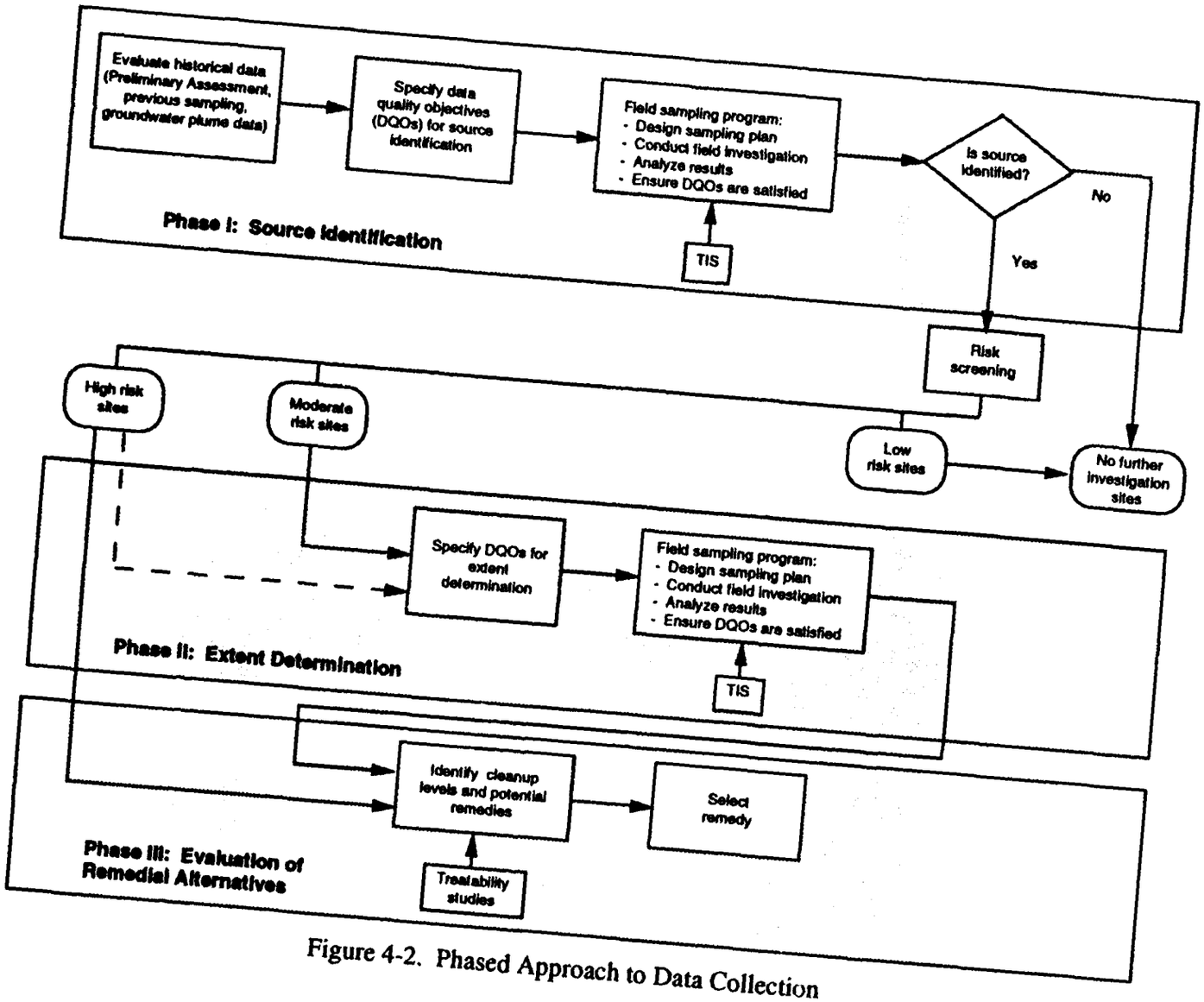


Figure 4-2. Phased Approach to Data Collection

such as the Technical Information System (see Section 6.2) to determine the need for additional data at various decision points. Key features of the phased sampling approach are the decision framework that specifies decision criteria through data quality objectives and the risk/ARAR screening methodology that allows McAFB to tailor the timing and type of data to the needs for various sites.

The screening procedure sorts sites into three categories:

- Sites that require early action. Sites can be identified as belonging to this category if risk screening indicates that these pose a high risk or if there are indications that the ARAR will be exceeded. Sites that meet EPA's criteria for non-time-critical removals would also fall into this category, as would those that are demonstrated sources of existing high contamination in the groundwater. Data collection for sites requiring early action is focused on establishing that a site is a suitable candidate for a specific technology.
- Sites that require no further action at the present time. These sites sill be referenced in a consensus statement and included in the first available ROD after the resolution of the groundwater nondegradation policy. Sites may be identified as belonging to this category if there is no evidence of the presence of contaminants or if they are estimated to pose acceptable risk when evaluated using the risk screening methodology. While additional data or analysis might be needed to close these sites, there is no immediate need for either remedial action or additional data collection.
- All remaining sites. It is most likely that additional data will be needed before remediation decisions can be made for these sites. The standard RI/FS approach will be followed for these sites unless sample data indicate that these sites can be reclassified as requiring early action or no further action.

Program Execution Elements of the Remediation Strategy

McAFB also plans to continue to improve its ability to execute the technical elements described above and summarized in Table 4-2. These efforts focus on improving contracting mechanisms and facilitating program management and implementation. These initiatives are summarized in Table 4-3.

4.2 Compliance Strategy

4.2.1 Underground Storage Tanks

Efforts to survey, locate, and analyze USTs and determine programmatic and regulatory jurisdiction have been ongoing in the McClellan UST program. These efforts will continue as needed on the base and at the McClellan off-base properties. At present, McClellan has programmed, or is planning UST projects for removal and replacement of 30 USTs through FY96. These are, by FY:

- FY93: Remove and replace three USTs at the Capehart (off-base) property.
- Remove and replace 17 USTs on the base. Of these 17, seven will be replaced with state-of-the-art USTs, six will be above ground tanks, and four will not be replaced.
- FY94: Replace waste fuel UST (BRAC project funding).
- FY96: Remove Tank Farm 1 (nine tanks). (This project is in the planning stage.)

In parallel with these projects, McClellan is working with regulatory agencies to develop and refine soil cleanup standards for UST sites. Currently, Sacramento County is considering application of Safe Drinking Water Act standards to soil contamination levels in determining UST remediation

Table 4-3. Program Execution Elements of the Remediation Strategy

Program Execution Elements of Remediation Strategy	Specific Activities
Develop Improved Contracting and Funding Mechanisms	• Acknowledge restoration is not equivalent to construction • Apply the most appropriate contracting approach for the problem - Architectural Engineer/construction - Systems (design/implement) - Services - Cooperative Research and Development Agreements (public/private partnerships) • Expand project scopes of work to include future work, subject to funds availability • Gain local approval to realign dollars among projects within SAF-MIQ approved programs • Utilize DERA money for all appropriate accounting categories (i.e., no color of money)
Facilitate Program and Management Implementation	• Continue process of improvement under EPIC • Improve staff recruitment and retention • Expand and tailor an environmental career path to evolving needs • Develop training academy • Continue and institutionalize teamwork approach • Expand current staff to adequately accomplish and monitor all work (e.g., field work)

requirements. This will necessitate a thorough search of McClellan records of UST site sampling and analysis, and will also likely necessitate resampling of previously closed UST sites. Needs for additional remediation will be determined after records review and soil analyses have been completed. In view of this dynamic situation, McClellan is adopting the following nine-point UST strategy:

- Develop soil cleanup standards for UST site remediation
- Record search/review of UST site sampling and analysis results
- Resurvey and analyze sites with inadequate soil contamination data
- Develop a screening-level technique and protocol to quickly identify previous (or present) tanks sites for further study
- Integrate with OU plans if UST site is within an identified IRP site
- Program for cleanup
- Implement cleanup
- Obtain regulatory certification for site closure
- Delist from IRP

In the area of remediation technology, McClellan is planning to undertake a bioventing project for eight sites in FY96.

McAFB has already identified 23 IRP sites that will be delisted as CERCLA sites and transferred to the UST program for remediation. McAFB is pursuing an aggressive program to identify additional sites for treatment as USTs, and this effort is being coordinated with regulators. Any CERCLA site that is within 200' down gradient of a current or past UST will be considered as a candidate for remediation under the UST program if sampling results indicate that the only contaminants of concern are POLs. McAFB is also exploring the possibility of transferring other types of CERCLA sites to the UST program, as long as the only contaminants of concern are POLs. These other site types include maintenance facilities that handle on POLs, such as fuel cell repair docks and maintenance aprons, and other flow-through process structures, such as sumps and oil-water separators.

4.2.2 Solid and Hazardous Wastes, Asbestos, Radon, PCBs, National Pollutant Discharge Elimination System (NPDES) Permit, or Other

The Pollution Prevention/Compliance Program at McAFB addresses source reduction, recycling, treatment and disposal alternatives, and risk reductions in all McClellan activities. A particular emphasis is the application of pollution prevention resources to restoration projects conducted under the McClellan IRP. For example, credits earned through reduction or elimination of source emissions can be applied to offset emissions associated with remediation projects. Recycling and innovative treatment and disposal technologies developed under the Pollution Prevention Program may also be applied to restoration projects. McClellan is continually assessing all of the installation's waste generating activities to seek opportunities for pollution prevention and enhanced compliance capability. Pollution prevention and compliance activities are programmed as follows:

- Phaseout of the industrial waste line, FY92 and 93
  - Plating shop rinse water treatment, FY92
  - Complete 10 microseparators, FY92
  - PWB rinse water recycle (Building 640), FY92
  - PWB de-use particle separation system (Building 375), FY92
  - Heavy metal separator (Building 243G), FY92

- Cad removal ultrasonic tank (Building 242), FY92
- Heavy metal separator (Building 244), FY93

- Pollution prevention innovative technologies, FY92 and 93
  - CFC/Ozone Study (VOC reduction), FY92
  - Selective Ion Exchange Study (VOC reduction), FY92
  - Powder Coating Evaluation Study (VOC reduction), FY92
  - Low Vapor Pressure Study (VOC reduction), FY92
  - Water-based Chemical Mill Evaluation/Substitution, FY93
  - Electrowinning Development, FY93
  - Evaluation of Electrodialytic Techniques, FY93
  - New RCRA conforming storage facility, FY93
  - New comprehensive tracking, usage and reporting system operational during FY93
  - PCB storage facility and transformer retrograde (two units), FY93

4.3 Modifications Since Last Update

Because this MAP document is the first in the series, there are no interim modifications to report.

Chapter 5

Environmental Restoration/Compliance Program Master Schedule

This chapter presents the McClellan AFB Master Schedule of anticipated activities in the environmental restoration and compliance programs. These schedules are simplified from detailed network and operational schedules developed to support site OU-specific work plans and compliance agreements. Planned response activities are graphically summarized in Figure 5-1. Compliance activities are summarized in Figure 5-2.

5.1 Installation Restoration Program

5.1.1 Response Schedules

The base's ability to meet the milestones shown on the Master Schedule in Figure 5-1 depends on (1) the availability and timeliness of funding, (2) the successful completion of conceptual models of sources, contaminant migration, and receptors in OUs under investigation, and (3) the preparation of draft RI reports and baseline risk assessments in a timely manner (i.e., not impeded by discovery of additional sources). The assumptions in the schedule are as follows:

- The draft primary RI is reviewed (60 days), revised (60 days), and becomes final (30 days), before the FS and PP are submitted.
- Community relations activities and the ROD review, revision, and finalization occur within eight to eleven months (depending on the OU) of final primary FS and PP documents.

5.1.2 Requirements by Fiscal Year

Fiscal requirements for the IRP Program are provided in Table D-1 (in Appendix D) which lists basewide and general requirements first followed by entries for the various OUs.

5.2 Compliance

5.2.1 Compliance Schedules

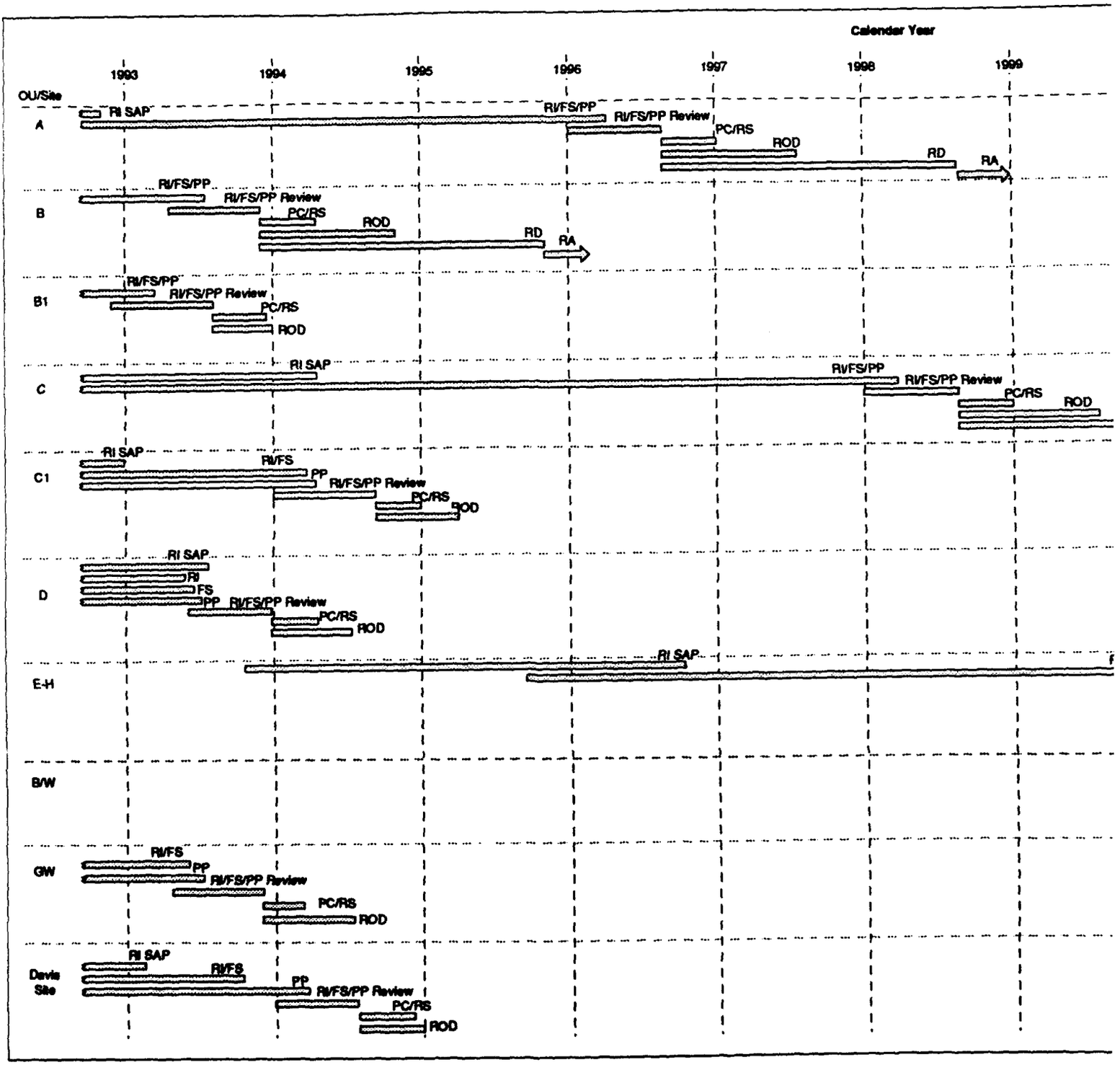
The compliance schedule for McClellan AFB is shown in Figure 5-2. It is based upon detailed schedules from the UST, RCRA corrective action, asbestos management, and PCB removal programs.

5.2.2 Requirements by Fiscal Year

Fiscal requirements for the Pollution Prevention/Compliance Program are provided in Table D-2 (in Appendix D) which lists the UST program entries followed by those for the Solid Waste, Asbestos, PCB, etc., programs.

5.3 Project Team Meeting Schedule

The Project Team has an established, regular meeting schedule—a two or three-day block of time around the second to last Wednesday of each month—for intensive discussions. Some of the topics include field activities/sampling results, consensus statements, record-of-decision workshops, up-front planning, and the resolution of technical issues such as the basewide SVE removal action.


