INSTALLATION RESTORATION PROGRAM

Supplemental Site Investigation Report

February 1997

144TH FIGHTER WING
CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL, FRESNO, CALIFORNIA

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Supplemental Site Investigation Report documenting the results of soil and groundwater samples obtained during the 1992 field effort. This report covers Sites 1, 2, and 3. Based on the data the Sites were recommended for no further action under the IRP. The State concurred with this recommendation.

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Table of Contents

Page

List of Tables iii
List of Figures iv
List of Acronyms v
Executive Summary ES-1
1.0 Introduction 1-1
1.1 Purpose of Report 1-1
1.2 Background 1-1
1.3 Overview 1-2
2.0 Facility Background and Setting 2-1
2.1 Facility History 2-1
2.2 Preliminary Assessment 2-1
2.3 Site Descriptions 2-2
2.3.1 Site 1 - Old Fire Training Area 2-2
2.3.2 Site 2 - Base POL Area 2-2
2.3.3 Site 3 - Storage Area at the USMC Sublease Area 2-2
2.3.4 Site 4 - Suspect Burial Area 2-3
2.3.5 Site 5 - Base Collection Pond 2-3
2.4 Site Investigation Summary 2-4
2.4.1 Site 1 - Old Fire Training Area 2-6
2.4.2 Site 2 - Base POL Area 2-8
2.4.3 Site 3 - Storage Area at the USMC Sublease Area 2-8
2.4.4 Site 4 - Suspect Burial Area 2-11
2.4.5 Site 5 - Base Collection Pond 2-13
2.5 Environmental Setting 2-13
2.5.1 Climate 2-13
2.5.2 Geology 2-13
2.5.3 Hydrogeology 2-14
3.0 Supplemental Site Investigation Activities 3-1
3.1 Quarterly Groundwater Sampling Program 3-1
3.1.1 June/July 1992 Groundwater Sampling 3-1
3.1.2 October 1992 Groundwater Sampling 3-1

Table of Contents *(Continued)*

Page

3.1.3 January 1993 Groundwater Sampling 3-3
3.1.4 April 1993 Groundwater Sampling 3-3
3.2 Periodic Water Level Measuring 3-3
3.3 Evaluation of Site Investigation Soil Sample Results 3-3
4.0 Results 4-1
4.1 Groundwater Sampling Results 4-1
4.1.1 Site 1 Groundwater 4-1
4.1.2 Site 2 Groundwater 4-1
4.1.3 Site 3 Groundwater 4-4
4.2 Groundwater Elevation Measurements 4-4
4.3 Evaluation of Site Investigation Soil Sample Results 4-4
4.3.1 Site 1 Soil Sample Results Comparison 4-5
4.3.2 Site 2 Soil Sample Results Comparison 4-5
4.3.3 Site 3 Soil Sample Results Comparison 4-5
5.0 Summary and Recommendations 5-1
5.1 Summary 5-1
5.2 Recommendations 5-1
6.0 References 6-1
Appendix A - Groundwater Elevation Contour Maps

List of Tables

Table	Title	Page
2-1	Summary of Site Investigation Activities	2-5
3-1	Summary of Groundwater Sampling Activities for Water Table Wells	3-2
4-1	Summary of Groundwater Sample Detections for SI Sites	4-2
4-2	Comparison of Site 1 Soil Sample Results to Screening Levels	4-6
4-3	Comparison of Site 2 Soil Sample Results to Screening Levels	4-9
4-4	Comparison of Site 3 Soil Sample Results to Screening Levels	4-10

List of Figures

Figure	Title	Page
1-1	Vicinity Map	1-3
1-2	Base Map Location Map of Identified Investigation Sites	1-4
2-1	Soil Boring and Monitoring Well Locations at Site No. 1	2-7
2-2	Soil Boring and Monitoring Well Locations at Site No. 2	2-9
2-3	Soil Boring and Monitoring Well Locations at Site No. 3	2-10
2-4	Test Pit and Monitoring Well Locations at Site No. 4	2-12

List of Acronyms

ANG	Air National Guard
ANGRC	Air National Guard Readiness Center
BCP	Base Collection Pond
bgs	below ground surface
BTEX	benzene, toluene, ethyl benzene, and xylene
DOE	U.S. Department of Energy
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
FS	feasibility study
FTA	Fire Training Area
FW	Fighter Wing
HAZWRAP	Hazardous Waste Remedial Actions Program
HMTC	Hazardous Material Technical Center
IRP	Installation Restoration Program
IT	IT Corporation
JP-4	jet petroleum grade 4
MCL	maximum contaminant level
µg/L	micrograms per liter
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
PA	preliminary assessment
PCE	tetrachloroethene
POL	Petroleum, Oil, and Lubricants (Area)
PRG	preliminary remediation goal
RI	remedial investigation
SAP	sampling and analysis plan
SI	site inspection
SOV	soil organic vapor
TCE	trichloroethene
TPH-d	total petroleum hydrocarbons, as diesel
USMC	U.S. Marine Corps
UST	underground storage tank
VOC	volatile organic compound

Executive Summary

A site investigation (SI) was completed for five sites at the Fresno Air National Guard Base (the Base) in Fresno, California in 1992 with the issuance of the SI report. Recommendations from the SI report have been completed and are presented in this supplemental report. Environmental activities at the Base have followed the Air National Guard Readiness Center's (ANGRC) Installation Restoration Program (IRP) for identifying, characterizing, managing, and remediating sites with potential surface and subsurface contamination by past Base use or disposal practices. The SI consisted of characterizing four sites identified in a preliminary assessment as potential sources of environmental contamination:

- Site 1 - Old Fire Training area
- Site 2 - Base Petroleum Oil and Lubricant Area
- Site 3 - Storage Area at the USMC Sublease Area
- Site 4 - Suspect Burial Area.

As a result of information gained from the SI, a fifth site, the Base Collection Pond, was identified as a potential contributor to groundwater contamination beneath the Base. Following recommendations from the SI, the investigation moved into a supplemental SI for Sites 1, 2, 3, and 4, and moved to a remedial investigation for Site 5. However, Site 4, a suspect burial area, was removed from the list of IRP sites based on physical and analytical information obtained in the SI (IT, 1992a).

The SI report (IT, 1992a) recommended three general activities to supplement existing information for the SI sites. A quarterly groundwater sampling and periodic groundwater elevation monitoring program was implemented. Also, a baseline risk assessment was recommended to be performed to quantify risk from exposure to various chemicals detected at each site.

A quarterly groundwater sampling program was initiated in June 1992, and was completed in April 1993. Periodic groundwater elevation measurement rounds concluded in May 1993. Groundwater sampling results for each of the sites indicate that past materials handling or waste disposal practices have not impacted groundwater. Regional groundwater contamination is present in monitoring wells at Site 2, and also sporadically appears in Site 1 wells. Site-related chemicals of concern have not been detected in site-specific monitoring wells over their sampling history.

It was recommended by the State of California, and agreed to by the ANGRC, that a simple screening level comparison approach should be used in lieu of developing a rigorous baseline risk assessment for soil contamination at the SI sites. Concentrations of each analyte at each site were compared to residential preliminary remediation goals (PRG) that have been developed by the U.S. Environmental Protection Agency, Region IX. Results of the comparisons show that chemical constituents detected in soil at each site are not present at concentrations that may potentially pose a threat to human health. Therefore, no remedial actions are determined to be required for any of the SI sites.

Based on results from several groundwater sampling events and from a comparison of PRGs to measured contaminant concentrations in soil at each SI site, it is determined that no remedial actions are warranted for Site 1 (Old Fire Training Area), Site 2 (Base Petroleum, Oil, and Lubricants Area), or Site 3 (Storage Area at the U.S. Marine Corps Sublease Area). No site-related chemicals are present in groundwater at any site-specific monitoring wells. Constituent concentrations in soil are not present at concentrations that will pose a threat to human health.

Based on investigation results and risk-based screening level comparisons, it is recommended that Sites 1, 2, and 3 be removed from any further investigation or risk-based analytical activities and that no further action be taken under the IRP. Closure, or relocation, of underground storage tanks that are present at Site 2 must, however, follow appropriate actions as mandated by the State of California Leaking Underground Fuel Tank regulations at the time of closure/relocation.

Site 4 was removed from the IRP upon completion of the SI. Site 5 was moved into a remedial investigation and is reported separately from the SI sites.

1.0 Introduction

1.1 Purpose of Report

This supplemental site investigation (SI) report documents activities at the four SI sites at the California Air National Guard (ANG) Base in Fresno, California. Five investigation sites have been identified throughout the course of the Installation Restoration Program (IRP) at the Base. Only one of the five sites was carried forward into a remedial investigation (RI). This report has been produced by the Air National Guard Readiness Center (ANGRC) to keep SI and RI sites and activities separate because regulatory requirements apply differently to the two types of investigation sites.

When the SI report was issued and accepted as final (IT, 1992), the State of California requested that a quarterly groundwater sampling program be conducted to ensure that groundwater underneath the four sites was not being impacted as a result of past site activities. This report will discuss procedures and results from the quarterly groundwater sampling program. Additionally, this report will reevaluate SI soil sampling data to determine if any sites require further characterization for soil contamination, or if no further action is warranted.

At the time the SI report was produced, target cleanup levels for soil contamination had not been developed, e.g., if the concentration of chemical X in soil exceeded a certain cleanup level, then further evaluation of contamination/risk was warranted. The cleanup level represents a concentration of a contaminant that is expected to be less than a concentration that would reasonably be expected to cause a health concern to certain exposure populations. SI soil sampling showed low to moderate concentrations of certain organic compounds. To determine cleanup levels, the SI report recommended a baseline risk assessment be performed in order to establish cleanup criteria. With the development of preliminary remediation goals (PRG) by the U.S. Environmental Protection Agency (EPA), a standard risk assessment is no longer required and analytical results from the SI can be compared to PRGs to determine the need for further characterization or no further action. The supplemental SI report will present this comparison.

1.2 Background

The National Guard Bureau, now referred to as the ANGRC, through the Air Force Engineering and Services Center, has entered into an interagency agreement (No. 1489-1489-A1) with the U.S. Department of Energy (DOE). Under this agreement, DOE provides technical assistance for

implementing the ANGRC IRP and related activities. The ANGRC has requested support in assessing the extent of suspected contamination at the Fresno ANG Base (Figure 1-1).

Lockheed Martin Energy Systems, Inc. (formerly Martin Marietta Energy Systems, Inc.), operating subcontractor for DOE facilities at Oak Ridge, Tennessee, is providing technical assistance through the Hazardous Waste Remedial Actions Program (HAZWRAP). IT Corporation (IT) was contracted by Lockheed Martin Energy Systems, Inc. to conduct an SI and provide an SI report that served as the basis for subsequent IRP activities.

Four sites were originally listed as IRP sites:

- Site 1 - Old Fire Training Area (FTA)
- Site 2 - Base Petroleum, Oil and Lubricants (POL) Area
- Site 3 - Storage Area at the U.S. Marine Corps (USMC) Sublease Area
- Site 4 - Suspect Burial Area.

Site locations are shown in Figure 1-2. Sites 1, 2, and 3 were recommended for investigation as a result of a preliminary assessment (PA) that was completed in 1988. The fourth site was added to the SI program at the initiative of the ANGRC to investigate all areas of potential environmental concern. The SI was developed through the sampling and analysis plan (SAP), which was finalized in 1990 (IT, 1990). Plans were implemented in July 1990 and completed in February 1991.

As a result of the SI, a fifth site (Site 5 - Base Collection Pond [BCP]) was added to the list of IRP sites. Sufficient information was gained from the SI to suspect Site 5 as a potential source area for observed groundwater contamination in the uppermost saturated zone beneath the Base. After the issuance of the SI report in 1992 (IT, 1992), the investigation program moved to a supplemental SI for Sites 1, 2, and 3, and into an RI for characterizing site conditions in and around Site 5.

1.3 Overview

This supplemental SI report presents and discusses all SI-related information obtained since the conclusion of the SI report (IT, 1992). Investigation phases conducted between 1992 and 1994 include:

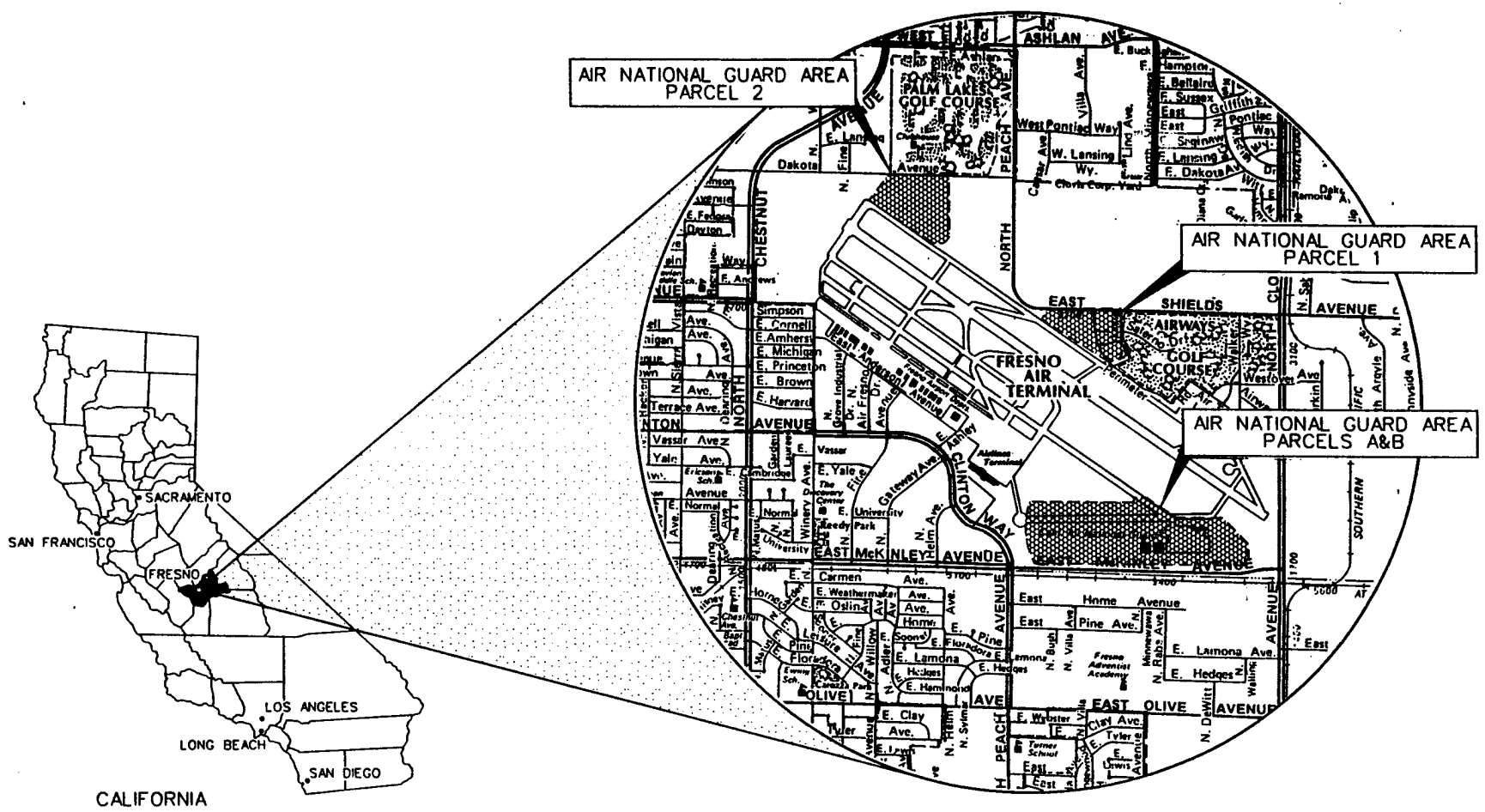

FIGURE 1-1
VICINITY MAP

CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL
FRESNO, CALIFORNIA

INTERNATIONAL
TECHNOLOGY
CORPORATION

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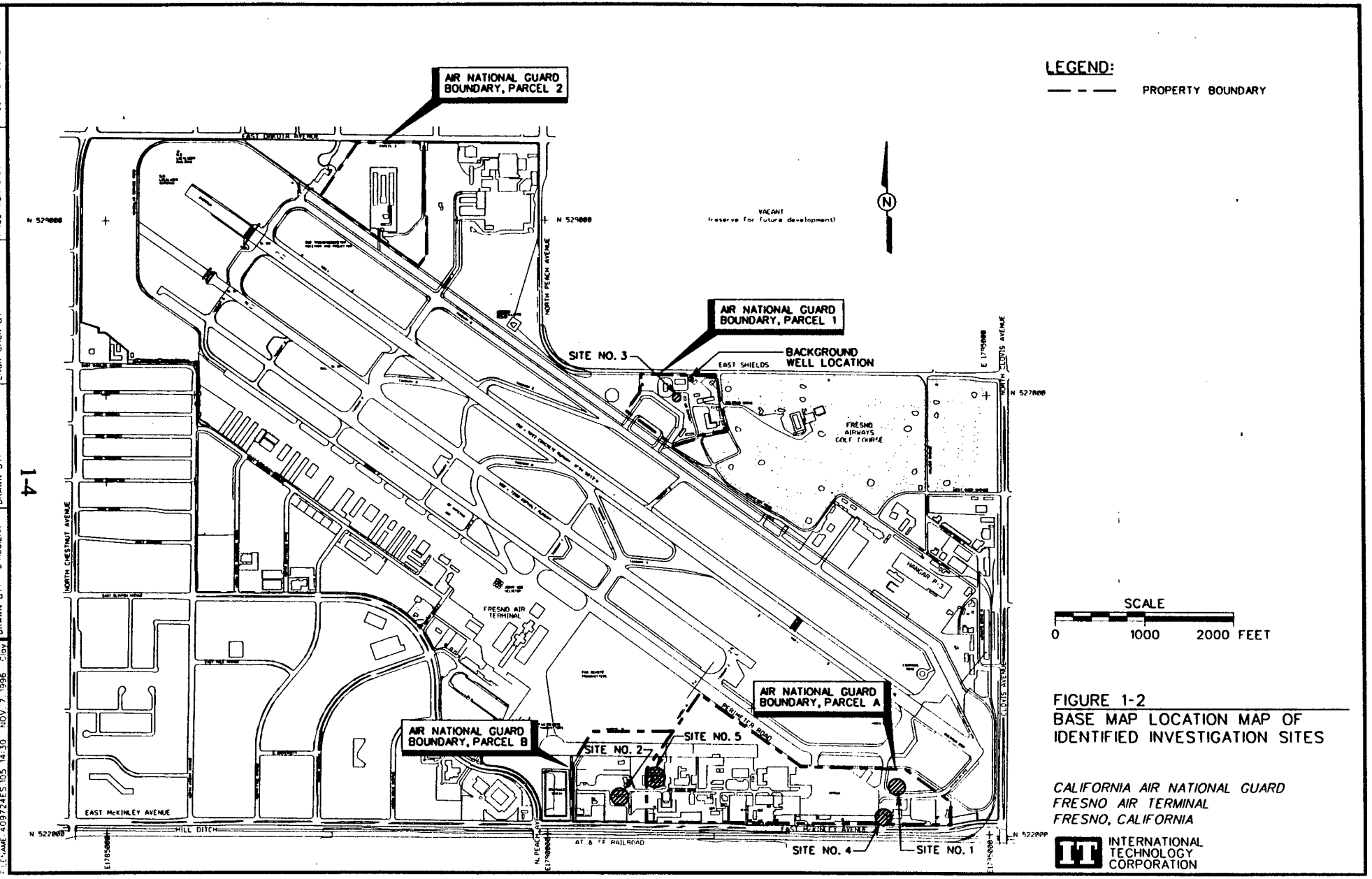

FIGURE 1-2
BASE MAP LOCATION MAP OF IDENTIFIED INVESTIGATION SITES

CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL
FRESNO, CALIFORNIA

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- Quarterly groundwater sampling and monthly groundwater monitoring program
- Supplemental evaluation of soil samples collected in the SI.

Recommendations from the SI included a quarterly groundwater sampling and monthly groundwater elevation monitoring program, as well as developing a baseline risk assessment for each SI site. However, additional evaluation of SI soil sampling data to health-based cleanup standards will be performed in lieu of site-specific risk assessments.

2.0 Facility Background and Setting

2.1 Facility History

The Fresno Air Terminal, located within the San Joaquin Valley of central California, is base for the 144th Fighter Wing (FW), California ANG. The 144th FW originally flew out of Oakland Municipal Airport in 1948 and moved to Hayward, California in 1951. Operations first began in Fresno in 1955 with the advent of jet aircraft. Before 1955, Fresno Air Terminal was referred to as Hammer Field and was used by the U.S. Army.

The California ANG leases approximately 140 acres of land from the City of Fresno on different parcels inside the airport boundaries (Figure 1-2). Sites 1, 2, 4, and 5 are located in the main leased parcels (Parcels A and B) which are bounded on the south by McKinley Avenue. On Parcel 1, bordered by Shields Avenue and taxiway B, the 144th FW hosts the USMC (Reserve) 4th Light Antiaircraft Motorized Battalion. Site 3 is in the area sublease by the USMC. Parcel 2, located immediately south of Dakota Avenue, does not contain any suspected contamination sites. The majority of SI activities took place on Parcels A and B (Figure 1-2). In subsequent chapters, "the Base" refers primarily to Parcels A and B, unless Site 3 (Parcel 1) is included in the discussion.