Calendar Year
1993
1994
1995
1996
1997
1998
1999
OU/Site
A
RI SAP
RI/FS/PP
RI/FS/PP Review
PC/RS
ROD
RD
RA
B
RI/FS/PP
RI/FS/PP Review
PC/RS
ROD
RD
RA
B1
RI/FS/PP
RI/FS/PP Review
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ROD
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RI SAP
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PP
RI/FS/PP Review
PC/RS
ROD
E-H
RI SAP
B/W
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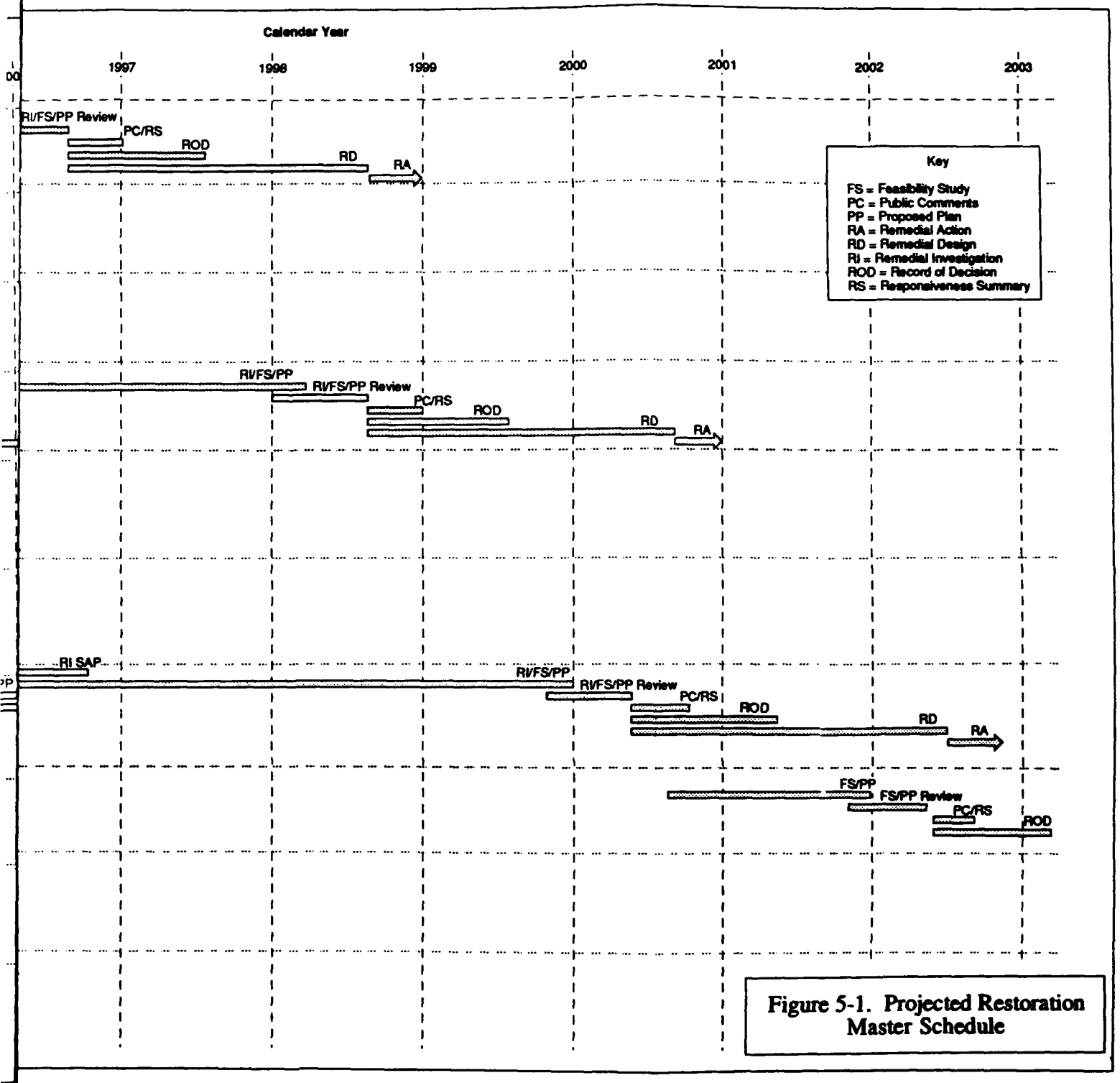

Figure 5-1. Projected Restoration Master Schedule

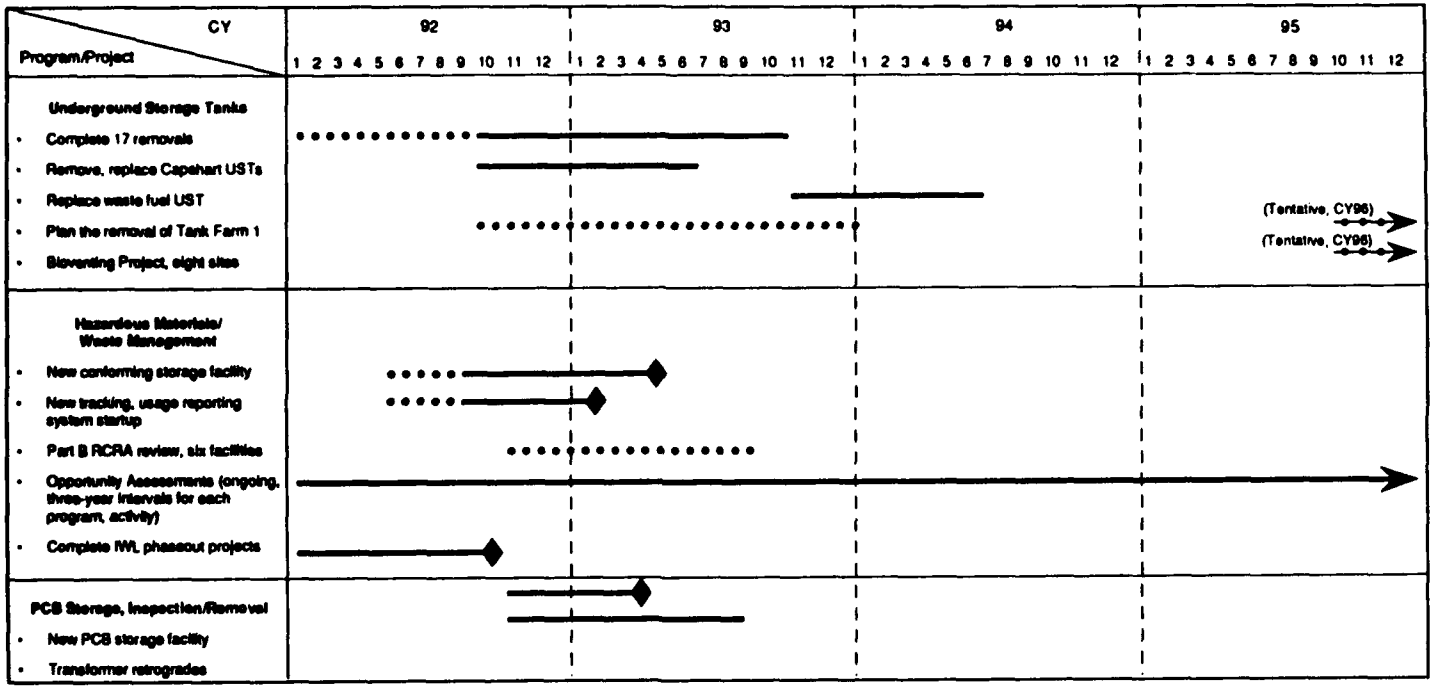

Figure 5-2. McClellan AFB Pollution Prevention/Compliance Program Summary Schedule

5.4 Modifications Since Last Update

Because this MAP document is the first in the series, there are no interim modifications to report.

Chapter 6

Technical and Other Issues to be Resolved

6.1 Data Usability

Project Team Action Items

- Ensure the usability of currently collected data by continuing to implement and reformulate Data Quality Management (DQM) procedures in response to the changing regulatory requirements.

  Responsible party: EMR
  Start date: In progress

- Continue to evaluate historical data sets at McAFB for their ability to satisfy Data Quality Objectives (DQOs) or to guide and optimize field activities, as an integral step during development of Sampling and Analysis Plans (SAPs) and Field Sampling Plans (FSPs).

- Responsible party: EMR
  Start date: In progress

- Ensure that all historical data that is assessed as part of ongoing activities is placed in the Installation Restoration Program Information Management System (IRPIMS) and the McAFB Technical Information System (TIS).

  Responsible party: EMR/AFCEE
  Start date: In progress

- Develop a strategy to ensure the maximum usefulness of historical and current environmental compliance data collected outside of the IRP.

  Responsible party: EMR
  Completion date: July 1993

Rationale

Historical analytical data is crucial to the completion of source identifications, site characterizations and risk assessment. The data may be used to fully or partially satisfy DQOs or help to guide current and future field sample collection programs. To ensure that both historical and current data are useful, SAPs and FSPs must be consistent with the McClellan *Handbook to Support the Installation Restoration Program (IRP) Statements of Work* and site specific DQOs, and all data Quality Assurance/Quality Control (QA/QC) procedures must be rigorously followed and well documented. Further, to ensure that both historical and current data are put to optimal use, they must be readily accessible and easily transferred to the McClellan TIS.

Status

McAFB has pursued a DQM plan that utilized hierarchical policy and procedure documents for specifying data collection and documentation procedures. Implementation of the procedures

outlined in the documents ensure the quality of data collected under the IRP and requires that procedures for sample collection and analysis are well documented. The policy documents include:

- **1989,** First Comprehensive Quality Assurance Program Plan (QAPP) written for OU B.
- **1991,** First SAP completed for OU B.
- **1992,** First comprehensive, basewide QAPP.

McAFB has pursued a deliberate plan to make data collected under the IRP accessible to IRP staff:

- **1988,** *Installation Restoration Program Stage 3 McClellan Air Force Base Index to Data References* completed for all data generated by the IRP. The index contains information regarding the type of data that was collected, where it can be found in the Administrative Record, and a preliminary quality ranking.
- **1989,** Preliminary assessment files developed for each identified site with quality assessed data included in each file.
- **1990,** Feasibility study for McClellan TIS completed.
- **1992,** Over 204,000 records sent to AFCEE as part of the historical data loading effort.

  1992, McClellan TIS installed and operable.
- **1992,** Over 400,000 records received directly from a prime contractor and installed on the McClellan TIS.

Strategy

The DQM program ensures the maximum future usability of currently collected data. Development of SAPs for future activities will also be guided by the DQM program, ensuring maximum usability of new data. Additionally, the McAFB strategy includes procedures to verify that the DQM plan is being fully implemented. These include:

- Implement a laboratory audits program similar to that available from the Air Force Center for Environmental Excellence (AFCEE), including laboratories not funded by AFCEE contracts. This audit program will include on-site mobile laboratories.
- Require all mobile laboratories used on-site to be certified by the California Department of Health services for every constituent analyzed.
- Audit the field sample collection procedures used by contractors operating on base to ensure compliance with the appropriate SAPs and/or FSPs.
- Audit the data quality assessments performed by the lead contractors, including preparation of data for entry into IRPIMS and the McClellan TIS.

- Audit a sample of environmental data collected post-1988, after well-documented QA/QC procedures were put in place, to document that the data assessment procedures were implemented and that the data quality is accurately documented. If significant deviations are discovered, the entire set will be assessed.

McAFB is actively pursuing a program to assess all historical data and to expedite entry into the IRPIMS and the McClellan TIS. Major elements of this effort include:

- Ensure that all new and existing environmental contracts include a requirement to perform a historical data quality assessment that is a concomitant part of SAP and FSP development. The quality assessment should organize the data in a format consistent with data entry to the IRPIMS system.

- Perform quality assessments on all available lithological information and put it into a form amenable to entry into IRPIMS and the McClellan TIS.

- Screen all compliance data collected outside of the IRP for usability. If usable, assess the data and prepare it for entry into the IRPIMS.

- Develop data loading capabilities so that historical information can be loaded by McClellan staff.

6.2 Information Management

Project Team Action Items

- Develop standard operating procedures to ensure that data from ongoing environmental investigations at McAFB are loaded onto the base's TIS in a timely fashion to support real time decision making.

  Responsible party: MITRE
  Completion date: 31 January 1993

- Establish a program for loading historical soils contamination data from hardcopy reports.

  Responsible parties: AFCEE/EMR
  Start date: In progress

  Completion of data entry: June 1993

- Improve access to the TIS by Environmental Management Directorate staff, regulatory personnel, and contractors.

  Responsible party: EMR
  Completion date: Dependent upon coordination with Communications Squadron (CS)

- Integrate use of the TIS into the day-to-day decision making process at McAFB. Focus on providing training regarding use of the spatial analysis tools to Environmental Management Directorate Staff and regulatory personnel, and establishing standard procedures for analyzing data as they are obtained from contractors.

  Responsible parties: EMR/MITRE
  Round 1 training conducted November 1992
  Completion of standard operating procedures: February 1993

- Automate primary Project Management/Program Control (PM/PC) functions using the AFCEE PM/PC system as a starting point.

  Responsible party: MITRE
  Completion date: TBD

Rationale

A prototype TIS became operational at McAFB in August 1992. The prototype has made environmental sampling and analysis data more accessible to the project team, and has given the project team the capability to apply sophisticated spatial analysis and display techniques to the data. The three keys to making most effective use of the TIS are (1) assuring that data from ongoing efforts are available for analysis in a timely fashion, (2) training base and regulatory personnel on use of spatial analysis tools, and (3) establishing standard procedures for analyzing data from ongoing activities.

At the same time, the base is pursuing development of a PM/PC system to ensure that the many parallel activities ongoing at the base can be effectively managed, and that deadlines imposed by the Interagency Agreement are consistently met.

Status

McAFB followed a deliberate systems engineering approach in developing its TIS. Key milestones include the following:

- **December 1990.** Completion of a feasibility study/preliminary assessment of the base's information management needs. The preliminary assessment identified the staffing required to support a TIS, proposed a preliminary architecture for the system, and estimated the costs for hardware and software acquisition and operation and maintenance of the system.
- **September 1991.** Completion of a functional requirements and preliminary design specification for the TIS. Relationships between the TIS and other information systems, including IRPIMS, the Base Comprehensive Planning System (BCP), and WIMS/ES were examined. System requirements identified in the specification were validated by both base personnel and the regulatory community. The specification and an accompanying test dataset of environmental sampling and analysis data were provided to vendors of commercial-off-the-shelf hardware and software.
- **January 1992.** Selection of commercial off-the-shelf (COTS) hardware and software for the prototype. Based on vendor demonstrations and follow-up investigations, the following software and hardware components were selected for inclusion in the TIS:
  - Oracle—Relational database management system, compatible with IRPIMS.
  - Genamap—Geographic Information System (GIS).
  - Interactive Concepts Surface III—Surface modeling/contouring.
  - Lynx Geoscience Modeling System (GMS)—three dimensional modeling of geology, geostatistics, and volumetric analysis.
  - Wavefront Technologies Data Visualizer—three dimensional visualization, interactive data exploration, and preparation of presentation materials.

- The Statistical Analysis System (SAS)—statistical analysis.
- Lotus 1-2-3—ad hoc report, analysis, and graphics.
- Hewlett Packard 9000/720-series workstation—supports the required software has three dimensional rendering capabilities, and capacity to support increased use versus time.

- **August 1992.** Installation of prototype at McAFB. A subset of the EMR staff was trained in the use of the Lynx GMS package using data from the Building 666 investigation.

Currently, groundwater sampling and analysis data from 1979 to 1991 have been loaded into IRPIMS, and copied onto the McClellan TIS. Contractual mechanisms are in place to capture groundwater and soil sampling and analysis data from ongoing studies. Data loading is incomplete in two areas:

- **Historical Soils Data Collected as Part of the IRP.** Some historical soils data collected by McLaren Engineering, circa 1986, have not been loaded into IRPIMS. These data will be loaded via a combination of AFCEE contractors in San Antonio, Texas, and student interns utilizing the Historical Data Loading Tool (HDLT) on the McClellan TIS.
- **Historical Soils Data Collected by the Environmental Compliance Division.** Some 25 shelf feet of shallow soils data have been collected by the Compliance Division since 1985. These data have not been subject to the rigorous QA/QC procedures of the IRP, but may be useful for screening purposes. A decision to load these data onto the TIS will be made after the usefulness of the data has been determined and the base has had sufficient hands on experience with the HDLT.

Strategy

- **Establish standard operating procedures for collecting data in a timely fashion.** Extensive soil sampling programs are ongoing at the base. The base needs rapid access to the data from those programs in near-real time in order to make decisions such as placement of additional sampling locations during the current round of sampling and analysis and development of sound sampling and analysis plans for the next stage of each investigation. Contractors can provide full IRPIMS batch file submissions in three months, whereas they can provide electronic files with local parameters and chemical concentrations within two weeks. The delay is caused by time needed for data entry, collating of data from the field and laboratory, and data QA/QC procedures. It is McClellan's intention to collect electronic files in near-real time; to segregate those data from the fully-qualified IRPIMS data; to use those data to make operational decisions regarding placement of additional sampling locations; and to delete those data and replace them with the fully-qualified IRPIMS data as soon as they are available. The fully qualified data will be used for purposes of risk assessment and in justifying remediation decisions. The base is in the process of working out standard operating procedures with its contractors to administer the fast track data. For instance, contractors reserve the right to change and/or delete data values based on their assessment of the quality of data. In order to ensure that the base does not have to update and/or delete individual records, IRP contractors have agreed to periodically resubmit the entire file for fast-track data, simplifying the base's data administration task.
- **Establish a program for loading historical soils data.** The base intends to install the IRPIMS HDLT on its TIS and use student interns trained in the earth and environmental sciences to enter its backlog of historical soils data.

- **Improve access to the TIS.** The TIS is currently accessible only from the system console. The base intends to improve access to the TIS by:
  - Installing Ethernet cabling in its new office area
  - Acquiring X-terminal emulation software for the new IBM-compatible 486 personal computers
  - Installing Ethernet cards in the new computers

Acquisition of the hardware and software is proceeding through the base's Communications Squadron (CS). When the acquisition is complete, each staff member will be able to access the TIS from his/her desktop. Regulatory personnel will be able to access the full graphics capability of the TIS at the base, or will be able to download data to floppy disk for analysis off site.

- **Integrate use of the TIS into the day-to-day decision-making process.** Integration of the TIS into the day-to-day operations of the Environmental Management Directorate entails two related activities:
  - **Training.** The base intends to conduct training on three levels:
    - Personnel with system management, data administration, and database administration tasks will attend courses offered by vendors of the COTS hardware and software that makes up the TIS.
    - The base will conduct in-house training sessions on use of the TIS, using data recently collected in the field.
    - The base will schedule a course on applied geostatistics and simulation taught by an expert in the field, to ensure that base personnel make optimal use of the three dimensional geostatistical and volume modeling capabilities of the TIS.
  - **Establishment of standard procedures for analyzing data.** The base will formalize its method of exchanging fast track data with its contractors, as it gains experience with the process. Training materials developed for the system describe a procedure for analyzing data that includes visual inspection of data, use of univariate and bivariate statistics to describe the data, development of geological models, two dimensional and three dimensional estimation using geostatistical techniques, and use of visualization tools. This procedure will be formalized into a standard operating procedure as additional base personnel are trained on the TIS and in geostatistical techniques, and as base personnel gain hands-on experience in analyzing data from the source area (soils) characterization projects. Regulatory personnel will be included in the training and data analysis programs, and will have input in development of the standard operating procedures.

6.3 Data Gaps

Project Team Action Items

- Implement a continual, phased approach to identifying and filling data gaps so that sampling programs can be focused and optimized.

  Responsible party: EMR
  Start date: Early 1993

- Ensure that all applicable historical data is fully evaluated in the data gap identification process.

  Responsible party: EMR
  Start date: In progress

Rationale

At an IRP site as complex as McAFB, data gap identification is not a one-time activity but a process that evolves as understanding of the individual release sites evolve. The prototype sampling plan at McAFB utilizes a phased sampling approach for remedial investigations that identifies data gaps site by site at the end of each phase. In phase I sampling, potential release locations with no site investigation information are sampled to determine which sites are candidates for no further action and which sites need further characterization. Sites identified in phase I as having significant contamination are further investigated in phase II, to delineate the extent of the problem area. At the conclusion of each of the first two phases, the acquired information is presented at an RPM meeting which includes regulators, where determinations concerning the next phase are made. In phase III, after a health based prioritization, identified sites are further sampled as part of remedial design. During all phases of the data gap identification process, historical data must be fully evaluated to ensure no duplication of previous effort and to ensure that all possible available information is used to guide and optimize the new field work.

Status

Recognizing the data gap evaluation is not a one-time activity, McAFB has established a cooperative atmosphere of trust and communication with the regulatory community and the local residents that allows a phased approach to site evaluation and optimization of the limited resources available for the IRP. Some of the key historical elements in this process are:

- **1990**, The amended IAG between McAFB, the US EPA, and the State of California was signed by all parties. It specifies the procedures and time frames for data and document review and also specifies a dispute resolution procedure.