Missions of the 144th FW are to recruit, administer, and train ANG personnel and to maintain combat-ready equipment for short-notice mobilization for air defense of central California and the west coast of the United States.

2.2 Preliminary Assessment

In April 1988, a PA was completed by the Hazardous Material Technical Center (HMTC) focusing on past and present generation, use, handling, and disposal practices of hazardous waste and materials. Based on HMTC's findings, three suspect sites (Sites 1, 2, and 3) were identified as being potentially contaminated with hazardous waste/hazardous materials. These sites were assigned a Hazard Ranking Score according to the U.S. Air Force Hazardous Assessment Rating Methodology. Because of the potential for contamination and contaminant migration, further IRP investigation was recommended.

Site 4, suspected of being a former burial area where waste materials, either intentionally or inadvertently, may have been disposed, was added to the list by the ANGRC. The suspect burial

area was added as a commitment by the ANGRC to assess the extent of contamination and to confirm environmentally sound conditions at the Base.

2.3 Site Descriptions

The Fresno Air Terminal is within the corporate boundaries of Fresno, specifically in Range 20, Township 13, Sections 19, 29, and 30. The city of Clovis lies approximately 4 miles north of the terminal. Areas north, west and south of the terminal are predominantly residential and industrial, while the area east of the airport is mainly agricultural (City of Fresno, 1990).

The following site descriptions are drawn from the PA (HMTC, 1988) and from information gathered from Base personnel during the course of the project.

2.3.1 Site 1 - Old Fire Training Area

The location of the Old FTA (Site 1) on Base is shown in Figure 1-2. Site 1 was constructed as a circular, 10-inch-high, unlined earthen berm approximately 60 feet in diameter. A mock airplane was in the middle of the area and was periodically soaked with flammable liquids and set on fire for training exercises. The site was abandoned, covered with 3 to 4 feet of fill material, and subsequently graded in the early 1970s.

Materials that were burned for exercises during site operations included jet petroleum grade 4 (JP-4), aviation gas/fuel, and used POL from Base shops. It was estimated that between 500 and 1,000 gallons of flammable materials were used each month from the late 1960s through the early 1970s.

2.3.2 Site 2 - Base POL Area

The POL area was established in 1958 by the Base as the primary storage and distribution area for JP-4 fuel. Four 25,000-gallon steel underground storage tanks (UST) were emplaced for use at that time. Two additional 30,000-gallon USTs were installed in the early 1970s to meet demand for increased fuel usage. Current operating inventory is approximately 35,000 gallons of fuel per month. The location of the POL area (Site 2) on Base is shown in Figure 1-2.

2.3.3 Site 3 - Storage Area at the USMC Sublease Area

Site 3 was identified within one parcel of the Base that is sublease to the USMC. The site is centrally located along the northern edge of the airport, bordering the runways (Figure 1-2). The USMC uses the area primarily for vehicle and aerospace ground equipment maintenance. Site 3

was an abandoned POL storage area where products may have leaked or spilled onto the ground during normal handling, transfer, and storage to an underground waste oil tank.

During the PA, soil staining was observed along a fence line that previously surrounded the storage area. Staining was believed to have resulted from leaking waste POL. It was estimated that less than 100 gallons of waste oil had leaked onto the ground (HMTC, 1988). In mid-1988, the fence line, storage area, and waste oil tank were removed and relocated along with any evidence of soil staining as reported in the PA. The waste oil tank was relocated as an above-ground storage tank.

2.3.4 Site 4 - Suspect Burial Area

The suspect burial area was added to the list of sites investigated under the SI at the ANGRC's initiative based on refuse excavated during construction of a water line in the early 1970s. Typical items unearthed included household goods, stoves, plates, scrap metal, and building materials from disposal practices when the airport was used as an air base by the Army Air Corps.

Site 4 was identified as approximately 50 feet wide by 150 feet long (east-west) and located as shown in Figure 1-2. Based on information from former personnel involved in the construction, buried waste appeared to have been localized in a trench located 35 feet north of the fence line along McKinley Avenue.

Typical of operations near the end of World War II, items not salvageable would be disposed of in trenches before closing operations. Burial sites were also likely to be located close to base salvage yards. The former Quartermaster's salvage yard (shown in 1944 military construction drawings of Hammer Field) was located 400 feet east of Site 4.

Additional refuse was discovered when a revetment next to McKinley Avenue was under construction in the late 1980s. Household goods consisting of tableware and plates were uncovered at one footing location excavated during revetment construction. A metal can, approximately 1 gallon in size and similar to those containing food, paint or other material, was also uncovered during construction activities.

2.3.5 Site 5 - Base Collection Pond

Site 5 was added as a result of activities and sampling data generated during the SI. The location of the BCP within the western portion of the Base is shown in Figure 1-2. The BCP was a

collection sump that periodically received washdown waters and storm runoff from drains across the western portion of the Base and from portions of Mckinley Avenue. Water was allowed to percolate through soil at the pond to the regional water table. Infiltration was originally aided by five vertical gravel wells that were installed in the bottom of the BCP in the 1970s. Over time, however, the wells became clogged with sediment and their ability to transmit water was diminished.

The BCP covered an area of approximately 19,000 square feet and had steeply sloping sides down to the bottom, which was approximately 12 feet below ground surface (bgs). Three inflow pipes released washdown water and runoff to the BCP.

In early 1995, a request to construct at Site 5 was granted by the State of California, Department of Toxic Substances Control (DTSC). Approval was based on findings from investigations (presented elsewhere) that indicate that soils at Site 5 do not pose a threat to human health or the environment and are not a continuing source of contamination to groundwater. Presently, the BCP has been filled to grade with clean soil and, therefore, no longer exists as it did during previous investigations. The former BCP will later be converted into an aboveground fuel storage tank farm that will serve as a new location for the Base POL Area.

2.4 Site Investigation Summary

As a result of the PA, Fresno ANG was included in the ANGRC's IRP for further investigative activities. The IRP adopted an expanded approach to an SI such that data obtained would be able to allow one of several recommendations, including no further action, expedite an immediate remedial response, or expand the study to an RI/feasibility study (FS).

Data were collected during the SI to characterize soil conditions beneath each site and groundwater conditions of the uppermost saturated zone. Soil conditions were characterized in response to past site-related activities. Groundwater was characterized to determine potential effects that past activities have had on the uppermost saturated zone, which is the first hydrogeologic unit that would have been impacted by potential contamination or sources beneath the Base.

Field activities were conducted according to the SAP (IT, 1990). Field screening activities provided physical indications of subsurface and/or chemical conditions, which then guided subsequent confirmation activities. A complete and detailed discussion of field activities, sampling results, interpretations, and recommendations were presented in the SI report (IT, 1992). A summary from the SI report follow. Table 2-1 provides a summary of activities

Table 2-1

Summary of Site Investigation Activities
(Conducted from July 1990 to February 1991)
California Air National Guard - Fresno, California

Site No.	Description	Screening Activities			Confirmation Activities							Analytical Parameters[a]	
								Soil Samples Analyzed					
		Geophysical Survey	SOV Samples	Piezometers	Soil Borings	Test Pits	Monitoring Wells	Borehole	Test Pit	Shallow Soil	Groundwater Samples Analyzed	Soil	Groundwater
1	Old Fire Training Area	--	--	3	17	--	3	52	--	--	6	VOC, TPH-d, Lead, Total Organic Lead	VOC, TPH-d
2	POL Area	✓	40	3	8	--	3	23	--	--	6	BTEX, TPH-d	VOC, TPH-d
3	USMC Sublease Area	--	18	2	3	--	1	13	--	--	2	VOC, SVOC, TPH-d	VOC, SVOC, TPH-d
4	Suspect Burial Area	✓	52	2	--	8	2	--	11	--	4	VOC, SVOC, Pesticides/PCBs, TPH-d, CCR Metals, Total Organic Lead	VOC, SVOC, Pesticides/PCBs, TPH-d, CCR Metals
5	Base Collection Pond	--	--	--	--	--	--	--	--	8	--	VOC, SVOC, Pesticides/PCBs, TPH-d, Total Organic Lead	--
Base Perimeter		--	--	--	--	--	8	--	--	--	16		VOC, SVOC, Pesticides/PCBs
Base Background		--	--	--	1	--	2	--	--	--	3	VOC, SVOC, Pesticides/PCBs, TPH-d, RCRA Metals, Total Organic Lead	VOC, SVOC, Pesticides/PCBs, TPH-d, CCR Metals

[a]VOC = Volatile organic compounds by 8010/8020 (water) or Contract Laboratory Program (CLP) (soil) methods.
TPH-d = Total petroleum hydrocarbons - as diesel.
BTEX = Benzene, toluene, ethyl benzene, xylene by 8020.
SVOC = Semivolatile organic compounds (CLP).
PCB = Polychlorinated biphenyls (CLP).
CCR = California Code of Regulations list.
RCRA = Resource Conservation and Recovery Act list.

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conducted at each site during the SI. Soil sample results from the SI are compared to risk-based screening levels in Chapter 3.0.

2.4.1 Site 1 - Old Fire Training Area

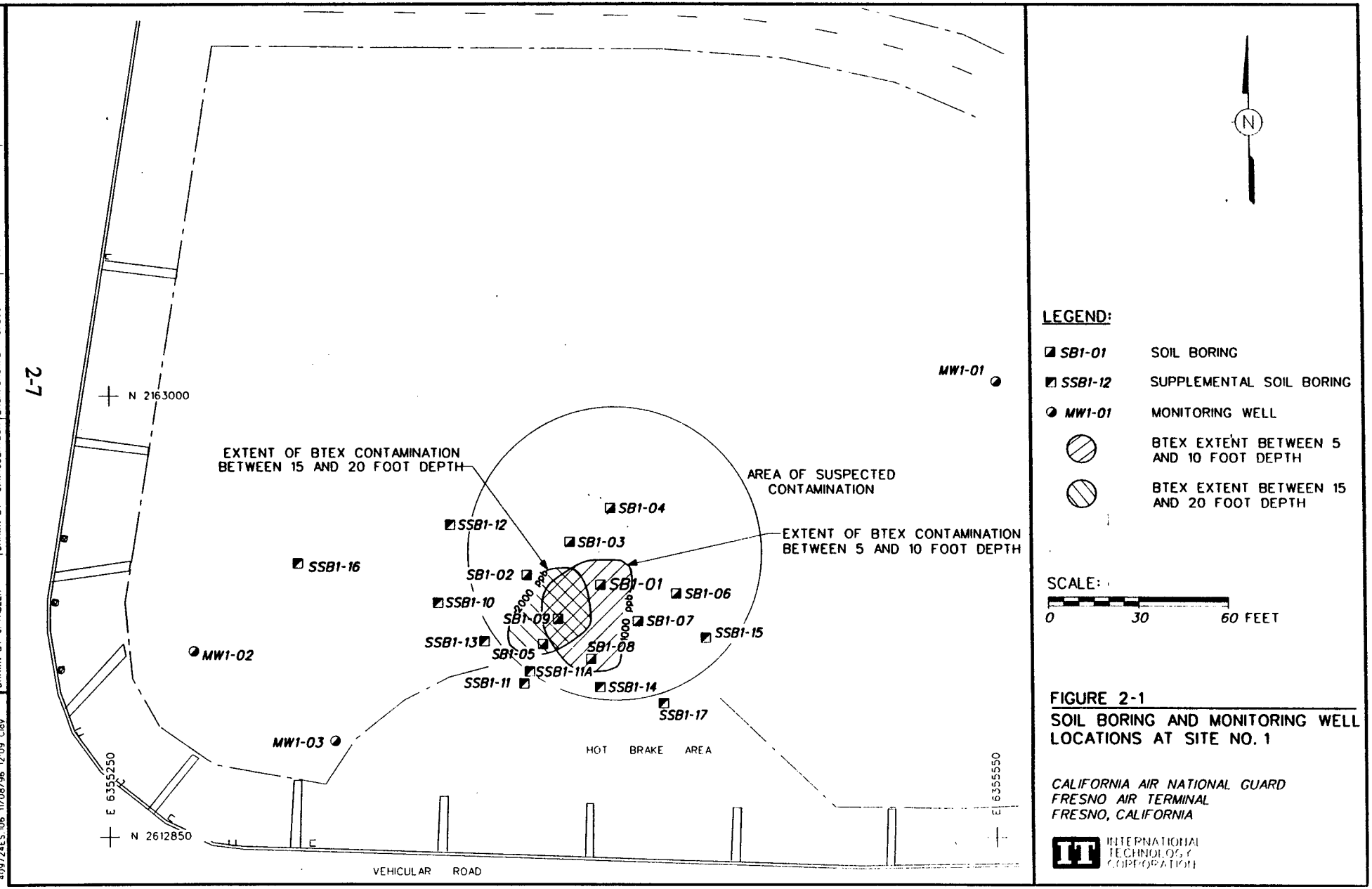
During the SI, 3 piezometers, 17 soil borings, and 3 monitoring wells were installed. More than 50 samples were collected to a depth of 60 feet for chemical analysis to confirm or deny the presence of soil contamination. Limited soil contamination by fuel hydrocarbons and related volatile organic compounds (VOC) was confirmed at Site 1. Soil boring locations and the physical extent of contamination as shown in the SI report is shown in Figure 2-1. Chemicals detected included 2-butanone (methyl ethyl ketone), acetone, ethyl benzene, xylenes, and total petroleum hydrocarbons, as diesel (TPH-d). Lead was also detected in soil samples. Organics were detected to depths of, but not below 25 feet. Lead was detected in samples throughout the soil column.

The following lists the detected chemical and the range of detected concentrations (in units specified) for each:

2-butanone	9 - 250 micrograms per kilogram (µg/kg)
4-methyl-2-pentanone	7 - 610 µg/kg
Acetone	8 - 2,800 µg/kg
Ethyl benzene	4,600 µg/kg
Toluene	28 - 5,600 µg/kg
Xylenes	3 - 38,000 µg/kg
TPH-d	120 - 3,500 milligrams per kilogram (mg/kg)
Lead	0.74 - 18.5 mg/kg

Several detected compounds, such as toluene and 2-butanone, were also detected in associated laboratory or field quality control samples, leading to the suggestion that some of the detections are artifacts of the sampling and analysis process and are not necessarily site-related. However, no distinction is made here for the purposes of describing the types and concentrations of analytes detected at Site 1. Further comparison of concentrations in soil to available screening levels is provided in Chapter 4.0.

Groundwater sampling showed no evidence of site-related contaminants in groundwater beneath the site. A preliminary hazard evaluation concluded that direct contact or exposure to impacted soil is not a concern.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LEGEND:
SB1-01 SOIL BORING
SSB1-12 SUPPLEMENTAL SOIL BORING
MW1-01 MONITORING WELL
BTEX EXTENT BETWEEN 5 AND 10 FOOT DEPTH
BTEX EXTENT BETWEEN 15 AND 20 FOOT DEPTH
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EXTENT OF BTEX CONTAMINATION BETWEEN 15 AND 20 FOOT DEPTH
AREA OF SUSPECTED CONTAMINATION
EXTENT OF BTEX CONTAMINATION BETWEEN 5 AND 10 FOOT DEPTH
SB1-04
SSB1-12
SB1-03
SSB1-16
SB1-02
SB1-01
SB1-06
SSB1-10
SB1-09
SB1-07
SSB1-15
SSB1-13
SB1-05
SB1-08
SSB1-11A
SSB1-11
SSB1-14
SSB1-17
MW1-02
MW1-03
HOT BRAKE AREA
E 6355250
E 6355550
N 2612850
VEHICULAR ROAD
FIGURE 2-1
SOIL BORING AND MONITORING WELL LOCATIONS AT SITE NO. 1
CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL
FRESNO, CALIFORNIA
INTERNATIONAL TECHNOLOGY CORPORATION
STARTING DATE: 3/18/91
DRAWN BY: J. TABLER
DATE LAST REV. 08/21/91
DRAWN BY: C.K.ROBERTSON
DRAFT. CHCK. BY: J. HUBBARD
ENGR. CHCK. BY: S. LOGAN
INITIATOR S. LOGAN
PROJ. MGR.: D. BURTON
PROJ. NO.: 409724
409724ES106 11/08/96 12:09 Clov
2-7

The SI determined the magnitude and extent of contamination associated with burning activities at the old FTA. Recommendations from the SI were to continue periodic groundwater sampling to confirm that groundwater quality was not deteriorating from site-related contamination.

Additionally, it was recommended that a baseline risk assessment be performed to quantify the leaching potential and impact of chemical constituents in soil to groundwater. However, with the development of risk-based PRGs, it was agreed by DTSC that a baseline risk assessment was no longer required for sites that were not carried forward to a RI. Rather, soil contaminant concentrations will be compared to PRGs in Section 4.2 to determine if further action is warranted.

2.4.2 Site 2 - Base POL Area

A total of 40 soil organic vapor survey (SOV) samples and 23 soil samples from 8 borings were collected and analyzed during the SI. Additionally, three monitoring wells were installed. Soil boring and monitoring well locations are shown in Figure 2-2. VOCs associated with fuel components (benzene, toluene, ethyl benzene, and xylene [BTEX]) were sporadically detected in SOV samples. BTEX compounds were only detected in 2 of 23 confirmation soil samples collected. Total BTEX was reported at 32 µg/kg in one sample.

Groundwater samples contained both trichloroethene (TCE) and tetrachloroethene (PCE) in monitoring wells installed upgradient and downgradient from Site 2. These organic compounds are not related to fuel handling activities and are indicative of a larger scale, regional groundwater contamination problem. BTEX compounds that were detected at light concentrations in soil were not detected in groundwater.

The Base POL Area is scheduled to be decommissioned by 2006, at which time a new tank farm will have been built. Further soil characterization activities were deferred until the area is decommissioned. Continued groundwater sampling was recommended to be performed to confirm that groundwater was not adversely impacted and to provide additional data on regional contamination by chlorinated solvents. A summary of groundwater sampling results is presented in Section 4.1.

2.4.3 Site 3 - Storage Area at the USMC Sublease Area

SI activities at Site 3 comprised collecting 18 SOV samples, drilling and sampling 3 borings, and installing 1 monitoring well (Figure 2-3). Additionally, two background monitoring wells were installed upgradient of Site 3 and served as both site- and Base-specific background monitoring wells. No significant findings were discovered with the SOV survey. No source area for