- **1991**, EPIC was established by McAFB to accelerate cleanup of polluted sites and to promote effective environmental protection through innovative management, education, communication, and action. One of EPIC's functions is to provide a forum for enhanced communication between the top managers of the IAG parties and provide a mechanism for timely identification of potential conflicts as well as opportunities for expedited actions. This aids in the rapid identification of data gaps and facilitates the phased/data gap identification process.

- **1992**, Draft SAP for OU A completed and under review. This SAP is the first (prototype) that establishes the phased approach to remedial investigation for the entire base.

McAFB has made a determined effort to establish procedures so that historical data is considered when identifying data gaps. Efforts have been made to make historical data readily available to potential users and to establish procedures which integrate historical data review into data gap determination. The success of the historical data review procedure shown in Figure 6-1 is dependent on data accessibility. Some of the key efforts to date are:

- **1988**, *Installation Restoration Program Stage 3 McClellan Air Force Base Index to Data References* completed for all data generated by the IRP. The index contains information regarding the type of data that was collected, where it can be found in the Administrative Record, and a preliminary quality ranking.

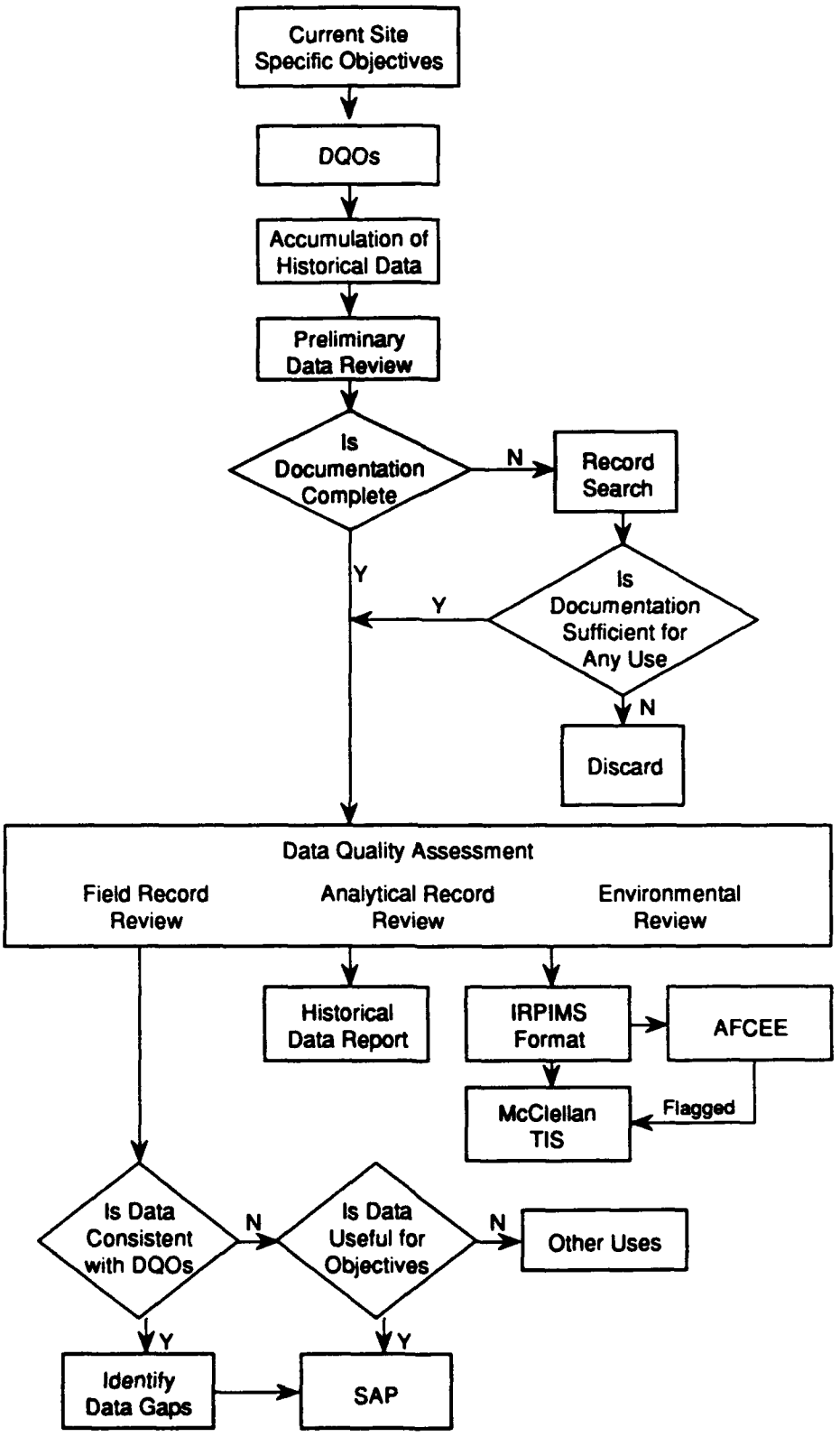

Figure 6-1. Process for Reviewing Historical Data

- **1992**, The McClellan *Handbook to Support the Installation Restoration Program (IRP) Statements of Work* was completed. This specifies a procedure for evaluating all potentially useful historical data during the data gap identification process which begins with articulated DQOs. The attached figure graphically displays the major steps and decisions that are integral to the process.
- **1992**, McClellan TIS installed and operable.

Strategy

To ensure the continuation of the plan embarked upon by McClellan for phased data gap evaluation and remedial investigation of the sites, the following action items will be implemented:

- Utilize the EPIC forum to resolve any conflicts and explore the possibility of accelerating schedules for SAP development.
- Use experience gained in development of the OU A SAP to improve the process for development of the remaining SAPs.

To ensure the maximum use of historical data during SAP and FSP development, McAFB is continuing to increase the accessibility of historical data for IRP staff. Some of the major activities are:

- Assess all available historical IRP data and prepare it for input to IRPIMS and the McClellan TIS.
- Acquire and install the IRPIMS historical data loading tool. This will allow the in-house loading of assessed data directly into the McClellan TIS or into IRPIMS format for delivery to AFCEE.

6.4 Background Levels

Project Team Action Items

- Establish background concentration ranges for naturally occurring elements and substances introduced into the environment as a result of ubiquitous land use (anthropogenic substances in surface soils and groundwater).
  - Finalize draft subsurface soil background consensus statement that defines the approach for determining basewide subsurface soil background concentrations and establishes procedures for decision making.

    Responsible party: Radian
    Completion date: TBD

  - Resolve issues with Regional Water Quality Control Board concerning soluble (California Waste Extraction Test method) inorganic analyte background concentration.

    Responsible party: EMR
    Completion date: TBD

  - Scope surface soil and sediment background study needs and prepare consensus statement.

    Responsible party: MITRE
    Completion date: TBD

- Establish groundwater background study needs and prepare consensus statement.

  Responsible party: CH2M Hill
  Completion date: TBD

- Define priorities for background studies in other media where necessary.

  Responsible parties: Radian/CH2M Hill/Jacobs Engineering
  Completion date: TBD

Rationale

Background concentrations are used to evaluate the presence of site-related contamination, and to calculate risk related to background concentration. In both applications, management decisions are needed regarding the levels of precision and the sufficiency of data for both the number and the geographic distribution of samples. Background concentrations need to be established for all media of concern at the base. At McClellan, data will be required for surface and subsurface soils, groundwater, air, and potentially for surface water and stream sediments if contamination is identified in the drainages on the base. Analytes to be determined vary from medium to medium and should be determined primarily based on contaminants detected or suspected in the medium.

Although the background concentration of an analyte, in general, is defined to be representative of the normal range of naturally occurring concentrations of an element or compound, land use activities unrelated to contaminated sites affect the background concentrations of some substances (anthropogenic compounds). Therefore, each medium must be considered individually when identifying the analytes that should be determined in the background study. For example, pesticides (some containing arsenic), herbicides, and fuel derived lead are common anthropogenic substances that can be present at elevated concentrations in groundwater and particularly in surface soils. The recognition of their presence in background samples can have significant impact on risk assessment and site characterization decisions.

Status of Background Determinations

At McAFB, a subsurface soil background study for inorganic and some radiogenic parameters has been completed. From ten soil borings drilled at locations considered to be uncontaminated, 120 samples were analyzed. The data were combined to generate background concentrations for one comprehensive soil category including all recognized soil types and two readily recognized soil sub-groups. For 17 substances and six radiogenic parameters the mean concentration was calculated to represent the background concentration and the mean plus two standard deviations was designated the "**threshold**" analyte concentration above which the analyte could be considered as potentially introduced as a result of base activities. For seven substances, with insufficient data above the reporting limit, the "threshold" concentration was arbitrarily established to be the reporting limit. No organic compound analyses were performed on these soils because it is assumed that the reported presence of such compounds in the subsurface is related to base activities.

Consensus Statement

In October 1992, the Air Force provided a draft consensus statement to regulators outlining the proposed approach for establishing subsurface soil background concentrations for a limited suite of elements and radiogenic parameters. The statement is intended to establish procedures for decision making and also includes a description of proposed objectives, data use, characterization needs and

approaches, and data quality and quantity. The document also outlines an approach to decision-making as follows:

- Compares site data to threshold concentration; if greater than threshold.
- Compares site data to soil type specific concentration; if typical concentration range is exceeded, evaluate for patterns (multiple occurrences/multiple elements).
- Evaluate site for logical discharge points and potential for migration to an exposure.
- Evaluate need for further sampling.
- Perform risk assessment, compare with Applicable or Relevant and Appropriate Requirements (ARARs).

Other Media

There are no background studies for surface soils, i. e., soils collected from the ground surface to various depths not exceeding six inches (ATSDR requires samples from the top three inches, US EPA from the top six inches). A shallow soil background study is necessary for the base to accomplish the required risk assessment tasks for a host of sites at which the ingestion pathway or worker exposure during construction has to be evaluated. There are also no background determinations for groundwater, air, surface water, and surface sediments. Such investigations will become necessary in the future as remedial decisions require media specific background information.

McClellan is preparing data quality objectives and a sampling and analysis plan for a shallow soil and stream sediment background investigation.

Strategy to Develop Background Data

The development of background information for each medium will be based on need. The characterization of background must, however, occur sufficiently early in the IRP so as not to delay decision making progress when considering remedial alternatives. Therefore, any assessment of need should be based on frequent evaluations of each potentially affected medium and the pathway by which the contamination could impact human health and the environment. At McClellan, surface and subsurface soils and potentially groundwater are affected by contaminants that also naturally occur in these media or are anthropogenic substances introduced through common land use. The need for background determinations for air, surface water, and stream sediments has not been determined Therefore, a comprehensive review of anticipated long range needs, available data, and anticipated information gathering is proposed to integrate the requisite background characterization into the ongoing IRP.

Although each medium presents unique requirements, the general approach used for the subsurface soil background study applies to all media and will be applied to upcoming surface soil and groundwater studies. The approach is outlined below:

- Identify the need for media-specific background characterization.
- Develop the data quality objectives and a sampling and analysis plan in cooperation with regulators.
- Incorporate sampling activities into ongoing IRP.
- Develop appropriate statistical characterization protocol to establish defensible and meaningful background concentration data.

- Develop an approach for "below detection limit" data in the determination of background concentrations and establish criteria to determine when adequate basewide background sampling has been achieved.
- Formalize the approach in a consensus statement agreed to by participating agencies.
- Apply background data to evaluate the presence of site-related contamination and to calculate risk.

6.5 Risk Assessment

Project Team Action Items

- Develop a risk consensus statement to address the following overarching issues for human health risk assessment:
  - The relationship of risk assessment with groundwater nondegradation policy in supporting base remediation decisions
  - The appropriate level of risk assessment required to support various remediation decisions (e.g., no further investigation, removal action, interim ROD, final ROD)
  - A risk screening methodology and a modified methodology for the derivation of PRGs
  - Consensus on several key issues on the baseline risk assessment, including land use, exposure parameters, and potential receptors
  - The integration framework

  Responsible party: MITRE
  Completion date: February 1993
- Continue working with regulatory agencies to develop the approach for a basewide ecological risk assessment.

  Responsible party: MITRE
  Completion date: TBD
- Phased implementation of vadose zone modelling to predict potential impacts to groundwater

  Responsible parties: Radian
  Completion date: June 1993

Rationale

Risk assessment at McAFB requires special considerations beyond the general principles available in relevant national and regional guidance documents. This is due to two major factors. First, technical complexity arises from the fact that the interrelationship among the 258 sites at the base must be considered and there is a potential for exposure through the common pathways of air and groundwater. Second, administrative complexity is a factor since there are a large number of sites, as well as separate required remediations for source areas and groundwater. Phased remediations are taken for each of these media. Therefore, a risk consensus statement is necessary to address issues specific to the application at McAFB and to ensure uniform application basewide.

Risk assessment at McAFB has evolved in the past and will continue to evolve as needed to address new concerns. Various levels of risk assessment, ranging from risk screening to full-scale baseline risk assessment, are to be performed to support various program decisions. These program decisions

include directing the remedial investigation effort, setting remediation priorities, and supporting removal actions, interim remedial actions, no-further investigation decisions, and final remedial actions.

Status/Strategy

Risk assessment consensus statement: in progress. A workshop on the risk assessment consensus statement was held as part of the October Project Team meeting to elicit the participation of regulators and suppliers on this effort. An annotated outline of the consensus statement was distributed at the workshop for comments. A draft is due to the Project Team for review by the end of December 1992.

Basewide ecological risk assessment: an EPA ecological risk assessor has performed a preliminary field ecological risk screening for McAFB. The result will be presented at the December 1992 Project Team meeting. Based on the findings from this screening assessment, MITRE will work with regulatory agencies to scope a more comprehensive basewide ecological risk assessment.

Vadose zone modelling: in progress. The development of vadose zone modeling applications for OU B is continuing. A sensitivity analysis for the VAPOUR-T model is being developed, along with approaches for using this model for screening-level analysis based on mobility consideration.

6.6 Soil Gas Investigations

Project Team Action Items

- Develop downhole soil gas sampling standard operating procedures. Integrate across all OUs and with all contractors to meet the soil gas consensus statement requirements.

  Responsible party: MITRE
  Completion date: TBD

  - As part of the routine characterization work, develop basewide data needed for the quantitative estimation of soil VOC concentrations derived from soil gas concentration data.

Consensus Statement

A soil gas consensus statement was signed in November 1992. The statement establishes procedures for decision making and also includes a description of proposed objectives, data use, characterization needs and approaches, and data quality and quantity (see Appendix E for full text). The objectives of the soil gas consensus statement are twofold:

- To expedite inexpensively the identification of source areas that contain VOCs in the unsaturated (vadose) zone, and
- To estimate quantitatively the nature and extent of soil VOC contamination in the vadose zone.

The first objective applies widely practiced shallow (five or six feet below ground) soil gas sampling methods and uses mobile field analytical laboratories in a phased characterization program. The approach is to identify areas containing significant VOC concentrations and, based on a "real time" appraisal of results, determine further characterization needs.

The second objective extends the current soil gas sampling methods to subsurface investigations and uses soil gas VOC concentration data to calculate soil VOC concentrations by an equation that assumes equilibrium conditions among soil, soil moisture, and soil gas. The use of mobile field

analytical laboratories is an integral component of this program. One or more of the following quantitative estimates are goals of this program:

- Total VOC mass present in a contaminated area
- Mass present in each phase (gaseous, liquid, solid)
- Flux from vadose zone to groundwater
- Flux from vadose zone to crawlspaces of structures located above VOC contamination
- Flux to ambient air
- Risk assessment for ingestion of VOC contaminated soils
- Identify highly volatile compounds (such as vinyl chloride) not commonly detected in soil samples

The advantages of this program are that analytical results are rapidly available for review and field level decision making; there is a better chance of detecting highly volatile compounds not commonly identified in soil samples; and for remediation considerations of soil vapor extraction, VOC soil gas contamination is directly measured and mapped. The uncertainties associated with this approach are that equilibrium conditions may not be represented by the reported soil gas composition and concentrations; that the accuracy of estimating soil VOC concentrations using soil gas data has not been verified; and that calculated estimates of soil concentrations are generally significantly higher (several orders of magnitude) than directly measured soil concentrations based on routine sampling methods.

Status of Soil Gas Sampling

Both shallow and downhole soil gas sampling is used extensively and successfully at McAFB to define source areas and the nature and extent of VOC contamination in the unsaturated (vadose) zone.

Strategy for Quantitative Soil Gas Sampling

To exploit the apparent advantages of three dimensional subsurface characterization of volatile organic contamination, uncertainties about this approach need to be resolved. The principal uncertainty lies with the assumption that equilibrium conditions are approximated by the collected soil gas sample. Also, a number of variables used in the equation for the calculation of soil VOC concentrations need to be determined for site specific conditions. To reduce these uncertainties, McAFB is developing a standardized downhole soil gas sampling protocol aimed at minimizing the impact of disturbing equilibrium during sampling and acquiring the needed physical parameters. The need to identify factors that may explain the reported large differences in calculated and directly measured soil VOC concentrations will also be addressed. Reported comparisons between the two approaches have all been based on direct measurement data from small volume samples collected into 40 ml vials. Large potential losses of VOCs during storage, laboratory subsampling and weighing have been reported for this procedure and the validity of a one to five gram sample used in the laboratory has also been questioned. McAFB is developing a small test program in which closely colocated soil gas samples will be compared to larger than normal soil samples that will be preserved in methanol, a known preservative of VOCs. The method has been tested and is an EPA recommended alternative to conventional sampling procedures.

If results from this study demonstrate significant improvements between the two methods of determining the VOC concentrations than those cited in the literature, McClellan may adopt the soil gas sampling approach basewide for the subsurface characterization of VOC contamination and expand the use of soil gas data to meet some or all of the other stated goals.

6.7 Modifications Since Last Update

Because this MAP document is the first in the series, there are no interim modifications to report.