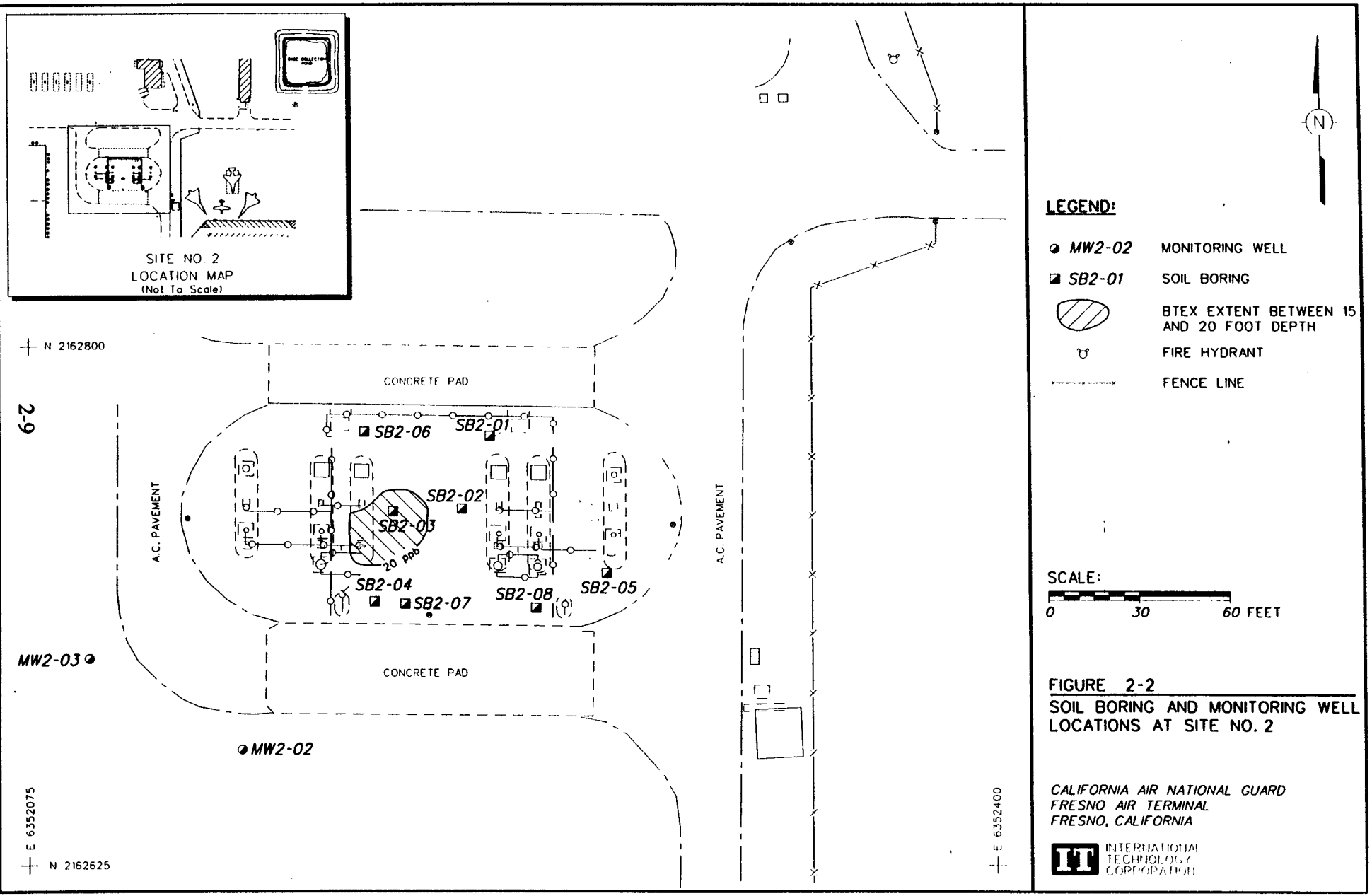
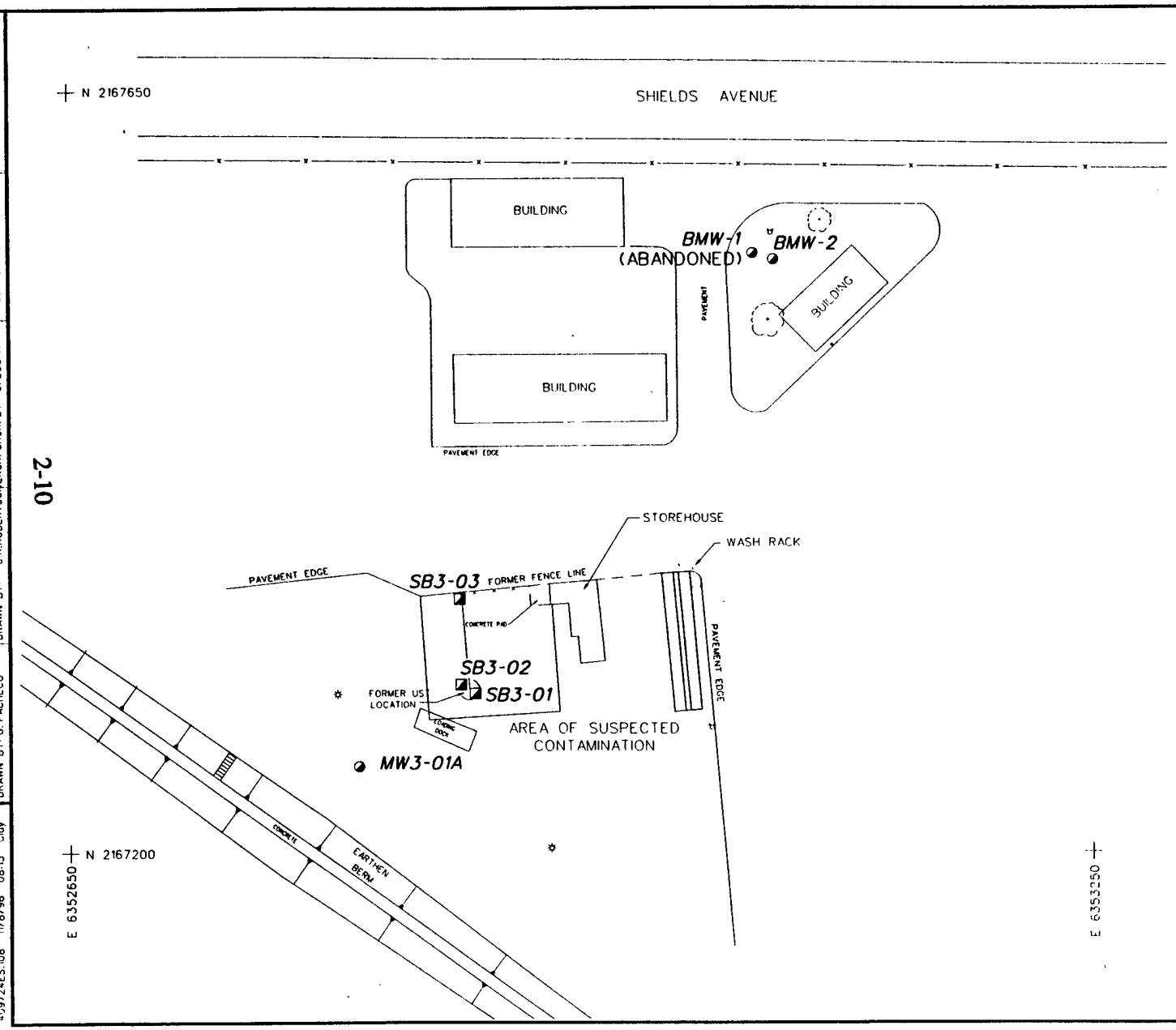


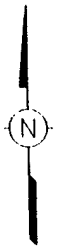
FIGURE 2-2
SOIL BORING AND MONITORING WELL LOCATIONS AT SITE NO. 2

CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL
FRESNO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 03/29/91 | DATE LAST REV.: | DRAFT. CHCK. BY: J. HUBBARD | INITIATOR S. [illegible] | DWG NO. 409724ES.107
DRAWN BY: G. PACHECO | DRAWN BY: | ENGR. CHCK BY: S. LOGAN | PROJ. MGR. D. BURTON | PROJ. NO.: 409724
409724ES.107 11/8/96 12:40 Clov





LEGEND:

SB3-01	SOIL BORING
BMW-1	BACKGROUND MONITORING WELL
MW3-01A	MONITORING WELL
	LIGHT POLE
	FIRE HYDRANT
	FENCE LINE
	TREE

SCALE:

0 60 120 FEET

FIGURE 2-3

SOIL BORING AND MONITORING WELL LOCATIONS AT SITE NO. 3

CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL
FRESNO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 03/21/91 | DATE LAST REV.: 08/21/91 | DRAFT CHCK. BY: CTUMLIN | INITIATOR: S. LOGAN | DWG. NO.: 409724ES.108
DRAWN BY: G. PACHECO | DRAWN BY: C.K.ROBERTSON | ENGR. CHCK. BY: S. LOGAN | PROJ. MGR.: D. BURTON | PROJ. NO.: 409724
409724ES.108 11/8/96 08:15 Clay

potential soil contamination was identified with either screening or confirmation samples. Only acetone (maximum concentration of 9 µg/kg) and bis(2-ethylhexyl)phthalate (92 µg/kg) were reported in any of the 13 soil samples collected for analysis.

An absence of detections in groundwater samples verified that groundwater has not been impacted by past handling and disposal activities at Site 3.

Recommendations from the SI included continuing periodic groundwater sampling to monitor groundwater quality at the site. A baseline risk assessment was also recommended to quantify exposure risks. However, with the development of risk-based PRGs, it was agreed by DTSC that a baseline risk assessment was no longer required for sites that were not carried forward to a RI. Rather, soil contaminant concentrations will be compared to PRGs in Section 4.2 to determine if further action is warranted.

2.4.4 Site 4 - Suspect Burial Area

A total of 52 SOV samples were collected, 8 test pits were excavated and sampled, and 2 monitoring wells were installed for the SI. Eleven soil samples were collected from the test pits. Test pit and monitoring well locations are shown in Figure 2-4. A surface geophysical survey was conducted to identify areas where subsurface metallic debris was present and test pits were excavated in these and surrounding areas. No contamination was detected with the SOV survey.

Several semivolatile organics were detected in soil samples. Lead was detected in each sample; however, lead concentrations were well below concentrations accepted as being protective of human health. Groundwater at Site 4 has not been impacted from any past site-related activities.

Materials unearthed in the test pits consisted of waste construction debris and other miscellaneous refuse, some of which appeared to have been burned prior to disposal. Residue from incomplete burning is a likely source of the semivolatiles detected in soil samples.

Based on the results from the SI and the lack of evidence that any hazardous materials were ever disposed at the site, Site 4 was removed from further investigation activities. Site 4 was removed from the list of IRP sites by DTSC and ANGRC with the acceptance of recommendations in the SI report.

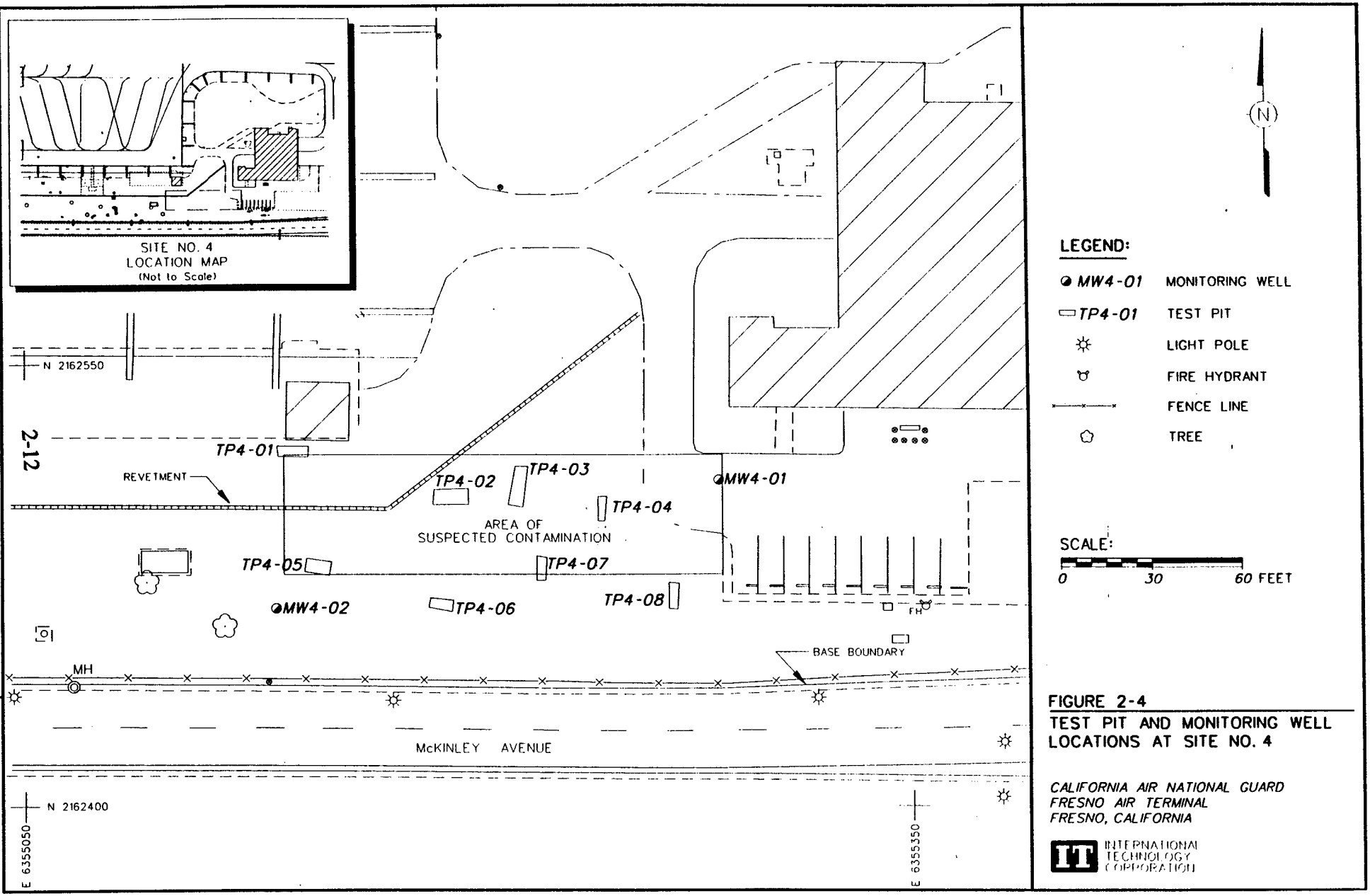


FIGURE 2-4
TEST PIT AND MONITORING WELL LOCATIONS AT SITE NO. 4

CALIFORNIA AIR NATIONAL GUARD
FRESNO AIR TERMINAL
FRESNO, CALIFORNIA

IT INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE 6/11/92 | DATE LAST REV: | DRAFT CHCK BY: J. HUBBARD | INITIATOR: D. BURTON | ENG NO: 409724ES.109
DRAWN BY: D. HIGGS | DRAWN BY: | ENGR CHCK. BY: S. LOGAN | PROJ MGR: D. BURTON | PROJ NO: 409724
409724ES.109 11/8/96 9:00 Clay