Appendix A

Detailed Site Locations

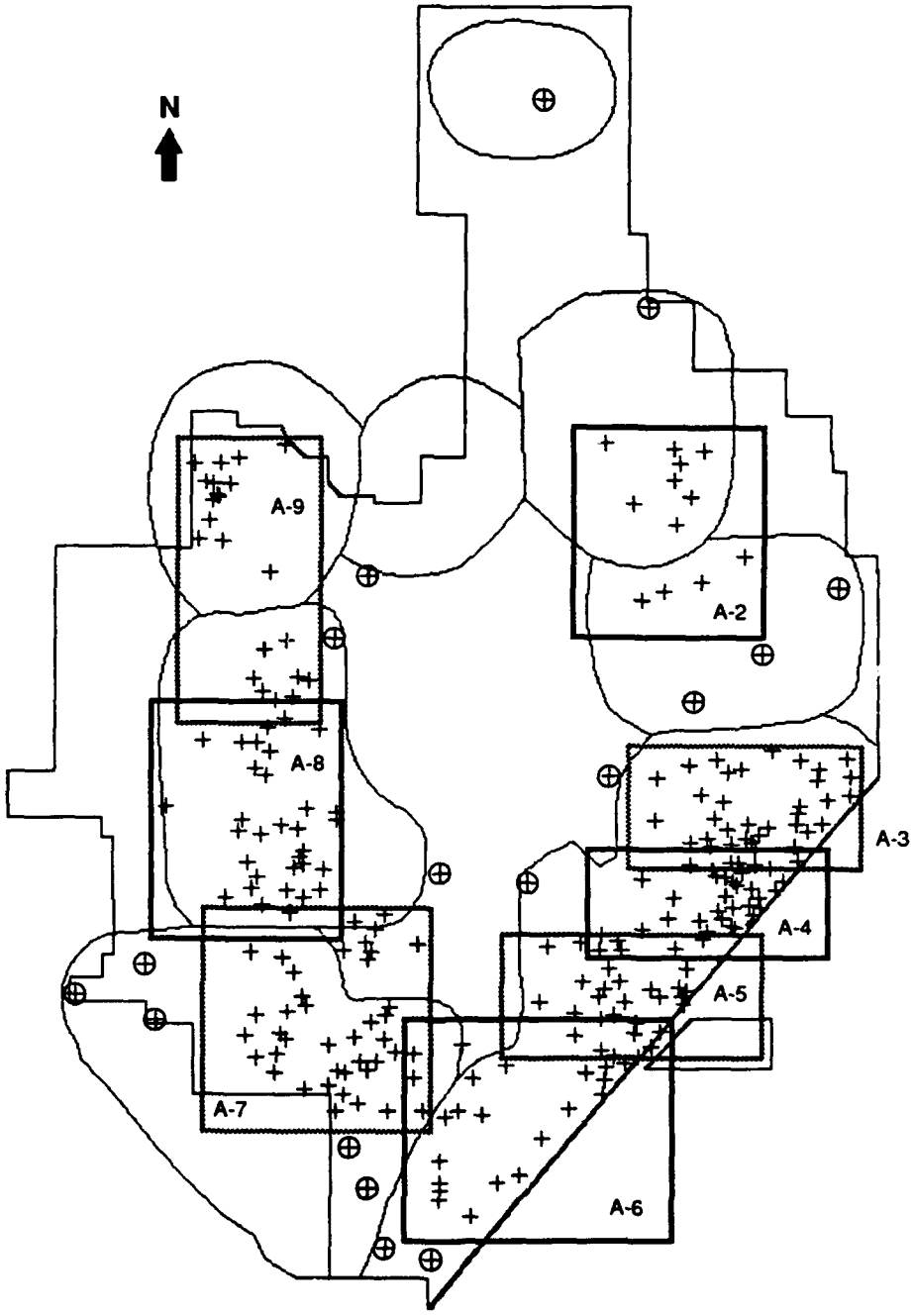

Figure A-1. Detailed Site Locations—Entire Base

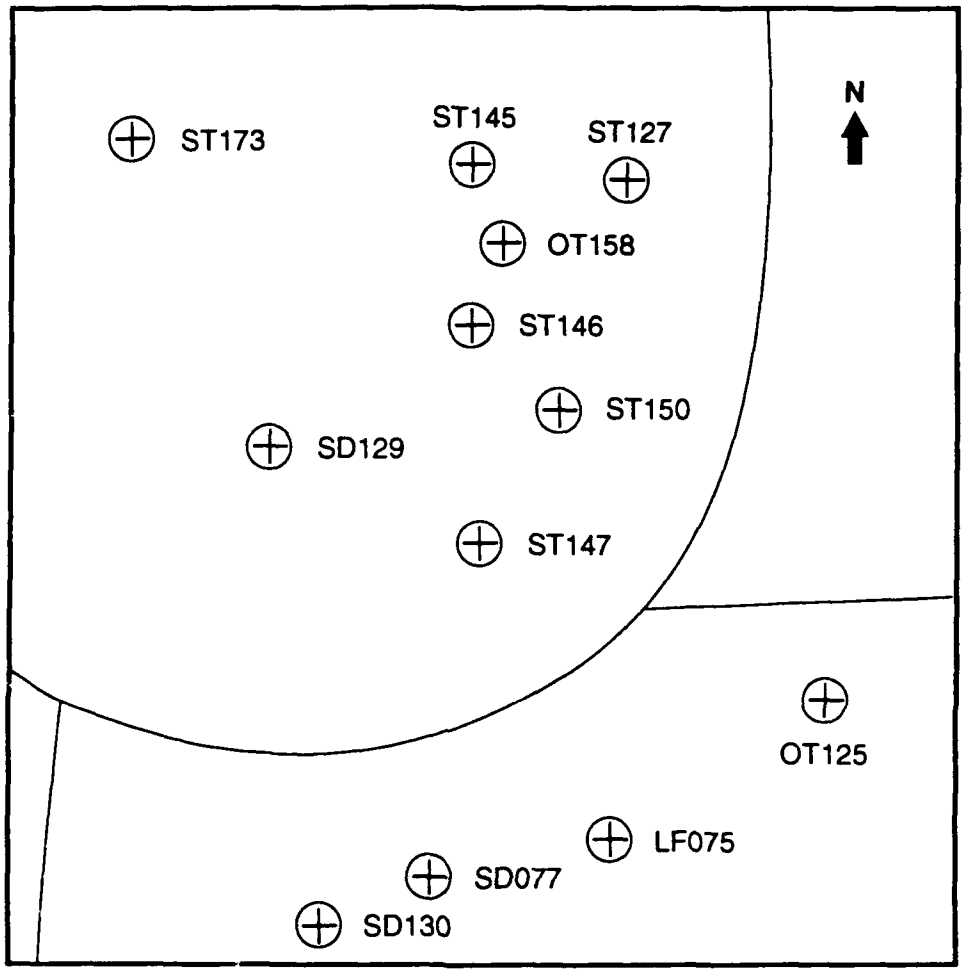

Figure A-2. Detailed Site Locations—Portion A-2

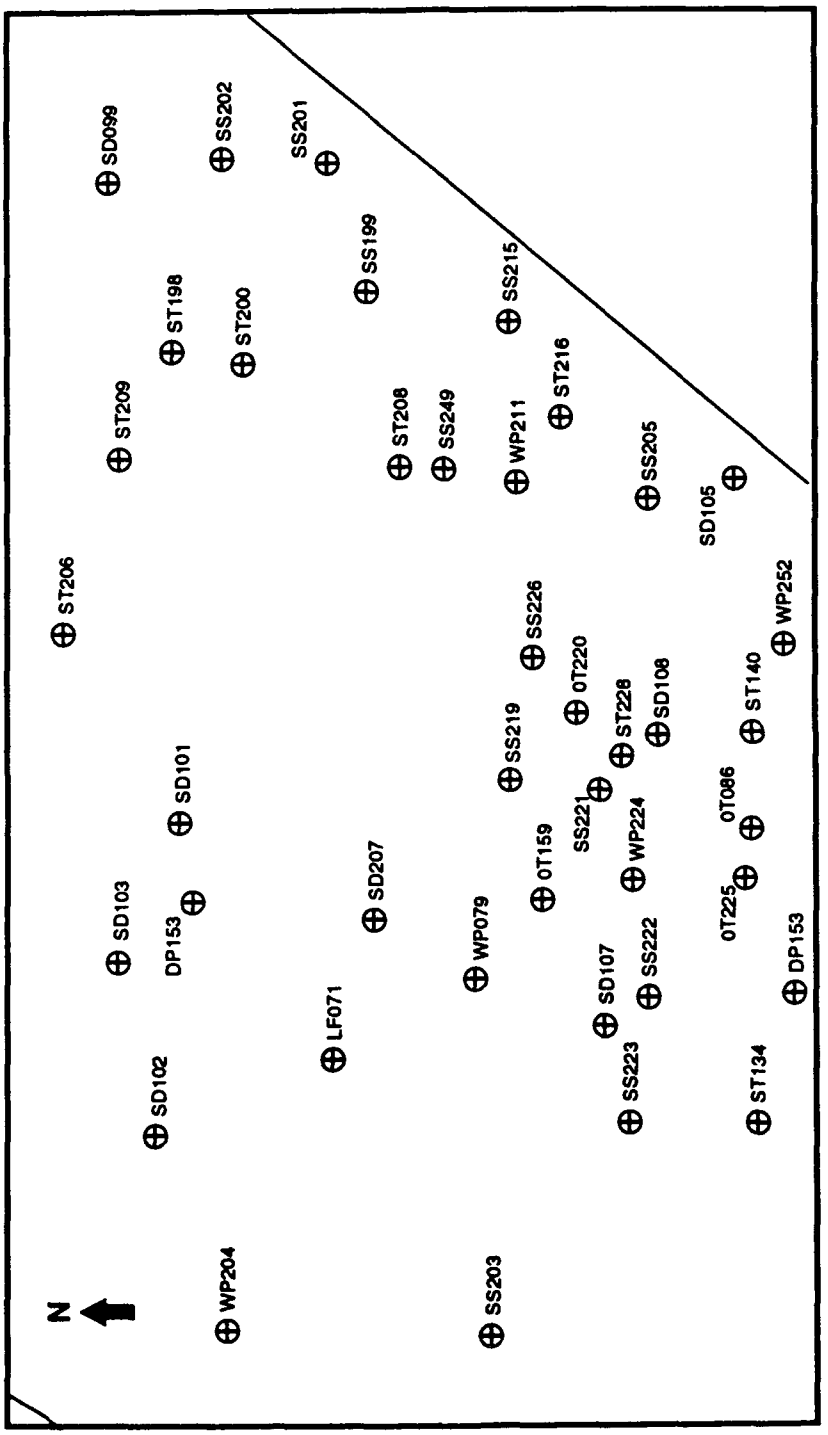

Figure A-3. Detailed Site Locations—Portion A-3

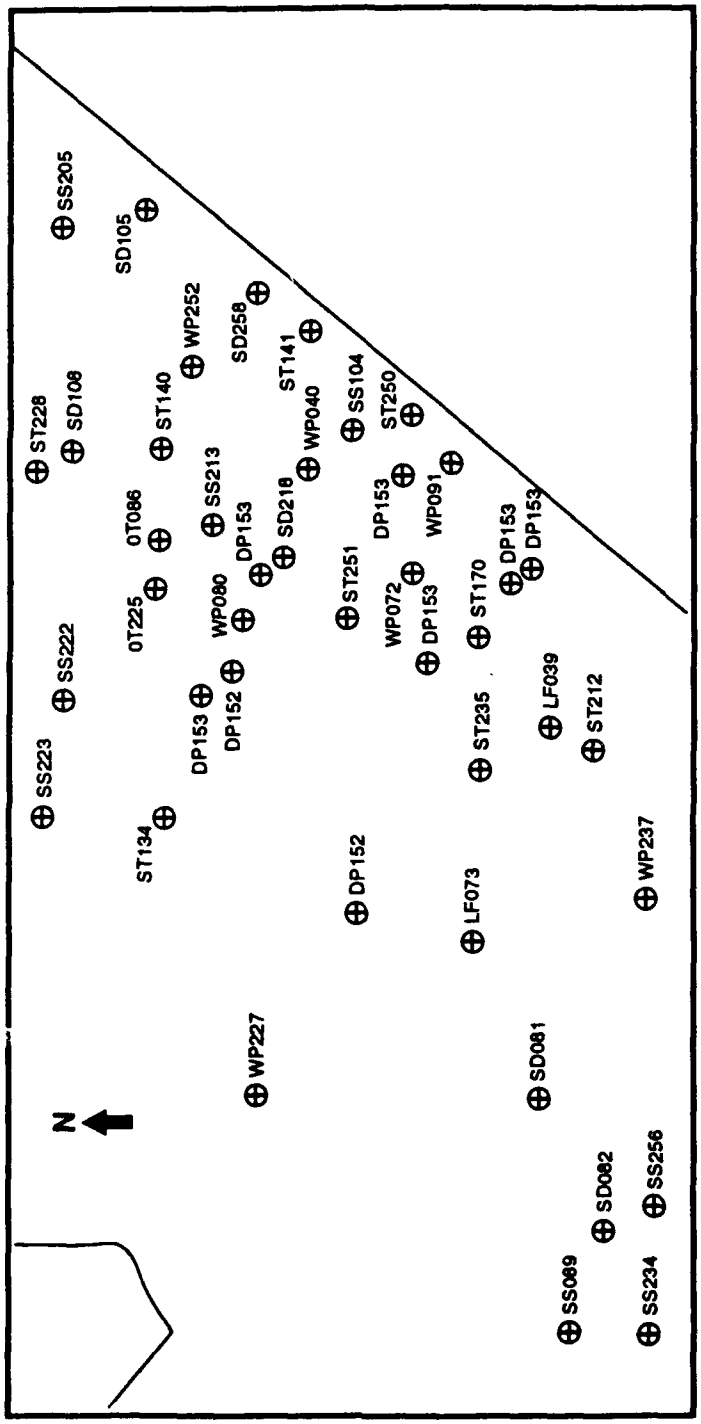

Figure A-4. Detailed Site Locations—Portion A-4

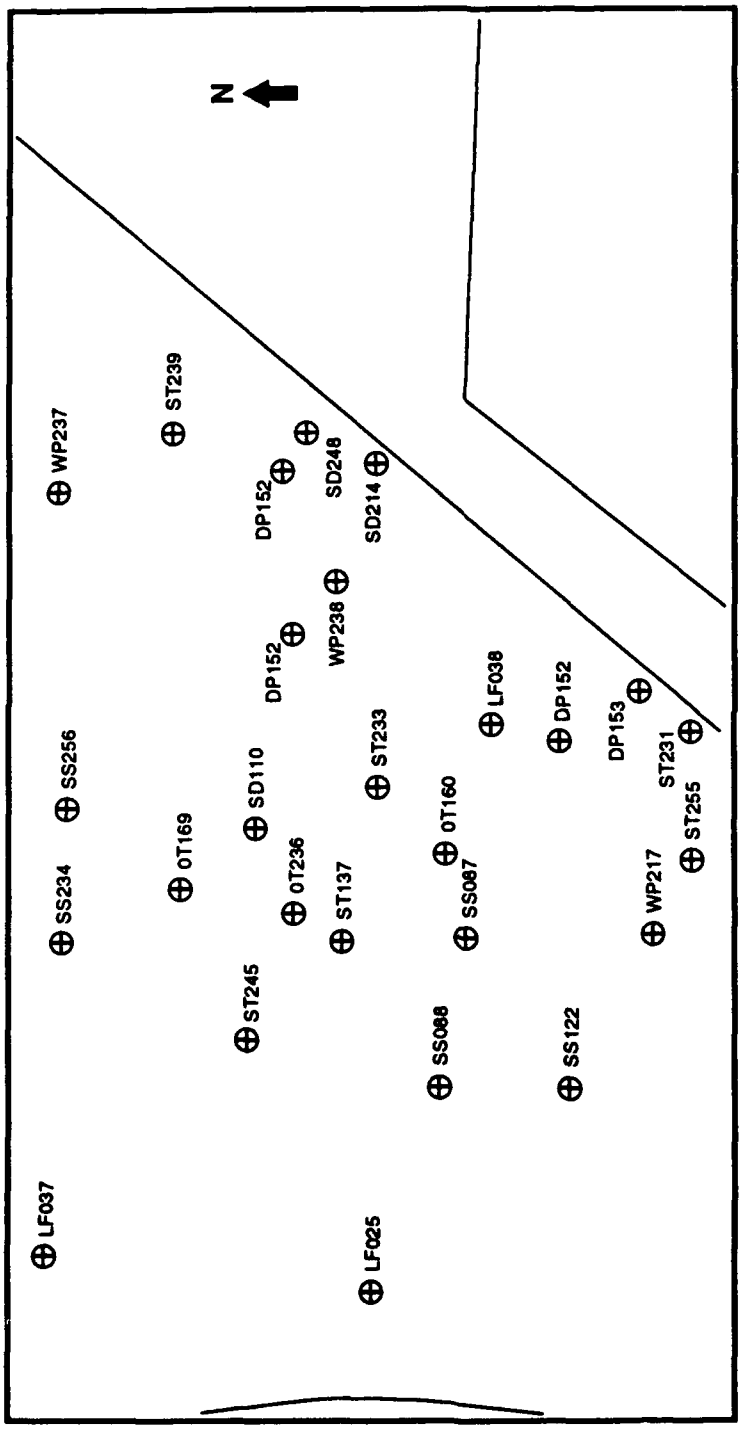

Figure A-5. Detailed Site Locations—Portion A-5

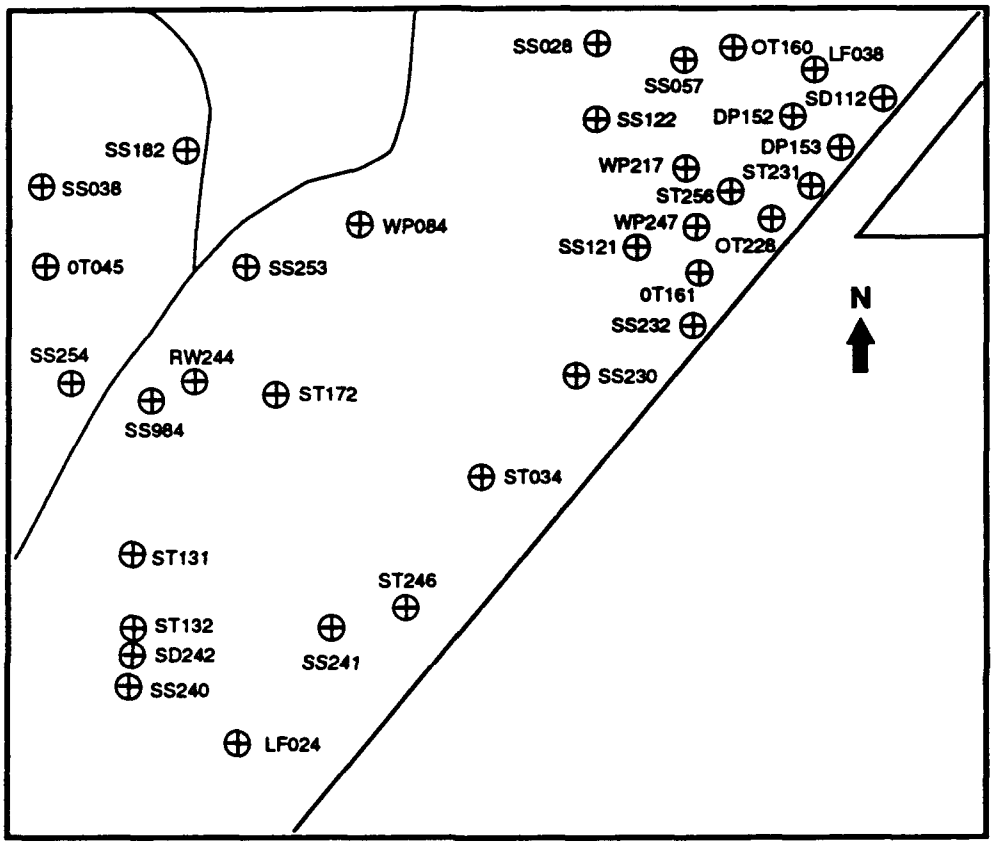

Figure A-6. Detailed Site Locations—Portion A-2

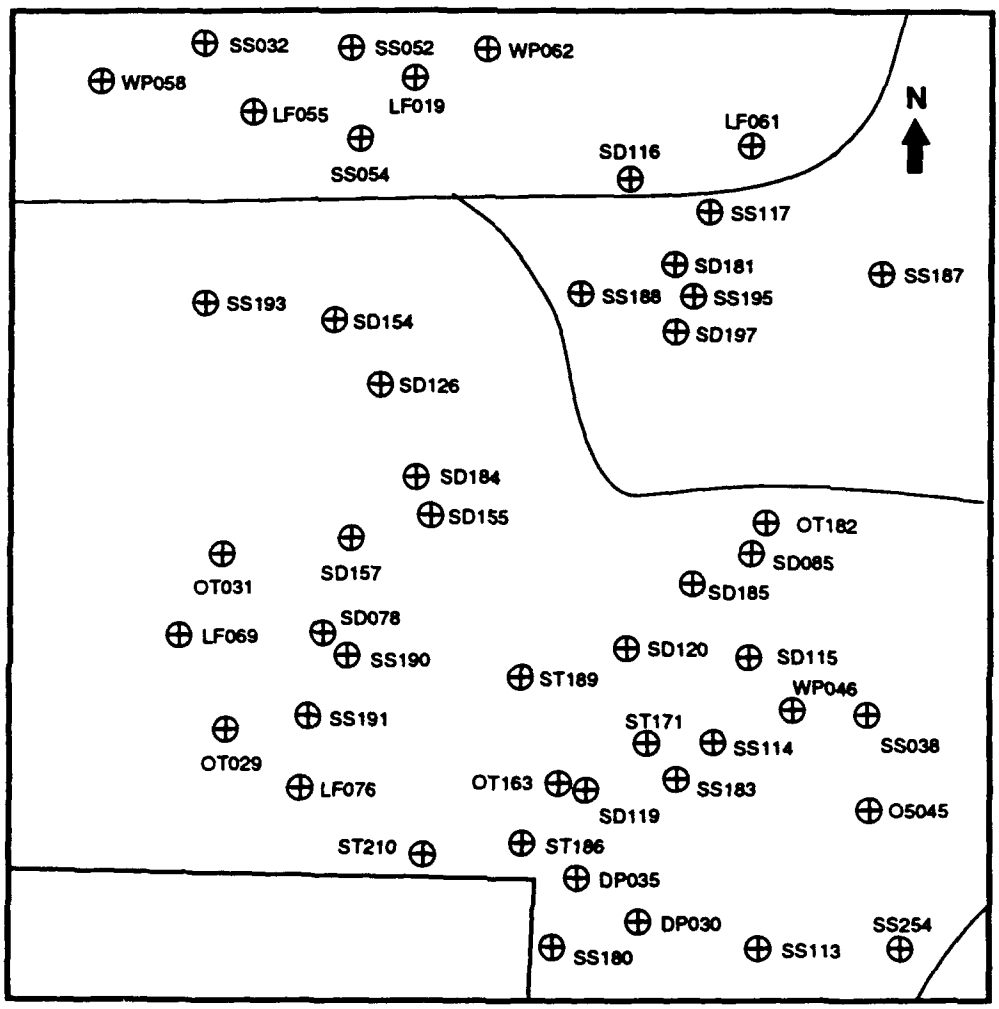

Figure A-7. Detailed Site Locations—Portion A-7

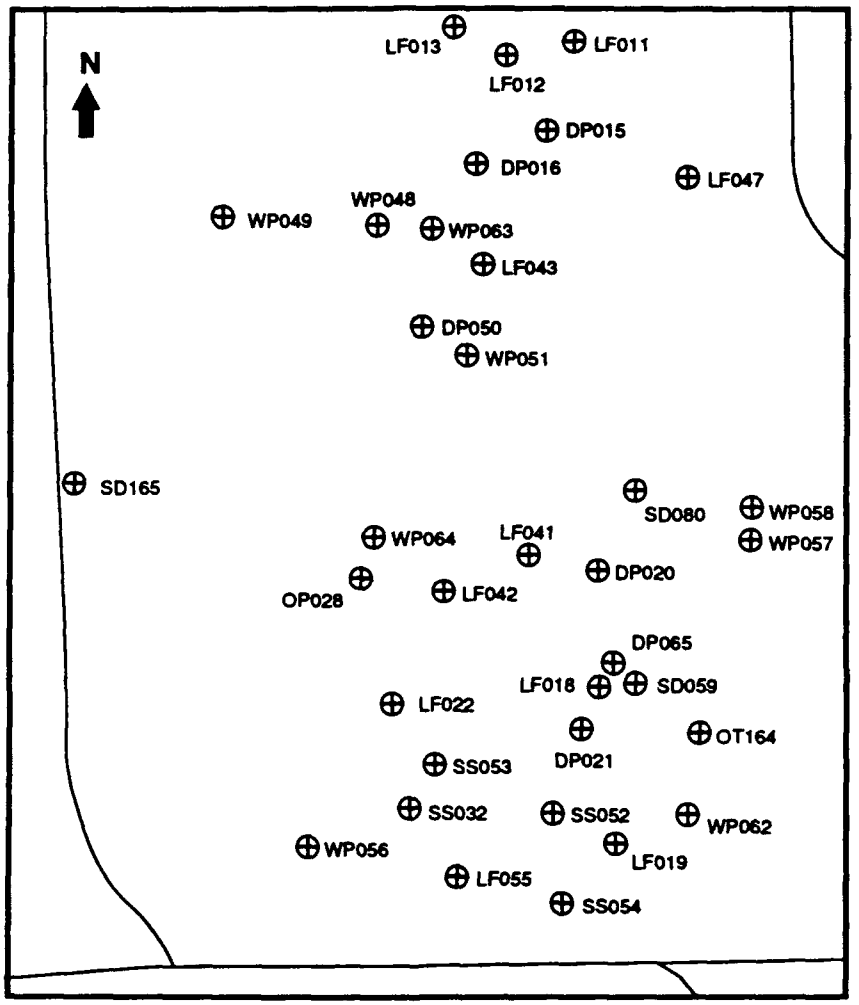

Figure A-8. Detailed Site Locations—Portion A-8

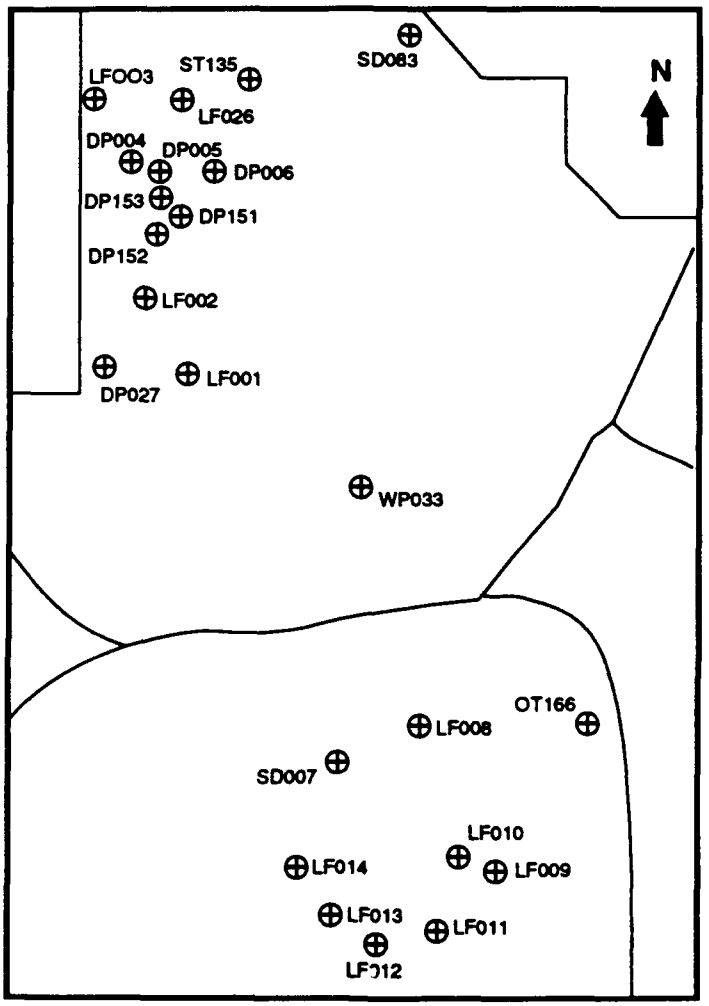

Figure A-9. Detailed Site Locations—Portion A-9

Appendix B

UST Inventory

Table B-1. McClellan AFB Underground Storage Tank Inventory*

OU[a]	LOC[b]	WIMS[c] No.	Capacity[d]	Contents	Date Installed[e]	Date Removed[e]	Status/Regulatory Mechanism[f]
A	7	--	1,000	Diesel	1939	1986	R/NR, UST
	7	--	10,000	Diesel	1992	NAP	ACT
	7	--	25,000	Diesel	1951	1992	R/NR, UST
	7	--	25,000	Diesel	1951	1992	R/NR, UST
	20	ST 198	2,500	Diesel	1942	1992	R/NR, IRP, SA-35, (61)[g]
	22	--	200	MOGAS	--	1980	R/NR,UST
	22	--	1,000	Diesel	--	1980	R/NR, UST
	26	ST 200	5,000	Diesel	1939	1991	R/NR, IRP, SA-38, (63)
	26	ST 200	10,000	Diesel	1939	1991	R/NR, IRP, SA-38, (63)
	91	ST 216	200	Diesel	1952	1988	R/NR, IRP, SA-59, (79)
	200	--	8,000	Diesel	1969	NAP	TBR (93), UST
	209	ST 206	3,000	Diesel	--	1986	R/NR, IRP, SA-46, (69)
	209	ST 206	3,000	Diesel	--	1986	R/NR, IRP, SA-46, (69)
	231	SD 102	200	MOGAS	--	1984	R/NR, UST, S-17, (26)
	251N	LF 071	150	Diesel	1939	1990	R/NR, UST, PRL-B-3 (9)
	252	SD 103	250	Nitrate/waste	1938	1990	AIP, UST, PRL-S-18, (27)
	252	SD 103	250	nitrate	1938	1990	AIP, UST, PRL-S-18, (27)
	252	SD 103	250	Solvent/waste	1938	1990	AIP, UST, PRL-S-18, (27)
	252	SD 103	500	acetone	1938	1990	AIP, UST, PRL-S-18, (27)
	252	SD 103	1,500	Naptha/waste	1938	1990	AIP, UST, PRL-S-18, (27)
	252	SD 103	1,500	Naptha	1938	1990	AIP, UST, PRL-S-18, (27)
	252	ST 209	2,000	Diesel	1965	1986	R/NR, IRP, SA-49, (72)
	252	--	10,000	Diesel	1992	NAP	ACT
	262	ST 209	25,000	Diesel	1965	1992	R/NR, IRP, SA-49, (72)
	264	ST 208	500	Diesel	1941	1991	R/NR, UST, SA-48, (71)
	329	ST 250	125	Diesel	1950	1990	R/NR, IRP/UST, SA-99, (113)
	332	ST 251	500	Diesel	1973	1992	R/NR, IRP/UST, SA-100, (114)
	338	ST 216	--	Diesel	--	1988	N/NR, IRP, SA-59, (79)
	339	SS 2-5	150	Diesel	1954	1989	R/NR, UST, SA-45, (68)
	340	WP 091	--	Diesel	--	1987	R/NR, UST, PRL-S-6, (21)

Table B-1. McClellan AFB Underground Storage Tank Inventory* (Continued)

OU[a]	LOC[b]	No. WIMS[c]	Capacity[d]	Contents	Installed[e] Date	Removed[e] Date	Status/Regulatory Mechanism[f]
A	344	SD 218	500	Solvent	1954	1989	R/NR, UST, SA-61, (81)
	347	--	2,000	Diesel	1967	1992	R/NR (Discovered during construction), UST
	351	ST 143	500	Solvent	1943	1989	R/NR, UST, CS-T-21, (50)
	351	ST 143	500	Solvent	1943	1989	R/NR, UST, CS-T-21, (50)
	351	ST 143	500	Solvent	1943	1989	R/NR, UST, CS-T-21, (50)
	367	WP 224	20,000	Diesel	1942	NAP	TBR (93), IRP/UST, SA-69, (87)
	367	WP 224	20,000	Diesel	1942	NAP	TBR (93), IRP/UST, SA-69, (87)
	367	WP 224	21,000	Diesel	1942	1991	AIP, IRP/UST, SA-69, (87)
	367	WP 224	21,000	Diesel	1942	NAP	TBR (93), IRP/UST, SA-69, (87)
	395	ST 228	200	MOGAS	1943	1989	R/NR, IRP, SA-74, R/NR, (91)
	405	--	500	Diesel	--	1989	R/NR, UST
	458	WP 238	500	AVGAS	--	1988	R/NR, UST, SA-86, (101)
	458	WP 238	500	AVGAS	--	1988	R/NR, UST, SA-86, (101)
	458	WP 238	500	Solvent	--	1988	R/NR, UST, SA-86, (101)
	458	WP 238	500	Waste fuel	--	1988	R/NR, UST, SA-86, (101)
	486	OT 160	12,500	Diesel	1946	1990	R/NR, UST, RRL-L-3, (56)
	486	WP 238	12,500	Diesel	1946	1990	R/NR, UST, SA-86, (101)
	614	ST 172	300	Diesel	--	1988	R/NR, IRP, CS-T-61, (60)
	617	SS 253	300	Diesel	--	1988	R/NR, UST, SA-103, (116)
	640	ST 132	500	Diesel	1965	1986	R/NR, UST-PRL-T-7, (41)
	641	--	7,500	Caustic	1954	1989	R/NR, UST
	TF-1	ST 137	50,000	Diesel	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	Empty	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	Empty	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	Empty	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	JP 5/8	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	JP 5/8	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	JP 5	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	JP 5	1955	NAP	ACT, IRP, PRL-T-15, (44)
	TF-1	ST 137	50,000	Waste fuel	1955	NAP	ACT, IRP, PRL-T-15, (44)

Table B-1. McClellan AFB Underground Storage Tank Inventory* (Continued)

OU[a]	LOC[b]	No. WIMS[c]	Capacity[d]	Contents	Installed[e] Date	Removed[e] Date	Status/Regulatory Mechanism[f]
A	TF-2	ST-138	12,000	Waste fuel	1938	1992	R/NR, IRP, CS-T-16, (45)
	TF-2	ST-138	25,000	JP 4	1938	1992	R/NR, IRP, CS-T-16, (45)
	TF-2	ST-138	25,000	JP 4	1938	1992	R/NR, IRP, CS-T-16, (45)
	TF-2	ST-138	25,000	JP 4	1938	1992	R/NR, IRP, CS-T-16, (45)
	TF-2	ST-138	25,000	JP 4	1938	1992	R/NR, IRP, CS-T-16, (45)
	TF-3	ST 139	12,500	Alcohol	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	12,500	Alcohol	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	12,500	Alcohol	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	12,500	Solvent	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	12,500	Solvent	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	AVGAS	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	AVGAS	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	AVGAS	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	Diesel	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	Diesel	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	Diesel	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	Diesel	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	Diesel	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-3	ST 139	25,000	Diesel	1942	1989	R/NR, IRP, CS-T-17, (46)
	TF-4	SD 156	25,000	Jet fuel	1939	1992	R/NR, UST, PRL-T-18 (54)
	TF-4	SD 156	25,000	Jet fuel	1939	1992	R/NR, UST, PRL-T-18 (54)
	TF-4	SD 156	25,000	Jet fuel	1939	1992	R/NR, UST, PRL-T-18 (54)
	TF-4	SD 156	25,000	Jet fuel	1939	1992	R/NR, UST, PRL-T-18 (54)
	TF-6	ST 142	11,000	Solvent	1946	1990	R/NR, UST, CS-T-20, (49)
	TF-6	ST 142	12,000	Alcohol	1946	1990	R/NR, UST, CS-T-20, (49)
	TF-6	ST 142	25,000	Diesel	1946	1990	R/NR, UST, CS-T-20, (49)
	TF-6	ST 142	27,000	Diesel	1946	1990	R/NR, UST, CS-T-20, (49)
	TF-6	ST 142	27,000	Diesel	1946	1990	R/NR, UST, CS-T-20, (49)
	TF-6	ST 142	27,000	MOGAS	1946	1990	R/NR, UST, CS-T-20, (49)
	TF-6	ST 142	27,000	Waste solvent	1946	1990	R/NR, UST, CS-T-20, (49)
	431	SS 256	--	Waste water	--	1987	Concrete sump, UST, SA-107, (119)

Table B-1. McClellan AFB Underground Storage Tank Inventory* (Continued)