2.4.5 Site 5 - Base Collection Pond

Groundwater samples collected from perimeter monitoring wells installed during the SI indicated an on-Base source for PCE contamination in groundwater. The BCP was identified as a potential source, and the BCP was preliminarily investigated during a supplemental phase of the SI. Four shallow borings were advanced to depths of 3 feet. Sample analyses did not detect VOCs; some estimated concentrations of semivolatiles were detected. Results from shallow soil samples did not indicate that contaminants were currently being introduced through the BCP. However, additional investigation was recommended to identify a potential source area for PCE, and Site 5 was added to the list of IRP sites. Site 5 was moved into an RI, and will not be further discussed in the context of this supplemental SI report. A RI report has been prepared for investigation activities and results for Site 5 (IT, 1996).

2.5 Environmental Setting

The following subsections describe the environmental setting that governs the possible migration potential in the vicinity of each site.

2.5.1 Climate

The climate is characterized by hot, dry summers and cool, moist winters. Mean monthly temperatures range from 46 degrees Fahrenheit in December to 85 degrees in July. Winds are generally from the northwest. The average annual precipitation is less than 10 inches in the Fresno area. More than 90 percent of the yearly precipitation occurs between October and April. Yearly rainfall varies widely from year to year and shows long-term wet and dry periods. The mean evaporation rate is 66 inches per year.

2.5.2 Geology

Fresno is situated in the Central Valley province of California. The valley is a large, elongated, northwest trending, asymmetric structural trough that is bounded on the east by the Sierra Nevada and on the west by the Coast Ranges. Fresno is located in the eastern San Joaquin Valley on sedimentary deposits characterized by a mixture of poorly sorted clay, silt, sands and gravel with some beds of claystone, siltstone, sandstone, and conglomerate of Quaternary and Pliocene ages. The unconsolidated deposits extend to depths of 1,000 feet or more.

At the Base, geology is characterized by alluvial fan deposits (Cehrs, et al., 1979). The fans have low surface relief with very gentle gradients. Deposits in these fans are associated with an alluvial flood plain regime. Sediments on the fans range from clays to gravel, with finer sediments (silts and clays) associated with overbank and flood plain deposits, and coarser

sediments (sands and gravels) associated with levee, crevasse splay, channel lag, and point bar deposits.

Alluvial fan deposits are heterogeneous both vertically and laterally. Alluvial fans proximal to the site exhibit a wide variety of depositional processes. Alluvial deposits are variable both laterally and vertically with multiple source areas from shifting streams that transport, distribute, and deposit sediments (Cehrs et al., 1979). Therefore, beds beneath the general site are very localized in extent.

2.5.3 Hydrogeology

In the Fresno area, all municipal and rural domestic water is pumped from the alluvial aquifers. The aquifer has been described as unconfined or semiconfined depending on local hydrogeologic conditions (Cehrs et al., 1979; Steele, 1986). At the Base, the water table is approximately 80 feet bgs and flows from the northeast towards the southwest (IT, 1993; IT, 1996).

Groundwater flow, through the alluvial sediments comprising the aquifer system beneath the Fresno area, is controlled by the slope of the water table (to the southwest) and the occurrence of coarse-grained sediments within the alluvial fans. Coarse-grained sediments within fan deposits generally occur in northeast-southwest trending elongated sand bodies resulting from deposition in ephemeral stream channels that have shifted through time (Cehrs et al., 1979). Thus, in the Fresno area, groundwater flows generally to the southwest and preferentially through coarse-grained channel deposits.

3.0 Supplemental Site Investigation Activities

Investigation and other activities concerning the four SI sites include:

- Quarterly groundwater sampling program
- Periodic water level monitoring program
- Comparison of soil sample results to PRGs

The following subsections describe activities associated with each.

3.1 Quarterly Groundwater Sampling Program

A quarterly groundwater monitoring program was initiated in 1992 to provide information on the variability and/or stability of concentrations detected in water table monitoring wells. Four sampling rounds were conducted: June/July 1992, October 1992, January 1993, and April 1993. Table 3-1 lists the monitoring wells sampled and their respective analytical parameters for groundwater sampling for both the SI and quarterly sampling programs. Groundwater sampling procedures used during the SI were also used during the quarterly sampling program.

3.1.1 June/July 1992 Groundwater Sampling

Every monitoring well that was present on Base at that time was sampled, with the exception of well MW3-01A (which was physically obstructed by heavy equipment) and well BMW-1 (which had been damaged some time after completion of the SI, and was later abandoned). Analytical parameters that were specified for the SI were also analyzed during the first quarterly sampling round, as listed in Table 3-1. The exceptions to this were the monitoring wells associated with Site 4. After the SI was completed, Site 4 was removed from the IRP (IT, 1992); therefore, no groundwater samples were required to be collected. However, the two Site 4 wells were sampled in order to provide supplemental information regarding groundwater quality at nearby Site 1. As shown in Table 3-1, a total of 17 groundwater samples were collected.

3.1.2 October 1992 Groundwater Sampling

In September and October 1992, six additional monitoring wells were installed in association with the RI at Site 5. Four of these wells were installed along the Base perimeter, and were incorporated into the quarterly sampling program. For these new wells, analytical parameters were specified in the focused RI addendum (IT, 1992b), and are shown in Table 3-1. Based on analytical results from the previous sampling events, analytical parameters in eight Base perimeter and three Site 1 wells were reduced, as agreed to by the State of California and as

Table 3-1

Summary of Groundwater Sampling Activities for Water Table Wells
California Air National Guard - Fresno, California

Site No.	Well ID	Site Investigation												Quarterly Sampling Program																		Total Number of Sampling Events
		November 1990						February 1991						June/July 1992						October 1992						January 1993						April 1993						
		VOC	SVOC	TPH-d	Pest/PCB	Metals	Lead	VOC	SVOC	TPH-d	Pest/PCB	Metals	Lead	VOC	SVOC	TPH-d	Pest/PCB	Metals	Lead	VOC	SVOC	TPH-d	Pest/PCB	Metals	Lead	VOC	SVOC	TPH-d	Pest/PCB	Metals	Lead	VOC	SVOC	TPH-d	Pest/PCB	Metals	Lead	
1	MW1-01	✓		✓			✓	✓		✓			✓	✓		✓			✓	✓						✓						✓						6
	MW1-02	✓		✓			✓	✓		✓			✓	✓		✓			✓	✓						✓						✓						6
	MW1-03	✓		✓			✓	✓		✓			✓	✓		✓			✓	✓						✓						✓						6
2	MW2-01	✓		✓				✓		✓				✓		✓				✓		✓				✓		✓				✓		✓				6
	MW2-02	✓		✓				✓		✓				✓		✓				✓		✓				✓		✓				✓		✓				6
	MW2-03	✓		✓				✓		✓				✓		✓				✓		✓				✓		✓				✓		✓				6
3	MW3-01A	✓	✓	✓				✓	✓	✓										✓	✓	✓				✓						✓						5
4	MW4-01	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓		✓			✓																		3
	MW4-02	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓		✓			✓																		3
5	MW5-01[a]																			✓	✓		✓			✓						✓						3
	MW5-02[a]																			✓	✓		✓			✓						✓						3
Base background	BMW-1[b]	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓																										2
	BMW-2							✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓				✓		✓				✓		✓				5
Base perimeter	MWBP-01[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-02[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-03[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-04[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-05[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-06A[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-07[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-08[a]	✓	✓		✓			✓	✓		✓			✓	✓		✓			✓						✓						✓						6
	MWBP-09[a]																			✓	✓		✓			✓						✓						3
	MWBP-10[a]																			✓	✓		✓			✓						✓						3
	MWBP-11[a]																			✓	✓		✓			✓						✓						3
	MWBP-12[a]																			✓	✓		✓			✓						✓						3
Number of Samples per Round				18						19						17						22						22						22				

[a] Sampling activities and results for these wells are presented in association with the RI for Site 5.

[b] Well unusable in Jan. 1992; abandoned in Nov. 1993

VOC - Volatile organic compounds by 8010/8020

SVOC - Semivolatile organic compounds by CLP

TPH-d - Total petroleum hydrocarbons, as diesel

Pest/PCBs - Pesticides/polychlorinated biphenyls by CLP

shown in Table 3-1. Only VOCs were analyzed from these wells. Monitoring wells at Site 4 were removed from the sampling list and have not been sampled since June 1992. Table 3-1 lists the monitoring wells sampled and their respective analytical parameters for October 1992. A total of 22 wells were sampled.

3.1.3 January 1993 Groundwater Sampling

Each well that was sampled in October 1992 was also sampled in January 1993. Analytical parameters for certain wells were again reduced based on a lack of detections in previous sampling events. Parameters to be eliminated were discussed with and agreed to by the California Department of Toxic Substances Control and the Regional Water Quality Control Board (Central Valley Region). A total of 22 wells were sampled in January 1993 for VOCs analysis. Four wells (Table 3-1) were sampled also for TPH (as diesel) (TPH-d).

3.1.4 April 1993 Groundwater Sampling

The sampling program for April 1993 remained consistent with the January 1993 event; 22 wells were sampled for VOCs and TPH-d (four wells only). No changes between the third and fourth rounds were determined to be necessary. April 1993 was the final quarter in which groundwater samples were collected from the water table monitoring wells.