OU[a]	LOC[b]	No. WIMS[c]	Capacity[d]	Contents	Installed[e] Date	Removed[e] Date	Status/Regulatory Mechanism[f]
B	600	--	20,000	Diesel	1988	NAP	ACT, SOAU
	603	--	1,000	Waste fuel	1984	NAP	TBR (93), UST, SA-21, (--)
	655	SS 114	1,000	Diesel	1956	1988	R/NR, UST, PRL-S-29, (138)
	655	SS 114	1,000	Diesel	1956	1988	R/NR, UST, PRL-S-29, (138)
	655	SS 114	1,000	Diesel	1956	1988	R/NR, UST, PRL-S-29, (138)
	655	SS 114	1,000	Diesel	1956	1988	R/NR, UST, PRL-S-29, (138)
	656	SS 183	21,000	Diesel	1954	1990	R/NR, UST, SA-5, (155)
	657	ST 184	5,000	MOGAS	1954	1991	R/NR, IRP, SA-6, (156)
	657	ST 184	10,000	MOGAS	1954	1991	R/NR, IRP, SA-6, (156)
	658	SD 115	--	Diesel	1951	1988	R/NR, UST, PRL-S-30, (139)
	659	SD 185	1,000	JP 4	1952	1986	R/NR, UST, SA-7, (157)
	659	SD 185	1,000	JP 4	1952	1986	R/NR, UST, SA-7, (157)
	659	SD 185	1,000	JP 4	1952	1986	R/NR, UST, SA-7, (157)
	659	SD 185	1,000	JP 4	1952	1986	R/NR, UST, SA-7, (157)
	659	SD 185	1,000	JP 4	1952	1986	R/NR, UST, SA-7, (157)
	659	SD 185	1,000	JP 4	1952	1986	R/NR, UST, SA-7, (157)
	664	OT 163	250	MOGAS	1943	1990	R/NR, UST, PRL-L-6, (145)
	677	--	500	Cal. fluid	1974	NAP	TBR (93), UST, SA-29, (--)
	677	--	500	Cal. fluid	1974	NAP	TBR (93), UST, SA-29, (--)
	677	--	500	Hyd. fluid	1974	NAP	TBR (93), UST, SA-29, (--)
	677	--	1,000	Hyd. fluid	1974	NAP	TBR (93), UST, SA-29, (--)
	711	SD 154	--	Waste oil	--	--	Concrete sump, IRP/UST, PRL-T-45, (147)
	739	SD 194	4,000	Purge oil	1970	1990	AIP (Asbestos), UST, SA-16, (165)
	739	SD 194	4,000	Purge oil	1970	1990	AIP (Asbestos), UST, SA-16, (165)
	756	--	15,000	JP 5	1970	NAP	TBR (93), UST
	756	--	15,000	Waste fuel	1970	NAP	TBR (93), UST, PRL-T-8, (146)
	756	--	20,000	JP 8	1970	NAP	TBR (93), UST, PRL-T-8, (146)
	761	--	1,000	Diesel	1969	1990	R/NR, UST
	766	--	2,500	Waste oil	1967	1990	R/NR, UST

Table B-1. McClellan AFB Underground Storage Tank Inventory* (Continued)

OU[a]	LOC[b]	No. WIMS[c]	Capacity[d]	Contents	Installed[e] Date	Removed[e] Date	Status/Regulatory Mechanism[f]
C	701	--	250	Diesel	1954	1990	R/NR, UST
	702	--	250	Diesel	1959	1989	R/NR, UST
	712	--	300	Diesel	1943	1984	AIP
	737	--	500	Diesel	1984	NAP	TBR (93), UST
	783	--	1,000	Waste fuel	1957	1989	R/NR, UST
	1093	--	1,000	Waste water	1977	NAP	TBR (93), UST, (--)
	1099	--	500	Diesel	1962	1990	R/NR, UST
	1099	--	1,000	Diesel	1962	1990	R/NR, UST
C1	703	SD 126	150	Diesel	--	1986	R/NR, UST, PRL-S-41, (143)
	714	LF 042	8,000	Chemical	1972	1989	R/NR, UST, CS-42, (215)
	714	LF 042	8,000	Chemical	1972	1989	R/NR, UST, CS-42, (215)
E	1092	--	1,000	Diesel	1979	1989	R/NR, UST
G	870	--	1,000	Diesel	1958	1988	R/NR, UST
	1028	ST 145	500	Diesel	1957	1989	R/NR, UST, PRL-T-31, (240)
	1028	ST 145	500	MOGAS	1957	1989	R/NR, UST, PRL-T-31, (240)
	1032	--	500	Diesel	1957	1990	R/NR, UST
	1032	--	500	MOGAS	1957	1990	R/NR, UST
	1036	--	2,000	MOGAS	1967	NAP	TBR (93), UST
	1036	--	4,000	Diesel	1967	NAP	TBR (93), UST
	1048	ST 150	500	Solvent	1955	1986	R/NR, UST, PRL-T-44, (243)
	1048	ST 150	500	Solvent	1955	1986	R/NR, UST, PRL-T-44, (243)
	1048	ST 150	500	Solvent	1955	1986	R/NR, UST, PRL-T-44, (243)
	1048	ST 150	500	Solvent	1955	1986	R/NR, UST, PRL-T-44, (243)
	1048	ST 150	500	Used solvents	1955	1986	R/NR, UST, PRL-T-44, (243)
	1048	ST 150	500	Used solvents	1955	1986	R/NR, UST, PRL-T-44, (243)
	1058	--	2,000	Waste fuel	1962	NAP	TBR (93), UST
	1075	ST 173	150	Diesel	--	1985	R/NR, UST, PRL-T-62, (245)
	1104	--	500	Diesel	1968	1989	R/NR, UST
	1104	--	500	Diesel	1968	1989	R/NR, UST
	1439	SD 127	500	Waste oil	1967	1990	R/NR, UST, PRL-S-42, (237)

Table B-1. McClellan AFB Underground Storage Tank Inventory* (Concluded)

OU[a]	LOC[b]	No. WIMS[c]	Capacity[d]	Contents	Installed[e] Date	Removed[e] Date	Status/Regulatory Mechanism[f]
H	3	--	50	Diesel	--	1988	R/NR, UST
	900	--	500	Waste oil	1957	NAP	TBR (93), UST
	900	--	10,000	MOGAS	1957	1991	R/RSOAU, UST
	900	--	10,000	MOGAS	1957	1991	R/RSOAU, UST
	900	--	10,000	MOGAS	1957	1991	R/RSOAU, UST
	900	--	10,000	MOGAS	1957	1991	R/RSOAU, UST
	900	--	10,000	MOGAS	1991	NAP	ACT, new SOAU
	900	--	10,000	MOGAS	1991	NAP	ACT, new SOAU
	900	--	10,000	MOGAS	1991	NAP	ACT, new SOAU
	900	--	10,000	MOGAS	1991	NAP	ACT, new SOAU
--	6008	--	150	Diesel	1979	1988	R/NR, UST
OFFB	5365 CT	--	10,000	NOGAS	1967	NAP	TBR (93), UST
OFFB	5365 CT	--	10,000	NOGAS	1967	NAP	TBR (93), UST
OFFB	5365 CT	--	10,000	NOGAS	1967	NAP	TBR (93), UST
OFFB	4004 KR	--	50	Ind. waste	--	1988	R/NR, UST
OFFB	4004 KR	--	50	Ind. waste	--	1988	R/NR, UST
OFFB	4089 KR	--	100	MOGAS	--	1984	R/NR, UST
OFFB	4098 KR	--	--	Photo waste	--	1988	R/NR, UST
OFFB	4098 KR	--	--	Photo waste	--	1988	R/NR, UST
OFFB	4131 LN	--	5,000	Diesel	1952	1988	R/NR, UST
OFFB	4131 LN	--	5,000	Diesel	1952	1988	R/NR, UST
OFFB	4131 LN	--	3,000	Diesel	--	1988	R/NR, UST
OFFB	4708 DV	--	8,000	Diesel	1952	?	TBR (93), UST
OFFB	4710 DV	--	20,000	?	--	1988	R/NR, UST
OFFB	4710 DV	--	20,000	?	--	1988	R/NR, UST
OFFB	4710 DV	--	20,000	Diesel	--	1988	R/NR, UST
OFFB	5008 SC	--	150	MOGAS	--	1988	R/NR (sold to county), UST
OFFB	5008 SC	--	100	MOGAS	--	1988	R/NR (sold to county), UST

Footnotes for Table B-1

* Includes underground tanks and sumps; no above-ground tanks are listed.

a. Operable Unit. Some entries in the table are not within a specific operable unit. Non-OU entries are "--" if they are on-base (and not located within an **OU**) or "**OFFB**" if they are located on one of the McClellan off-base properties. The McClellan off-base designations are: Capehart (CT), Camp Kohler (KR), Lincoln (LN), Davis (DV), and Splinter City (SC).

b. Locations. Unless otherwise designated (e.g., Tank Farm, TF), **UST** locations are named by using the identification number of the nearest building.

c. Work Information Management System-Environmental Subsystem. The existence of a **WIMS-ES** number implies that the **UST** is itself an **IRP** site, or in combination with some other feature (e.g., a landfill), is an **IRP** site. (Due to ongoing field surveys, not all IRP sites have assigned WIMS-ES numbers.)

d. Capacity in gallons.

e. Installation and removal dates. The term "**Removed**" may also mean emptied and abandoned in place in accordance with applicable requirements (see "**Status**" column). Under the "**Date**" heading, question marks indicate uncertainty in the date listed. A blank (--) indicates no knowledge regarding dates. The acronym "**NAP**" (not applicable) in the "**Removed**" column indicates that the tank either is still in use, or is in place scheduled for removal or abandonment.

f. Tank status may include one or more of the following:

ACT	Tank is in active use. The tank may be empty, but is still considered usable and, therefore, active.
AIP	Tank was abandoned-in-place. This usually means that tank was triple-rinsed and filled with a cement slurry.
IRP	Installation Restoration Program site. The "**Status**" entries for IRP sites also include the status designation **SA** (Study Area), **PRL** (Potential Rebase Location), and **CS** (Confirmed Site).
R/NR	Tank was removed and not replaced with a **UST** or **AGT** at the same location.
SOAU	State-of-the-Art UST. A modern UST complying with applicable codes and regulatory requirements.
R/RSOAU	Removed and replaced with an **SOAU** at the same location.
TBR(yr.)	Year when tank is scheduled for removal, or year when a project for tank removal will be scheduled to be budgeted.

g. Numbers shown parenthetically in the "Status/Regulatory Mechanism" column correspond to the consecutive site numbers in Table 3-1.

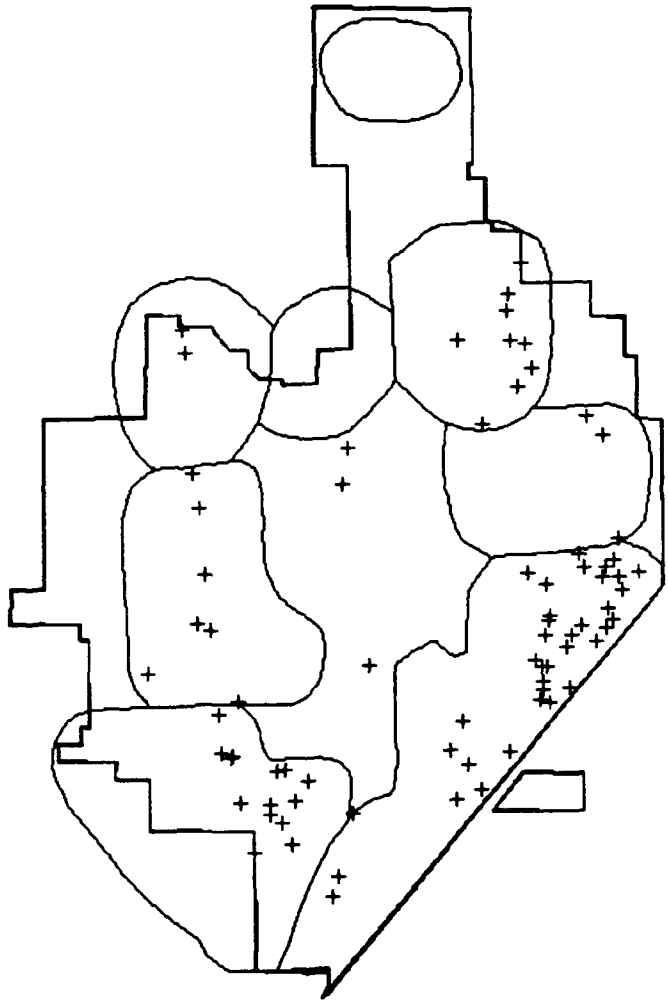

Figure B-1. Basewide UST Locations

Appendix C

MAFB Deliverable Schedules

Table C-1. McClellan Air Force Base Deliverable Schedule

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Operable Unit A				
OU A Summary Report	S	D	–	11 Feb 91
		RC	–	10 Jun 91
OU A RI SAP	P	D	14 May 92	–
		DF	Per IAG Section 7 (Consultation)	15 Sep 92
		F	Per IAG Section 7 (Consultation)	15 Oct 92
OU A RI/FS Report and Proposed Plan	P	D	09 Apr 96	–
		DF	Per IAG Section 7 (Consultation)	09 Aug 96
		F	Per IAG Section 7 (Consultation	10 Sep 96
OU A ROD	P	D	11 Feb 97	–
		DF	Per IAG Section 7 (Consultation)	13 Jun 97
		F	Per IAG Section 7 (Consultation)	15 Jul 97
OU A RD/RA Schedule	–	–	04 Jul 97[d]	–
OU A RA Work Plan	P	D	–	05 Aug 97[b]
		DF	Per IAG Section 7 (Consultation)	05 Dec 97
		F	Per IAG Section 7 (Consultation)	06 Jan 98
7. OU A RD	–	–	–	19 Aug 98[b]
Operable Unit B				
OU B Summary Report	S	RC	–	15 Aug 90
OU B RI SAP	P	D	05 Mar 91	–
		DF	Per IAG Section 7 (Consultation)	05 Jul 91
		F	Per IAG Section 7 (Consultation)	06 Aug 91
OU B RI/FS Report and Proposed Plan	P	D	29 Jun 93	–
		DF	Per IAG Section 7 (Consultation)	29 Oct 93
		F	Per IAG Section 7 (Consultation	30 Nov 93
OU B Technology Assessment/Soil Treatability Study	S	D	–	04 Jun 92
		RC	–	06 Oct 92

Note: See legend at end of table for meaning of symbols

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Operable Unit B (Continued)				
OU B ROD	P	D	03 May 94	–
		DF	Per IAG Section 7 (Consultation)	02 Sep 94
		F	Per IAG Section 7 (Consultation)	04 Oct 94
OU B RD/RA Schedule	–	–	23 Sep 94[d]	–
OU B RA Work Plan	P	D	–	25 Oct 94[b]
		DF	Per IAG Section 7 (Consultation)	24 Feb 95
		F	Per IAG Section 7 (Consultation)	28 Mar 95
OU B RD	–	–	–	08 Nov 95[b]
Removal Actions				
OU B EE/CA Report	S	D	–	01 Oct 90
		RC	–	01 Feb 91
OU B EE/CA Action Memorandum	S	D	–	08 Mar 91
Operable Unit B1				
OU B1 PCB Soil Treatability Study Work Plan	S	D	—	4 Jun 92
		RC	—	1 Nov 92
OU B1 RI/FS Report and Proposed Plan	P	D	3 Mar 93	—
		DF	Per Section 7 IAG (Consultation	6 Jul 93
		F	Per Section 7 IAG (Consultation)	7 Aug 93
OU B1 Interim ROD	P	D	26 Jul 93	—
		DF	Per Section 7 IAG (Consultation)	26 Nov 93
		F	Per Section 7 IAG (Consultation)	29 Dec 93
OU B1 RD/RA Schedule	—	—	17 Dec 93 [d]	—
Operable Unit C				
OU C Summary Report	S	D	–	29 Jul 92
		RC	–	30 Nov 92
OU C RI SAP	P	D	08 Nov 93	–
		DF	Per IAG Section 7 (Consultation)	10 Mar 94
		F	Per IAG Section 7 (Consultation)	11 Apr 94

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Operable Unit C (Continued)				
OU C RI/FS Report and Proposed Plan	P	D	02 Apr 98	–
		DF	Per IAG Section 7 (Consultation)	04 Aug 98
		F	Per IAG Section 7 (Consultation)	03 Sep 98
OU C ROD	P	D	05 Feb 99	–
		DF	Per IAG Section 7 (Consultation)	24 Jun 99
		F	Per IAG Section 7 (Consultation)	26 Jul 99
OU C RD/RA Schedule	–	–	15 Jul 99[d]	–
OU C RA Work Plan	P	D	–	16 Aug 99[b]
		DF	Per IAG Section 7 (Consultation)	16 Dec 99
		F	Per IAG Section 7 (Consultation)	17 Jan 00
OU C RD	–	–	–	01 Sep 00[b]
Operable Unit C1				
OU C1 RI SAP	P	D	21 Aug 92	
		DF	Per IAG Section 7 (Consultation)	14 Dec 92
		F	Per IAG Section 7	13 Jan 93
OU C1 RI/FS Report	P	D	18 Mar 94	
		DF	Per IAG Section 7 (Consultation)	11 July 94
		F	Per IAG Section 7	08 Aug 94
OU C1 Proposed Plan	P	D	31 Mar 94	
		DF	Per IAG Section 7 (Consultation)	26 Jul 94
		F	Per IAG Section 7 (Consultation)	24 Aug 94
OU C1 Record of Decision	P	D	01 Dec 94	
		DF	Per IAG Section 7 (Consultation)	27 Mar 95
		F	Per IAG Section 7	26 Apr 95
OU C1 Remedial Design/ Remedial Action (RD/RA) Schedule	–	–	26 Apr 95	–

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Operable Unit D				
Area D Groundwater Treatment Plant/Groundwater Extraction System and Off-Base Residential Water Supply FS Report and Proposed Plan	P	D	06 Sep 91	–
		DF	Per IAG Section 7 (Consultation)	08 Jan 92
		F	Per IAG Section 7 (Consultation)	07 Feb 92
Area D Groundwater Treatment Plant/Groundwater Extraction System and Off-Base Residential Water Supply ROD	P	D	09 Jun 92	–
		DF	Per IAG Section 7 (Consultation)	09 Oct 92
		F	Per IAG Section 7 (Consultation)	10 Nov 92
OU D Summary Report	S	D	—	25 Nov 92
		RC	—	16 Feb 93
OU D RI SAP	P	D	17 Feb 93	–
		DF	Per IAG Section 7 (consultation)	18 June 93
		F	Per IAG Section 7 (Consultation)	20 Jul 93
RI Report with Risk Assessment	P	D	19 May 93	–
		DF	Per IAG Section 7 (Consultation)	17 Sep 93
		F	Per IAG Section 7 (Consultation)	18 Oct 93
Feasibility Study	P	D	21 Jun 93	–
		DF	Per IAG Section 7 (Consultation)	20 Oct 93
		F	Per IAG Section 7 (Consultation	19 Nov 93
Proposed Plan	P	D	6 Jul 93	–
		DF	Per IAG Section 7 (Consultation)	3 Nov 93
		F	Per IAG Section 7 (Consultation)	3 Dec 93
Public Comment	–	–	3 Dec 93	1 Feb 94
OU D ROD	P	D	4 Feb 94	–
		DF	Per IAG Section 7 (Consultation)	6 Jun 94
		F	Per IAG Section 7 (Consultation)	5 Jul 94
OU D RD/RA Schedule	–	–	26 Jul 94	–

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Operable Units E, F, G, & H				
OUs E, F, G, & H Summary Report	S	D	–	26 Jul 95
		RC	–	01 Dec 95
OUs E, F, G, & H RI SAP	P	D	17 Apr 96	–
		DF	Per IAG Section 7 (Consultation)	21 Aug 96
		F	Per IAG Section 7 (Consultation)	23 Sep 96
OUs E, F, G, & H RI/FS Report and Proposed Plan	P	D	12 Jan 00	–
		DF	Per IAG Section 7 (Consultation)	16 May 00
		F	Per IAG Section 7 (Consultation)	16 Jun 00
OUs E, F, G, & H ROD	P	D	22 Nov 00	–
		DF	Per IAG Section 7 (Consultation)	30 Mar 01
		F	Per IAG Section 7 (Consultation)	01 May 01
OUs E, F, G & H RD/RA Schedule	–	–	20 Apr 01[d]	–
OUs E, F, G, & H RA Work Plan	P	D	–	22 May 01[b]
		DF	Per IAG Section 7 (Consultation)	26 Sep 01
		F	Per IAG Section 7 (Consultation)	29 Oct 01
OUs E, F, G, & H RD	–	–	–	19 Jun 02[b]
Basewide				
PGOURI Report	S	D	–	13 Sep 91
		RC	–	15 Jan 92
Basewide FS Report and Proposed Plan	P	D	09 Jan 02	–
		DF	Per IAG Section 7 (Consultation)	10 May 02
			Per IAG Section 7 (Consultation)	11 Jun 02
Basewide ROD	P	D	09 Oct 02	–
		DF	Per IAG Section 7 (Consultation)	13 Feb 03
		F	Per IAG Section 7 (Consultation)	15 Mar 03

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document		Dates	
	Category	Type	Deadline[a]	Target
Basewide (Continued)				
Groundwater Sampling and Analysis Program	I	–	–	29 Mar 94
	I	–	–	29 Jun 94
	I	–	–	28 Sep 94
	I	–	–	31 Dec 94
	I	–	–	29 Mar 95
	I	–	–	29 Jun 95
	I	–	–	28 Sep 95
	I	–	–	31 Dec 95
	I	–	–	29 Mar 96
	I	–	–	29 Jun 96
	I	–	–	28 Sep 96
	I	–	–	31 Dec 96
	I	–	–	29 Mar 97
	I	–	–	29 Jun 97
	I	–	–	28 Sep 97
	I	–	–	31 Dec 97
	I	–	–	29 Mar 98
	I	–	–	29 Jun 98
	I	–	–	28 Sep 98
	I	–	–	31 Dec 98
	I	–	–	29 Mar 99
	I	–	–	29 Jun 99
	I	–	–	28 Sep 99
	I	–	–	31 Dec 99
	I	–	–	29 Mar 00
	I	–	–	29 Jun 00
	I	–	–	28 Sep 00
	I	–	–	31 Dec 00
	I	–	–	29 Mar 01
	I	–	–	29 Jun 01
	I	–	–	28 Sep 01
	I	–	–	31 Dec 01
	I	–	–	29 Mar 02
	I	–	–	29 Jun 02
	I	–	–	28 Sep 02
	I	–	–	31 Dec 02[c]

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Operable Unit GW				
RI/FS Workplan	P	D	24 Nov 92	
		DF	Per IAG Section 7 (Consultant)	24 Mar 93
		F	Per IAG Section 7 (Consultant)	23 Apr 93
RI/FS Report	P	D	01 Jun 93	
		DF	Per IAG Section 7 (Consultant)	01 Oct 93
		F	Per IAG Section 7 (Consultant)	01 Nov 93
Proposal Plan	P	D	15 Jun 93	
		DF	Per IAG Section 7 (Consultant)	15 Oct 93
		F	Per IAG Section 7 (Consultant)	15 Nov 93
Record of Decision	P	D	15 Dec 93	
		DF	Per IAG Section 7 (Consultant)	15 Apr 94
		F	Per IAG Section 7 (Consultant)	15 May 94
Davis Site				
Davis Site Monthly Status Report	I	–	Per FFSRA Section 22 (Data and Document Availability)	–
Davis Site Work Plan for Aquifer Test	S	F	–	19 Jun 92
Data Summary of Aquifer Test	S	F	–	8 Dec 92
Davis Site RI SAP and Addendum to Basewide QAPP and Health and Safety Plan	P	D	14 Sep 92	–
		DF	Per FFSRA Section 7 (Review and Approval)	13 Jan 93
		F	Per FFSRA Section 7 (Review and Approval)	12 Feb 93
Admin. Record	I	F		30 Oct 92
Community Relations Plan	P	D	11 Nov 92	
		DF		5 Jan 93
		F		12 Feb 93

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Davis Site (Continued)				
Davis Site RD/RA Workplan; Petroleum Contaminated Soils[e]	P	I	15 Nov 93	–
		DF	Per FFSRA Section 7 (Review and Approval)	14 Jan 94
		F	Per FFSRA Section 7 (Review and Approval)	14 Feb 94
Davis Site RI/FS Report and Risk Assessment	P	D	15 Nov 93	–
		DF	–	14 Jan 94
		F	–	14 Feb 94
Davis Site Intermediate Design/Remedial Design	Pre-Design	–	21 Jan 93	–
	Intermediate Design	D	f	f
	Pre-Final Design	DF	f	f
	Final Design	F	–	31 May 93
NEPA Requirements	I	D	14 Mar 94	–
		F	–	14 Apr 94
Proposed Plan	P	D	14 Mar 94	–
		F	–	13 Jun 94
Draft RAP/ROD	P	D	18 Jul 94	–
		DF	–	14 Nov 94
		F	–	14 Dec 94
Davis Site RD/RA Workplan; VOC Contaminated Soils[e]	P	D	14 Dec 94	–
		DF	–	16 Jan 95
		F	–	20 Feb 95
Davis Site RD/RA Workplan; Groundwater Extraction System[e]	P	D	20 Mar 95	–
		DF	–	15 May 95
		F	–	19 Jun 95
Davis Site Groundwater Sampling and Analysis Program	I	D	–	31 Oct 92
	I	D	–	29 Jan 93
	I	D	–	29 Apr 93
	I	D	–	28 Jul 93
Scoping				
1990 CCWP	P	DF	Per IAG Section 7 (Consultation)	20 Jun 90
		F	Per IAG Section 7 (Consultation)	21 Jul 90

Table C-1. McClellan Air Force Base Deliverable Schedule (Continued)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Scoping (Continued)				
1991 CCWP & CRP Update	P	D	21 Jan 91	–
		DF	Per IAG Section 7 (Consultation)	23 May 91
		F	Per IAG Section 7 (Consultation)	24 Jun 91
1992 CCWP & CRP Update	P	D	23 Mar 92	–
		DF	Per IAG Section 7 (Consultation)	20 July 92
		F	Per IAG Section 7 (Consultation)	19 Aug 92
1993 CRP Update	P	D	20 Jan 93	–
		DF	Per IAG Section 7 (Consultation)	24 May 93
		F	Per IAG Section 7 (Consultation)	23 Jun 93
1994 CRP Update	P	D	20 Jan 94	–
		DF	Per IAG Section 7 (Consultation)	24 May 94
		F	Per IAG Section 7 (Consultation)	23 Jun 94
1995 CRP Update	P	D	20 Jan 95	–
		DF	Per IAG Section 7 (Consultation)	24 May 95
		F	Per IAG Section 7 (Consultation)	23 Jun 95
1996 CRP Update	P	D	22 Jan 96	–
		DF	Per IAG Section 7 (Consultation)	23 May 96
		F	Per IAG Section 7 (Consultation)	24 Jun 96
1997 CRP Update	P	D	20 Jan 97	–
		DF	Per IAG Section 7 (Consultation)	22 May 97
		F	Per IAG Section 7 (Consultation)	23 Jun 97
1998 CRP Update	P	D	20 Jan 98	–
		DF	Per IAG Section 7 (Consultation)	22 May 98
		F	Per IAG Section 7 (Consultation)	23 Jun 98

Table C-1. McClellan Air Force Base Deliverable Schedule (Concluded)

Document Title	Document Category	Document Type	Dates Deadline[a]	Dates Target
Scoping (Continued)				
1999 CRP Update	P	D	20 Jan 99	–
		DF	Per IAG Section 7 (Consultation)	24 May 99
		F	Per IAG Section 7 (Consultation)	23 Jun 99
2000 CRP Update	P	D	20 Jan 00	–
		DF	Per IAG Section 7 (Consultation)	24 May 00
		F	Per IAG Section 7 (Consultation)	26 Jun 00
2001 CRP Update	P	D	20 Jan 01	–
		DF	Per IAG Section 7 (Consultation)	25 May 01
		F	Per IAG Section 7 (Consultation)	27 Jun 01

[a] Primary documents follow the IAG schedule and do not include dispute resolution.

[b] Deadlines for RD/RA documents will be submitted 21 days following issuance of the draft final ROD per Section 8.3 of the IAG. Target dates are shown for discussion purposes.

[c] Groundwater sampling and analysis activities may continue past this date; deliverables are shown only through 2002 for brevity.

[d] Schedule will be submitted 21 days following the target date for the issuance of the draft final ROD. Deadline shown may change if the target date for the final ROD is adjusted per Section 7 (Consultation) of the IAG.

[e] Remedial Design/Remedial Action (RD/RA) workplans will consist of SAP, Addendum to Health and Safety Plan, and Addendum to Basewide QAPP.

[f] Pre, Intermediate and Pre-Final Design dates will be determined after Contractor is on line.

Legend

P = Primary Document
S = Secondary Document
I = Informational
D = Draft for Agency Review
DF = Draft Final
F = Final
RC = Response to Comments
TBD = To Be Determined

Table C-2 McClellan AFB Draft-Deliverable Dates—FY93

Operable Unit / Date	A	B	B1	C	C1	D	E-H	GW	Davis	Basewide
Oct 1992					16 (S) SIVE Sat. Zone Treat WP 23 (S) SIVE Sat. Zone FACE					
Nov 1992	1 (S) IWL TM	24 (S) O&M Manual				25 (S) Sum. Rpt.		24 (S) RI/FS WP	11 (P) CRP add.	
Dec 1992									8 (S) DSAT	
Jan 1993										6 (I) 3Q92 GSAP 20 (P) CRP
Feb 1993						17 (P) RI SAP				18 (I) 4Q92 GSAP
Mar 1993			3 (P) RI/FS + PP		12 (S) SIVE Lab and Field SM					
Apr 1993	--	--	--	--	--	--	--	--	--	--
May 1993						19 (P) RI		1 (P) RI/FS 15 (P) PP		
Jun 1993		29 (P) RI/FS + PP				21 (P) FS				
Jul 1993			26 (P) IROD			6 (P) PP				
Aug 1993	--	--	--	--	--	--	--	--	--	--
Sep 1993	--	--	--	--	23 (S) RI	23 (S) Treat. Sys. Eval. Rpt.	--	--		

Notes

Sources of Information:

A. Table 3–2 of the August 1992 CCWP
B. "Deliverables" schedules from August 1992 MSR
C. Addendum schedules transmitted from MAFB on 3 September 1992.

Glossary

CCWP	Comprehensive CERCLA Work Plan	PA	Preliminary Assessment
CE	Cost Estimate	P	Primary Document
CRP	Community Relations Plan	PP	Proposed Plan
DSAT	Data Summary of Aquifer Test	PPDCE	Preliminary Process Design and Cost Estimate
FACE	Feasibility Assessment and Cost Estimate	QAPP	Quality Assurance Project Plan
FS	Feasibility Study	RAR	Risk Assessment Report
GSAP	Groundwater Sampling and Analysis Program	RI	Remedial Investigation
GW	Groundwater	*ROD*	*Record of Decision*
I	Informational Document	SAP	Sampling and Analysis Plan
IRP	Installation Restoration Program	S	Secondary Documents
IWL	Industrial Waste Line	SIVE	Steam Injection Vapor Extraction
MAFB	McClellan Air Force Base	SM	Summary Memorandum
MSR	Monthly Status Report	SVE	Soil Vapor Extraction
O&M	Operations and Maintenance	WP	Work Plan

Ground Rules:

- Whenever there are several dates associated with a particular document, only the draft delivery date to Regulatory Agencies is used
- The entry in parentheses (a letter) indicates whether the document is a primary, secondary, or informational one
- The other entry, a number, indicates the day of the month

Appendix D
Funding Requirements

Table D-1. Funding Requirements by Fiscal Year for DERA-Eligible Activities

Project Number	Program Description	FY 93 $000	FY 94 $000	FY 95 $000	FY 96 $000
1701	Manpower	2610	2700	2800	2900
1702	GWTP O&M	1617	1500	1600	1700
1703	IRP TDY/Administration Supplies	235	500	500	550
1704	Ex-Situ Soil Treatment	—	1900	1500	1600
1705	Technical Information System	250	500	500	525
1706	Interim GSAP	1900	2200	1900	2200
1707	B/W Response Action Support	1450	1950	2000	2000
2562	Carbon Renewal Base Well 18	152	250	250	265
1722	Site Delisting Investigation	800	1200	1000	—
1721	B/W SVE RA	2535	3500	3000	3000
1708	OU A RI	12000	—	—	—
1723	OU A Accelerated RI Requirements	5000	—	—	—
1726	OU A RD/RA	—	—	—	14000
1734	OU A O&M	—	—	—	1000
1709	OU B RI/FS	7450	—	—	—
1710	OU B RD	1225	—	—	—
1725	OU B RA	—	17500	20000	15500
1735	OU B O&M	—	—	—	1000
1712	OU C SAP	200	—	—	
1720	OU C RI/FS	12000	—	10000	8000
1732	OU C RD	—	1000	—	—
1711	OU C1 RI/FS	5500	—	—	
1731	OU C1 RD/RA	—	13000	—	—
1731	OU C1 RA	—	—	5000	6000
1713	OU D SAP	125	—	—	—
1714	OU D RI/FS, PP, ROD	5500	—	—	—
1729	OU D RD/RA	—	6000	—	—
1733	OU D RA	—	—	7500	7500
1715	OU D SVE RA	2150	—	—	—
1728	OU D SVE O&M	—	1000	500	1500
1719	OU E-H Summary Report	350	—	—	—

Table D-1. Funding Requirements by Fiscal Year for DERA-Eligible Activities (Concluded)

Project Number	Program Description	FY 93 $000	FY 94 $000	FY 95 $000	FY 96 $000
1730	OU E-H SAP	—	500	—	—
1736	OU E-H RI/FS	—	—	—	3000
1716	Davis RI/FS, PP, ROD	1200	—	—	—
1717	Davis O&M Interim RA	3500	1350	600	600
1724	Davis RD/RA Work Plan	—	1200	—	—
1732	Davis RA	—	—	2500	2500
1718	OU GW Interim ROD	500	—	—	—
	Total	69250	73750	79650	75340

Project number shown is only the last 4 digits of a 6-digit number. The first 2 numbers are the fiscal year (e.g., 1701 becomes 931701, 941701, etc.)

Dollar amounts have been rounded to the nearest thousand dollars

B/W	Basewide
FS	Feasibility Study
GSAP	Groundwater Sampling and Analysis Program
GWTP	Groundwater Treatment Plant
IRP	Installation Restoration Program
O&M	Operations and Maintenance
PP	Proposed Plan
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SVE	Soil Vapor Extraction
TDY	Temporary Duty

Table D-2. Funding Requirements by Fiscal Year for Compliance Program

Project Description	Fiscal Year	Cost
TO BE PROVIDED BY McAFB		

Appendix E

Consensus Statement—Soil Gas

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105-3901

October 30, 1992

Mr. Fran Slavich
Remedial Project Manager
Environmental Management
SM-ALC/EMR
Building #250-HH
McClellan Air Force Base, CA

Dear Mr. Slavich:

Enclosed is the Final Soil Gas Consensus Statement. The statement has two attachments:

1) Use of Soil Gas Sampling to Estimate the Nature and Extent of Contamination in the Vadose Zone, and

2) Use of Soil Gas Sampling to Locate VOC Release Areas.

If you would like to discuss this statement please contact me at (415) 744-2407.

Sincerely yours,

Katherine Moore
Remedial Project Manager

Enclosures (3)

cc: Mark Malinowski, DTSC
Alex MacDonald, RWQCB
Greg Reller, PRC
Dave Watson, PTI
Ming Wang, Mitre Corp
John Lucera, CH2M Hill
Tom Cudzilla, Radian Corp
Geoff Watkins, Jacobs Engineering

Soil Gas Consensus Statement

At recent McClellan Air Force Base (AFB) remedial project manager (RPM) meetings, considerable discussion has occurred on how soil gas sampling and analysis for volatile organic compounds (VOCs) should be used during the remedial investigation (RI). This discussion has centered around two main issues: 1) when and how soil gas sampling data versus soil sampling data will be used to characterize the nature, extent, and concentration of VOCs present in the vadose zone and 2) the procedures for using soil gas sampling as a screening tool to identify contaminant release locations.

To resolve these two issues, respectively, the RPMs have reached consensus on the following two attachments:

- Attachment 1 - Recommended Method for Using Soil Gas Sampling to Estimate the Nature, Extent, and Concentration of VOC Contamination in the Vadose Zone at McClellan Air Force Base

- Attachment 2 - Recommended Method for Using Soil Gas Sampling to Locate VOC Release Areas at McClellan Air Force Base.

The RPMs agree that collecting defensible and conservative estimates of the nature, extent, and concentration of VOCs in the vadose zone during the RI will be extremely important when performing risk assessments, evaluating exposure pathways, assessing applicable or relevant and appropriate requirements (ARARs), selecting target cleanup areas and levels, and evaluating and selecting remedial alternatives. A reasonable number of studies have shown that, under most circumstances, soil gas data provide a better indication of the full suite of VOCs present and a higher estimate of the concentration of VOCs in the vadose zone than soil sampling data alone. Therefore, during the investigation of the nature and extent of VOCs in the vadose zone, soil gas sampling will be an integral part of the RI. (This does not preclude the use of soil sampling.) In addition, because the remedial action at sites contaminated with VOCs is likely to include soil vapor extraction (SVE) technology (a potential presumptive remedy), collecting sufficient soil gas data during the RI to evaluate, design, and install SVE systems will be important for efficient and rapid remediation of the vadose zone beneath the AFB.

Barring unusual and/or unforeseen circumstances, Attachments 1 and 2 will be used as a guide to locating and characterizing VOC release areas at McClellan AFB during the RI. However, the

accuracy of estimating total soil VOC concentrations using soil gas data has not been verified. Therefore, the attachments may be revised if data collected during the RI and/or remediation indicate the assumptions and procedures presented in the attachments are incorrect or inadequate.