3.2 Periodic Water Level Measurements

As a part of the quarterly groundwater sampling program, water level measurements were collected monthly from June 1992 through May 1993. Water levels were measured in every well existing on Base at the time of the measurement round. This information was then added into the existing groundwater elevation database to monitor seasonal fluctuations and any changes in general groundwater flow direction.

In association with activities during the remedial investigation at Site 5, other measurement rounds were conducted periodically between May 1993 and March 1995. Groundwater elevation measurements from the SI through the completion of the RI are contained in Appendix A. Groundwater contour patterns for selected measurement rounds are also contained in Appendix A.

3.3 Evaluation of Site Investigation Soil Sample Results

As stated in Section 1.1, no risk-based screening levels were available at the time of the SI (1990) for comparing analytical results in order to determine if detected concentrations in soil samples would potentially pose a threat to human health under certain exposure scenarios.

Instead, a baseline risk assessment was recommended to be performed so that risks could be quantified for contaminant concentrations in soil.

However, since 1993, risk-based screening levels have been developed by various regulatory agencies, including EPA, Region IX, that have become industry standards for comparing analytical results. Screening levels, or PRGs, represent the maximum concentration of a constituent in soil that does not pose an unacceptable risk to human health. These values are derived using exposure scenarios for the human receptor population at greatest potential risk from constituents in soil. Conservative default values and assumptions are used in the scenario to ensure that the PRG is protective of all potential receptor populations.

If contaminant concentrations in a soil sample are less than the most stringent screening levels, then it can be reasonably stated that conditions in soil will not cause an unacceptable risk to human health. Soil sample results from the SI from Sites 1, 2, and 3 will, therefore, be compared to screening levels in lieu of using a baseline risk assessment to determine exposure risks associated with soil sampling results. Comparisons will be made to residential soil PRGs.

4.0 Results

4.1 Groundwater Sampling Results

Including the SI, six groundwater sampling rounds have been conducted between November 1990 and April 1993, as listed in Table 3-1. Not all of the wells have been sampled in each of the six events. Table 4-1 provides a summary of positive detections for all of the sampling events on a site by site or area basis. Groundwater sample results from the Base perimeter and Site 5 wells are presented and discussed within the RI report and are not necessary for discussing site-specific groundwater sample results for the SI sites. Groundwater sample results for Site 4 also are not discussed because Site 4 has been deleted from the list of IRP sites. Base-wide background monitoring well sample results are presented with data from Site 3.

4.1.1 Site 1 Groundwater

Three monitoring wells have been sampled six times each. TPH-d and lead were analyzed in the first three sampling rounds; VOCs have been analyzed six times.

TCE is the only VOC that was detected in any Site 1 well. It was detected five times at concentrations ranging from 0.6 to 1.4 micrograms per liter (µg/L), as shown in Table 4-1. For several of the samples, TCE was also detected in associated laboratory blanks, indicating that the presence of TCE may be an artifact of the analytical process. TCE was not detected in any soil samples collected from Site 1, leading to the conclusion that its presence in groundwater is not site-related, but is associated with a more widespread regional plume (IT, 1996). None of the detected concentrations exceed the maximum contaminant level (MCL) for TCE of 5 µg/L.

Lead was detected in four samples, at concentrations ranging from 1.1 to 9.4 µg/L, which is less than the MCL of 15 µg/L. Three of the four detections were reported from one sampling event, and lead was also detected in laboratory blank samples.

None of the organic compounds detected in soil at Site 1 has been detected in any groundwater samples, indicating that groundwater has not been impacted by past site activities.

4.1.2 Site 2 Groundwater

All three wells at Site 2 have been sampled six times each, and have been analyzed for TPH-d, and VOCs. A summary of detections is presented in Table 4-1.

Table 4-1

Summary of Groundwater Sample Detections for SI Sites
California Air National Guard - Fresno, California

(Page 1 of 2)

Sample ID	Parameter	Units	Results	Lab Qual	Valid Qual	Sample Date
Site 1 - Old Fire Training Area						
MW1-01-6/92	Lead	µg/L	8.9			6/30/92
MW1-01-02/91	Trichloroethene	µg/L	0.6	J		2/11/91
MW1-01-6/92	Trichloroethene	µg/L	0.7		J	6/30/92
MW1-02-02/91	Lead	µg/L	1.1	B	J	2/11/91
MW1-02-06/92	Lead	µg/L	9.4	B	U	6/29/92
MW1-02-11/90	Trichloroethene	µg/L	0.7	J		11/14/90
MW1-02-11/90FD	Trichloroethene	µg/L	0.7	J		11/14/90
MW1-02-02/91	Trichloroethene	µg/L	1.4			2/11/91
MW1-02-06/92	Trichloroethene	µg/L	0.7	J		6/29/92
MW1-03-06/92	Lead	µg/L	5	B*	U	6/29/92
Site 2 - Base POL Area						
MW2-01-10/92	Chloroform	µg/L	1.9			10/22/92
MW2-01-04/93	Chloroform	µg/L	0.7			4/19/93
MW2-01-11/90	Tetrachloroethene	µg/L	47	J		11/9/90
MW2-01-02/91	Tetrachloroethene	µg/L	52	J	J	2/6/91
MW2-01-06/92	Tetrachloroethene	µg/L	38			6/28/92
MW2-01-10/92	Tetrachloroethene	µg/L	25			10/22/92
MW2-01-01/93	Tetrachloroethene	µg/L	23			1/19/93
MW2-01-04/93	Tetrachloroethene	µg/L	15			4/19/93
MW2-01-11/90	Trichloroethene	µg/L	27	J		11/9/90
MW2-01-02/91	Trichloroethene	µg/L	20			2/6/91
MW2-01-06/92	Trichloroethene	µg/L	6			6/28/92
MW2-01-10/92	Trichloroethene	µg/L	8.4			10/22/92
MW2-01-01/93	Trichloroethene	µg/L	7			1/19/93
MW2-01-04/93	Trichloroethene	µg/L	3			4/19/93
MW2-02-02/91	Chloroform	µg/L	1.4			2/6/91
MW2-02-11/90	Tetrachloroethene	µg/L	100	J		11/9/90
MW2-02-02/91	Tetrachloroethene	µg/L	85	J	J	2/6/91
MW2-02-06/92	Tetrachloroethene	µg/L	22			6/28/92
MW2-02-10/92	Tetrachloroethene	µg/L	45			10/21/92
MW2-02-01/93	Tetrachloroethene	µg/L	69			1/19/93
MW2-02-04/93	Tetrachloroethene	µg/L	43			4/19/93
MW2-02-06/92	TPHC-as diesel	µg/L	230	J		6/28/92
MW2-02-10/92	trans-1,2-Dichloroethene	µg/L	7.1			10/21/92
MW2-02-11/90	Trichloroethene	µg/L	21	J		11/9/90
MW2-02-02/91	Trichloroethene	µg/L	9.5			2/6/91
MW2-02-06/92	Trichloroethene	µg/L	3.5			6/28/92
MW2-02-10/92	Trichloroethene	µg/L	5.6	J		10/21/92
MW2-02-01/93	Trichloroethene	µg/L	6			1/19/93
MW2-02-04/93	Trichloroethene	µg/L	5.9			4/19/93
MW2-03-02/91	Chloroform	µg/L	1.3			2/6/91
MW2-03-10/92	cis-1,2-Dichloroethene	µg/L	2.6			10/21/92
MW2-03-11/90	Tetrachloroethene	µg/L	41	J		11/9/90
MW2-03-02/91	Tetrachloroethene	µg/L	80	J	J	2/6/91
MW2-03-06/92	Tetrachloroethene	µg/L	30			6/28/92
MW2-03-10/92	Tetrachloroethene	µg/L	44			10/21/92
MW2-03-01/93	Tetrachloroethene	µg/L	46			1/19/93
MW2-03-04/93	Tetrachloroethene	µg/L	33			4/19/93
MW2-03-04/93Z	Tetrachloroethene	µg/L	33			4/19/93

Table 4-1

Summary of Groundwater Sample Detections for SI Sites
California Air National Guard - Fresno, California

Sample ID	Parameter	Units	Results	Lab Qual	Valid Qual	Sample Date
Site 2 - Base POL Area (continued)						
MW2-03-11/90	TPHC-as diesel	µg/L	430			11/9/90
MW2-03-11/90	Trichloroethene	µg/L	9.1	J		11/9/90
MW2-03-02/91	Trichloroethene	µg/L	11			2/6/91
MW2-03-06/92	Trichloroethene	µg/L	5.1			6/28/92
MW2-03-10/92	Trichloroethene	µg/L	6.6			10/21/92
MW2-03-01/93	Trichloroethene	µg/L	6.5			1/19/93
MW2-03-04/93	Trichloroethene	µg/L	5.8			4/19/93
MW2-03-04/93Z	Trichloroethene	µg/L	5.7			4/19/93
Site 3 - Storage Area at USMC Sublease Area						
MW3-01A-11/90	Chrysene	µg/L	6	J		11/14/90
Base Background Wells						
BMW-1-02/91	Arsenic	µg/L	1.4	B	J	2/13/91
BMW-1-11/90	Barium	µg/L	136	J		11/14/90
BMW-1-02/91	Barium	µg/L	129	B	U	2/13/91
BMW-1-11/90	Beryllium	µg/L	0.83	J		11/14/90
BMW-1-11/90	bis(2-Ethylhexyl)phthalate	µg/L	5	J		11/14/90
BMW-1-02/91	Cadmium	µg/L	4.1	B	J	2/13/91
BMW-1-11/90	Chromium	µg/L	4.1	J		11/14/90
BMW-1-11/90	Chrysene	µg/L	5	J		11/14/90
BMW-1-11/90	Copper	µg/L	4	J		11/14/90
BMW-1-11/90	Silver	µg/L	2.6	J		11/14/90
BMW-1-11/90	Vanadium	µg/L	19.6	J		11/14/90
BMW-1-11/90	Zinc	µg/L	24.7			11/14/90
BMW-2-02/91	Arsenic	µg/L	1.7	B	J	2/13/91
BMW-2-02/91	Barium	µg/L	31.5	B	U	2/13/91
BMW-2-02/91	Cadmium	µg/L	7.8			2/13/91
BMW-2-07/92	Cadmium	µg/L	4			7/1/92
BMW-2-07/92	Chromium	µg/L	10.2			7/1/92
BMW-2-07/92	Di-n-butyl phthalate	µg/L	0.6	J		7/1/92
BMW-2-07/92	Diethyl phthalate	µg/L	1	J		7/1/92
BMW-2-02/91	Lead	µg/L	1.4	B	J	2/13/91

NOTES:

Samples with a "Z" or "FD" suffix are field duplicate samples.