For the purposes of this consensus statement, VOCs are generally defined as chemicals routinely detected and quantified by EPA methods 8010, 8015, 8020, 8240, and TO-14. However, Attachment 1 will only be applied to situations when the total VOC mass estimated using soil gas sampling methods is higher than the mass estimated using soils data. Attachment 2 could be applied to any contaminant detected using soil gas sampling and analysis techniques.

Fran Slavich, McClellan AFB — Date: 10/23/92

Katherine Moore, U.S. EPA — Date: 10/23/92

Mark Malinowski, California DTSC — Date: 10/23/92

Alex MacDonald, California RWQCB — Date: 10-28-92

Attachment 1

Recommended Method for Using Soil Gas Sampling to Estimate the Nature, Extent, and Concentration of VOC Contamination in the Vadose Zone at McClellan Air Force Base

OBJECTIVE

To estimate the nature, extent, and concentration of volatile organic compound (VOC) contamination in the vadose zone.

ASSUMPTIONS

If nonaqueous-phase liquids (NAPLs) are absent, the total concentration of VOC contamination in soils can be estimated from soil gas sampling results assuming chemical equilibrium exists between soil gas, soil moisture, and soil particle matrices.

- If VOC NAPL is present, it may not be possible to obtain an accurate estimate of the concentration of contamination present; however, soil gas and soil sampling data should provide a clear indication that remedial action is needed in these areas.
- Soil gas concentration data will generally provide a higher estimate of VOC contaminant mass in the vadose zone than will be obtained through estimates made using only soil sampling data.
- VOC concentrations detected at soil gas sampling points may be discrete and may be associated with a soil interval.
- Soil samples will be used to define soil physical and chemical properties necessary for estimating calculations. If necessary, assumed soil properties will used to estimate the total mass of VOC contamination in uncharacterized soil layers.
- Soil gas sampling methodology provides results that are representative of actual soil gas concentrations in the subsurface.

USE, TYPE, QUANTITY, AND QUALITY OF DATA

Potential Data Uses

- Mapping the distribution and identifying the type of VOC soil gas contamination in the vadose zone
- Estimating the total contaminant mass present in the vadose zone and the mass present in each matrix (gaseous, solid, and liquid phases), considering that the mass may be underestimated if NAPL is present
- Estimating the flux of VOC contamination from the vadose zone to exposure points such as groundwater and the soil surface (e.g., crawlspaces and basements)
- Performing risk assessments for specific exposure pathways such as 1) migration of VOC-contaminated soil gas into crawlspaces and other exposure points, 2) direct exposure and ingestion of VOC-contaminated soils, and 3) potential future risks associated with VOC contaminant migration to groundwater
- Delineating zones targeted for cleanup
- Evaluating and selecting remedial alternatives, especially where soil vapor extraction (SVE) may be a presumptive remedy for unsaturated soils.

Data Type

Shallow soil gas samples collected from surface probes and deeper samples collected in boreholes will generally be needed at most sites. Soil gas sampling will generally be coupled with at least some soil sampling as necessary in and near potential source areas, especially if NAPLs may be present.

Data Quantity

The quantity of data will depend on site-specific conditions but should be sufficient to reliably estimate VOC mass in the vadose zone to the extent needed to conduct risk assessments, evaluate remedial alternatives, determine whether SVE is a viable presumptive remedy, and meet other specific remedial investigation/feasibility study (RI/FS) objectives. Although sufficient data should be collected to satisfy data quality objectives (DQOs), it should be assumed that additional characterization work will be completed during the remedial design/remedial action (RD/RA) phases.

Data Quality

The majority of analyses may be conducted at a noncertified mobile laboratory, although a certified laboratory is preferred. However, a subset of the samples should be split and analyzed at a certified laboratory (at least Level III on a gas chromatograph/mass spectrometer [GC/MS]) to validate the data for use in risk assessments (U.S. EPA 1989, 1990). The percentage of validated data will be high initially, and may decrease with subsequent sampling rounds, as justified.

PROCEDURES

Defining the nature and extent of VOC contamination should be conducted in phases. Each phase should consist of field sampling followed by data analysis. During the data analysis phase, the data should be evaluated to determine whether project objectives have been met and assumptions are valid. Strategies for subsequent sampling events should be revised if needed.

The following outline presents some recommended steps for using soil gas sampling to define the nature and extent of VOC contamination in the vadose zone:

1. Plan Phase I and select criteria that will be used to conclude that sufficient information on the extent of contamination has been obtained (e.g., defined to background concentrations, detection limits, closure of concentration contour boundaries at a chosen interval, concentrations selected based on a conservative risk analysis, or operable unit boundaries). The type of contamination present should be identified early. If non-VOCs or NAPL are present, additional soil sampling and analyses should be conducted along with soil gas sampling.

2. Map three-dimensional soil gas plume:

   a. If possible, establish correlation of spatial trends in soil gas data with lithology, contaminant release mechanism, or other factors

   b. Identify newly discovered release areas.

3. Review data and revise assumptions and criteria for terminating the investigation as needed. For example, it should be determined whether the extent of contamination has been defined to concentrations low enough to meet DQOs.

4. Perform additional phases of investigation and soil

sampling as needed (see Other Considerations).

5. Once adequate data have been collected, conduct the risk assessment and feasibility study.

OTHER CONSIDERATIONS

- Ideally, the extent of contamination should be defined to background concentrations or detection limits; however, low levels of soil gas contamination likely to exist across the base may make this impractical. Therefore, prior to the start of the RI, a preliminary risk assessment and contaminant fate and transport modeling may be needed to determine the concentrations of VOCs in soil gas that are likely to pose health risks and exceed water quality objectives and require remedial action. A preliminary estimate of the level of concern for soil gas for each individual constituent may be needed to determine when characterization is sufficient.

- Declining groundwater levels may result in contaminant smear zones extending upward from the water table due to dissolved groundwater contamination and/or NAPL being left in the vadose zone as residual contamination. These smear zones could result in soil gas contamination being detected at greater concentrations at depth (40 feet or deeper) than in shallower zones. Details of present and historical groundwater flow and groundwater contaminant occurrence may be helpful for identifying areas where smear zones are likely to exist and should be defined.

- To evaluate contaminant and exposure pathways and conduct the risk assessment, it will be important to understand whether there is a correlation between soil gas sampling results, lithology, release mechanism, and other factors. This correlation may be complicated and dependent on many factors, such as the source of contamination and method of discharge (e.g., NAPL, washwater, or steam). For example, the distribution of contamination resulting from residual contamination left in the vadose zone due to declining water tables (smear zones) may be different from the distribution of contamination that has resulted from the migration of soil gas contamination away from a release area above the water table. Understanding how lithology, release and transport mechanisms, and other factors influence the distribution of contamination will

also be important during evaluation and implementation of remedial alternatives (e.g., SVE).

- Soil sampling will be conducted in addition to soil gas sampling to 1) determine physical soil properties used for estimating VOC contaminant mass, 2) identify and determine the nature and extent of non-VOCs, 3) conduct toxicity characteristics leaching procedure (TCLP) testing or other sampling and analysis needed to dispose of wastes or evaluate remedial actions for the site, and 4) determine whether NAPL is present in source areas, 5) allow for comparison of VOC mass estimates in the vadose zone.

Attachment 2

Recommended Method for Using Soil Gas Sampling to Locate VOC Release Areas at McClellan Air Force Base

OBJECTIVE

Primarily to locate volatile organic compound (VOC) release areas, but also may be used to define the nature, extent, and concentration of VOCs in the shallow subsurface.

ASSUMPTIONS

- Shallow VOC soil gas contamination can result from shallow and deep contaminant sources. However, the correlation of shallow soil gas sampling results to source areas will be complicated by variations in lithology, nature and duration of the release, concentration of VOCs in groundwater, and other factors (see Other Considerations).
- VOC release areas will generally be in the vicinity of the highest soil gas concentrations.

USE, TYPE, QUANTITY, AND QUALITY OF DATA

Potential Data Uses

The primary use of data is to locate VOC release areas and plan subsequent investigations to define the nature and extent of VOCs in the vadose zone (Attachment 1). However, at select sites, the data are also likely to be used for all the potential data uses described in Attachment 1. It is recommended that the nature and extent of shallow soil gas contamination be defined if a source area is located. This shallow data will likely be needed to assess the risk of VOCs migrating into buildings.

Data Type

The sampling will focus on shallow subsurface VOC soil gas samples (upper 10 ft) collected through probes pushed from the surface. However, efforts should be made to collect shallow soil gas samples from depths greater than 4 ft. Deeper samples collected from boreholes or geoprobes (greater than 10 ft) may be necessary to determine whether soil gas contamination is related to other source areas, such as deeper, more widespread contamination.

Data Quantity

The number, depth, and spacing of samples will depend upon site-specific factors such as source, size, and configuration, contaminant concentrations, and site accessibility. Where clays and silts are present and variable lithology affects sampling results, low soil gas concentrations (false negatives) may be detected, even though a source may be nearby. Where these conditions exist, a closer sample spacing or possible soil sampling may be needed to reduce the uncertainty.

Data Quality

The majority of analyses may be conducted at a noncertified mobile laboratory, although a certified laboratory is preferred. However, a subset of the samples should be split and analyzed at a certified laboratory (at least Level III on a gas chromatograph/mass spectrometer [GC/MS]) to validate the data for use in risk assessments (U.S. EPA 1989, 1990). The percentage of validated data will be high initially and may decrease with subsequent sampling rounds, as justified.

PROCEDURES

Location of release areas should be conducted by mapping the soil gas contamination and delineating high concentrations. After the initial sample locations are selected and samples are collected and analyzed, professional judgment should be used to select subsequent probe locations. The following outline presents some of the recommended steps for using soil gas sampling to locate VOC release areas:

1. Select initial sample locations:

    a. Suspected release location: Use site-specific information to select initial sample locations, focusing on areas near suspected release.

    b. Unknown release location: Sample on a statistically-based grid spacing similar to that described in the Operable Unit B sampling and analysis plan (Radian 1992) and proposed for the Operable Unit A remedial investigation (Jacobs 1992).

2. Analyze samples collected from initial sampling locations; contour the concentrations of individual contaminants detected and the total VOCs detected

and look at steep contours to locate significant sources and attempt to close contours. Determine whether a soil gas plume is present and whether additional plume mapping is warranted. The decision to move on to step 3 and map the soil gas plume will be decided on a site-by-site basis, considering all available chemical data, historical disposal and release information, and transport and exposure pathways.

3. Map shallow soil gas contamination to locate high concentrations that may be associated with VOC release areas or mechanism (e.g., surface spills, sumps, and pipe joints).

4. If a VOC release area is identified, prepare plans to define the nature and extent of contamination (Attachment 1) and conduct soil sampling to determine whether non-VOCs are also present.

OTHER CONSIDERATIONS

- As needed, shallow soil gas surveys should be coupled with other activities to identify VOC release areas, such as geophysical surveys to locate underground tanks and pipelines, leak testing of pipelines and tanks, Hydropunch® sampling of groundwater (upgradient and downgradient of the site), soil sampling, and deeper soil gas sampling.

- Mapping the extent of shallow soil gas contamination is recommended even if the release area is identified before the mapping is completed. The results of the shallow soil gas mapping may be useful for planning investigations of the nature and extent of contamination (Attachment 1) and conducting risk assessments. Generally, it will be more efficient to map the horizontal extent of the soil gas plume prior to conducting extensive deep exploration.

- Lithology should be considered in conjunction with soil gas data when interpreting sampling results.

- The overall approach to the RI should take into consideration that where VOCs and non-VOCs are released by the same mechanisms, the extent of the non-VOCs should generally be within the extent of the VOCs.

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Appendix F
Acronyms, Initialisms, and Abbreviations

List of Acronyms, Initialisms, and Abbreviations

Act	Active
AE	Architect Engineer
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFGE	American Federation of Government Employees
AFIRP	Air Force Installation Restoration Program
AFRPM	Air Force Remedial Program Manager
AGT	Above-ground tank
AIP	Abandoned in place
ANSC	Area of no suspected contamination
APEG	Alkaline polyethylene glycol
ATSDR	Agency for Toxic Substances and Disease Registry
AVGAS	Aviation gasoline
BW	Base well
B/W	Basewide
BCDP	Base-catalyzed decomposition process
BCP	Base Comprehensive Planning System
BIO	Bioremediation process
CAA	Clean Air Act
Cal-EPA	California Environmental Protection Agency
CCWP	Comprehensive CERCLA Work Plan
CE	Cost estimate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, as amended
CN	Cyanide
COTS	Commercial off-the-shelf
CRP	Community Relations Plan
CS	Communications Squadron
CS	Confirmed site
CT	Capehart
DCE	Dichloroethylene
DERA	Defense Environmental Restoration Act

DERP	Defense Environmental Restoration Program
DHS	Department of Health Services (California)
DNAPLs	Dense non-aqueous phase liquids
DQM	Data Quality Management
DQO	Data quality objective
DRMO	Defense Reutilization and Marketing Office
DSAT	Data Summary of Aquifer Test
DTSC	Department of Toxic Substances Control
DV	Davis Site (Davis Transmitter Facility)
ECP	Environmental Compliance Program
ECRSC	Environmental Community Relations Steering Committee
EE/CA	Engineering Evaluation/Cost Analysis
EIAP	Environmental Impact Analysis Process
EM	Directorate of Environmental Management
EMR	Environmental Restoration Program Division
EPA	Environmental Protection Agency (U.S.)
EPC	Environmental Compliance Program
EPCRA	Emergency Planning and Community Right-to-Know Act
EPIC	Environmental Process Improvement Center
ERA	Emergency Removal Action
EW	Extraction well
FAA	Federal Aviation Administration
FACE	Feasibility Assessment and Cost Estimate
FFSRA	Federal Facility Site Remediation Agreement
FS	Feasibility study
FSP	Field Sampling Plan
FY	Fiscal year
GIS	Geographic Information System
GMS	Geoscience Modelling System
gpm	gallons per minute
GSAP	Groundwater Sampling and Analysis Program
GW	Groundwater
GWTP	Groundwater Treatment Plant
HASP	Health and Safety Plan

HDLT	Historical Data Loading Tool
HSP	Health and Safety Plan
I	Informational
IAG	Interagency Agreement
IBM	International Business Machine
IC	Investigative Cluster
ID	Identification
IDW	Investigative derived waste
IPA	Interagency Personnel Agreement
IROD	Interim Record of Decision
IRP	Installation Restoration Program
IRPIMS	Installation Restoration Program Information Management System
IWL	Industrial waste line
IWTP	Industrial Wastewater Treatment Plant
KR	Kohler (off base site)
LF	Landfill
LN	Lincoln (off base site)
LOC	Location
McAFB	McClellan Air Force Base
MAP	Management Action Plan
MAT K	Maintenance Apron Terminal No. K
Met	Metals
MOGAS	Automotive gasoline
MSR	Monthly Status Report
NAP	Not applicable
NAPL	Non-aqueous phase liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	None detected
NEPA	National Environmental Policy Act, as amended
NFI	No further investigation
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance

OFFB	Off base
OSD NVZ	Old site designation, now included in the Vadose Zone site
OSHA	Occupational Safety and Health Act
OU	Operable unit
P	Primary
PA	Preliminary assessment
PCB	Polychlorinated biphenyls
PGOURI	Preliminary GW OU RI
PM/PC	Project Management/Program Control
POL	Petroleum, Oil, Lubricants
PP	Proposed Plan
ppb	parts per billion
PPDCE	Preliminary Process Design and Cost Estimate
PRG	Preliminary Remediation Goal
Prip	Primary pollutant
PRL	Potential Release Location
PSPRL	Partially Studied Potential Release Location
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
R/NR	Removed and not replaced with a UST or an AGT at the same location
R/RAGT	Removed and replaced with an AGT
RA	Remedial action
RAR	Risk analysis report
RCRA	Resource Conservation and Recovery Act, as amended
RD	Remedial design
REG-CON	Regulatory Concurrence
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
ROD	Record of Decision
RPM	Remedial Project Manager
RWQCB	Regional Water Quality Control Board
S	Secondary
S/S	Solidification/stabilization
SA	Study area

SAF-MIQ	Deputy Assistant Secretary of the Air Force (Environment Safety and Occupational Health)
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SAS	Statistical Analysis System
SC	Splinter City (off base site)
SDW	Solar detoxification of water
SI	Site investigation
SIVE	Steam Injection Vapor Extraction
SM	Summary Memorandum
SOAU	State-of-the-art UST
Sol	Solvent
SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
TBD	To be determined
TBR	To be removed
TCE	Trichloroethylene
TDY	Temporary duty
TF	Tank farm
TIS	Technical Information System
TQM	Total Quality Management
TRC	Technical Review Committee
TSCA	Toxic Substances Control Act
UPRL	Unstudied potential release location
US EPA	United States Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound
WIMS-ES	Work Information Management System—Environmental Subsystem
WP	Work plan

Appendix G
Historical Data Loading Status Summary

McClellan Air Force Base Technical Documents
Historical Data Loading Status Summary

Date	Report Title	Location	Status
11/85	Stage 1, Phase II Cont/DO #4-4402/5	AFCEE	Loading complete: Data in IRPIMS
6/83	Phase II Cont/DO #0-4400/20	AFCEE	Loading complete: Data in IRPIMS
12/88	No Stage or Phase Cont/DO #7-4023/6	AFCEE	Expected Loading Date 2/93
12/88	Phase RI/FS Cont/DO #87-4023/3	AFCEE	EDLT[1]
10/89	Stage 5, Area B Groundwater Operable Unit Remediation Investigation Cont/DO #87-4023/19	AFCEE	Expected Loading Date 3/93
4/86	Tech Memo Shallow Investigation Areas A, B, C, and Other Sites, 1 Vol.	AFCEE	Expected Loading Date 3/93
2/86	Tech Memo Shallow Investigation Areas A, B, C, and Other Sites, 3 Vol.	AFCEE	Expected Loading Date 3/93
5/86	Tech Memo Shallow Investigation Areas A, B, C, and Other Sites, 3 Vol.	AFCEE	Expected Loading Date 3/93
8/82	Phase II Confirmation Interim Report, 1 Vol.	AFCEE	Expected Loading Date 4/93
3/88	Phase II Confirmation/Quantification State 2-5 Cont/DO #84-4402/18	AFCEE	Expected Loading Date 4/93
6/88	First Quarter Sampling and Analysis Report, Stage 3 Cont/DO #87-4023/03	AFCEE	EDLT

[1] Another contractor is preparing the electronic submission of this report

Appendix H
Bibliography

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