As listed in Table 4-1, TCE and PCE comprise the majority of compounds detected in groundwater samples. Chloroform was reported at low concentrations in four samples and dichloroethene was detected in two. TPH-d was detected in the first sample collected from well MW2-03 in November 1990, and in well MW2-02 in June 1992. Thereafter, no TPH-d was detected. The detection in MW2-03 is believed to have been caused by residual material from drilling and installation processes. The detection in MW2-02 is likely due to laboratory contamination since it was also reported in the laboratory blank sample.

Concentrations of TCE and PCE in Site 2 wells do exceed their respective MCLs of 5 µg/L. However, chlorinated organics are not associated with a fuel distribution system, and are not considered to be site related. All of the reported chlorinated organics are present in groundwater upgradient groundwater (IT, 1996). Groundwater, therefore, has not been impacted from site activities. Investigation of chlorinated organics in groundwater is developed on a Base-specific scale in the RI Report and is developed on a more regional scale in ERM-West, Inc., (1994).

4.1.3 Site 3 Groundwater

One monitoring well has been sampled five times. It has been sampled three times for semivolatiles and TPH-d, and five times for VOCs. Analytical results for the Site 3 well and upgradient background wells BMW-1 and BMW-2 are shown in Table 4-1.

The only organic compound detected in any sample was chrysene, a semivolatile compound. It was detected in the sample collected in November 1990. The Base background well (BMW-2) also detected chrysene at a similar concentration during the same sampling event. Chrysene was not detected in two subsequent sampling rounds nor was it found in any soil samples collected in the SI. Chrysene, therefore, is not considered to be site-related.

4.2 Groundwater Elevation Measurements

Groundwater elevation measurements from the SI through the completion of the RI are contained in Appendix A. Groundwater contour patterns for selected measurement rounds are also contained in Appendix A. As shown in the figures in Appendix A, groundwater flows across the Base in a general southwest direction.

4.3 Evaluation of Site Investigation Soil Sample Results

The SI report (IT, 1992) defined the nature and extent of soil contamination at the SI sites. This section will compare detected contaminant concentrations to established screening levels (PEGS)

to determine the potential exposure risks from each constituent. The methodology is to compare detected concentrations to the most restrictive screening levels in order to be protective of health.

If contaminant concentrations in a soil sample are less than the most stringent screening levels, then it can be reasonably stated that conditions in soil will not cause an unacceptable risk to human health or the environment. Soil sample results from the SI from Sites 1, 2, and 3 will, therefore, be compared to screening levels in lieu of using a baseline risk assessment to determine exposure risks associated with soil sampling results. Comparisons will be made to residential soil PEGS.

4.3.1 Site 1 Soil Sample Results Comparison

Table 4-2 presents chemical concentrations detected in each soil sample, along with PEGS developed under a residential scenario. Analytical results have been sorted in order of descending concentration to facilitate the comparison to each PRG.

A review of Table 4-2 shows that none of the organic compounds detected at Site 1 were reported at concentrations exceeding their respective screening level. This is also true for lead. No PRG exists for TPH-d, so no comparison can be made. However, it can be asserted that none of the analytes detected in soil at Site 1 will pose a threat to human health.

4.3.2 Site 2 Soil Sample Results Comparison

Table 4-3 presents chemical concentrations detected in each soil sample, along with PEGS developed under a residential scenario. Table 4-3 shows that all of the organic compounds detected at Site 2 were reported at concentrations much less than their respective screening level. Analytes detected in soil at Site 2 will not pose a threat to human health.

4.3.3 Site 3 Soil Sample Results Comparison

Table 4-4 presents chemical concentrations detected in each soil sample, along with PEGS developed under a residential scenario. Table 4-4 shows that all of the organic compounds detected at Site 3 were reported at concentrations much less than their respective screening level. Analytes at the concentrations detected in soil at Site 3 will not pose a threat to human health.

Table 4-2

Comparison of Site 1 Soil Sample Results to Screening Levels
California Air National Guard - Fresno, California

Sample ID	Parameter	Units	Result	Lab Qual	Valid Qual	Sample Date	EPA PRG Residential Soil
SB1-01-25.0-26.5	2-Butanone[a]	µg/kg	250			8/6/90	8.70E+06
SB1-08-23.5-25.0	2-Butanone[a]	µg/kg	230			8/20/90	8.70E+06
SB1-01-18.5-20.0	2-Butanone[a]	µg/kg	190	J		8/6/90	8.70E+06
SB1-01-20.0-21.5FD	2-Butanone[a]	µg/kg	180			8/6/90	8.70E+06
SB1-07-13.5-15.0	2-Butanone[a]	µg/kg	61			8/22/90	8.70E+06
SB1-01-04.0-05.5	2-Butanone[a]	µg/kg	9	J		8/6/90	8.70E+06
SB1-08-09.3-10.8	4-Methyl-2-pentanone[b]	µg/kg	610	J		8/20/90	5.20E+06
SB1-09-18.5-20.0	4-Methyl-2-pentanone[b]	µg/kg	500	J		8/22/90	5.20E+06
SB1-01-08.5-10.0	4-Methyl-2-pentanone[b]	µg/kg	320	J		8/6/90	5.20E+06
SB1-01-25.0-26.5	4-Methyl-2-pentanone[b]	µg/kg	71			8/6/90	5.20E+06
SB1-01-04.0-05.5	4-Methyl-2-pentanone[b]	µg/kg	42	J		8/6/90	5.20E+06
SB1-01-20.0-21.5FD	4-Methyl-2-pentanone[b]	µg/kg	34	J		8/6/90	5.20E+06
SB1-01-18.5-20.0	4-Methyl-2-pentanone[b]	µg/kg	13	J		8/6/90	5.20E+06
SB1-08-58.6-60.1	4-Methyl-2-pentanone[b]	µg/kg	13	J		8/21/90	5.20E+06
SB1-08-48.5-50.0	4-Methyl-2-pentanone[b]	µg/kg	12	J		8/20/90	5.20E+06
SB1-08-23.5-25.0	4-Methyl-2-pentanone[b]	µg/kg	7	J		8/20/90	5.20E+06
SB1-08-09.3-10.8	Acetone	µg/kg	2800	J		8/20/90	2.00E+06
SB1-05-16.0-17.5	Acetone	µg/kg	1900	J		8/23/90	2.00E+06
SB1-01-04.0-05.5DL	Acetone	µg/kg	1800	BD		8/6/90	2.00E+06
SB1-09-20.0-21.5	Acetone	µg/kg	1700	J		8/22/90	2.00E+06
SB1-09-18.5-20.0	Acetone	µg/kg	1500	J		8/22/90	2.00E+06
SB1-01-25.0-26.5	Acetone	µg/kg	780			8/6/90	2.00E+06
SB1-08-23.5-25.0	Acetone	µg/kg	650			8/20/90	2.00E+06
SB1-01-20.0-21.5FD	Acetone	µg/kg	640			8/6/90	2.00E+06
SB1-01-18.5-20.0	Acetone	µg/kg	560			8/6/90	2.00E+06
SB1-07-13.5-15.0	Acetone	µg/kg	220			8/22/90	2.00E+06
SB1-01-04.0-05.5	Acetone	µg/kg	190			8/6/90	2.00E+06
SSB1-17-08.5-10.0	Acetone	µg/kg	15			9/27/90	2.00E+06
SSB1-17-10.0-11.5	Acetone	µg/kg	14			9/27/90	2.00E+06
SSB1-17-38.5-40.0	Acetone	µg/kg	12	J		9/27/90	2.00E+06
SSB1-16-08.5-10.0	Acetone	µg/kg	11	J		9/27/90	2.00E+06
SSB1-16-38.5-40.0	Acetone	µg/kg	11	J		9/27/90	2.00E+06
SSB1-17-13.5-15.0	Acetone	µg/kg	9	J		9/27/90	2.00E+06
SSB1-16-16.0-17.5	Acetone	µg/kg	8	J		9/27/90	2.00E+06
SB1-08-09.3-10.8	Ethyl benzene	µg/kg	4600			8/20/90	2.90E+06
SB1-07-58.5-60.0	Lead	mg/kg	18.5			8/22/90	130
SB1-09-58.7-60.2	Lead	mg/kg	11.6			8/22/90	130
SB1-01-48.5-50.0	Lead	mg/kg	10.1	J		8/6/90	130
SB1-01-40.0-41.5	Lead	mg/kg	9.7	J		8/6/90	130
SB1-04-48.5-50.0	Lead	mg/kg	9.2	J		8/17/90	130
SB1-08-58.6-60.1	Lead	mg/kg	9.2			8/21/90	130
SSB1-11-48.5-50.0	Lead	mg/kg	8.9	J		9/26/90	130
SB1-05-58.0-59.5	Lead	mg/kg	8.3			8/23/90	130
SB1-01-53.5-55.0	Lead	mg/kg	8	J		8/6/90	130

Table 4-2

Comparison of Site 1 Soil Sample Results to Screening Levels
California Air National Guard - Fresno, California

Sample ID	Parameter	Units	Result	Lab Qual	Valid Qual	Sample Date	EPA PRG Residential Soil
SB1-08-48.5-50.0	Lead	mg/kg	7.3			8/20/90	130
SSB1-15-38.5-40.0	Lead	mg/kg	7.2	J		9/25/90	130
SSB1-17-38.5-40.0	Lead	mg/kg	7	J		9/27/90	130
SB1-03-58.3-59.8	Lead	mg/kg	6.8			8/23/90	130
SB1-06-48.2-49.7	Lead	mg/kg	6.4			8/20/90	130
SSB1-16-38.5-40.0	Lead	mg/kg	6.3	J		9/27/90	130
SB1-01-38.5-40.0	Lead	mg/kg	5.8	J		8/6/90	130
SSB1-14-38.5-40.0	Lead	mg/kg	5.8	J		9/26/90	130
SB1-02-48.5-50.0	Lead	mg/kg	5.6			8/16/90	130
SSB1-10-38.5-40.0	Lead	mg/kg	5.5	J		9/27/90	130
SB1-06-11.5-13.0FD	Lead	mg/kg	5.2	J		8/17/90	130
SSB1-12-38.5-40.0	Lead	mg/kg	4.8	J		9/24/90	130
SB1-05-16.0-17.5	Lead	mg/kg	4.4			8/23/90	130
SB1-02-19.0-20.5	Lead	mg/kg	4			8/16/90	130
SB1-07-15.0-16.5FD	Lead	mg/kg	3.7			8/22/90	130
SSB1-11-10.0-11.5FD	Lead	mg/kg	3.6	J		9/26/90	130
SB1-08-23.5-25.0	Lead	mg/kg	3.5			8/20/90	130
SB1-01-25.0-26.5	Lead	mg/kg	3.3	J		8/6/90	130
SSB1-16-16.0-17.5	Lead	mg/kg	3.2	J		9/27/90	130
SSB1-17-13.5-15.0	Lead	mg/kg	3.2	J		9/27/90	130
SB1-03-18.5-20.0	Lead	mg/kg	3			8/23/90	130
SSB1-14-18.5-20.0	Lead	mg/kg	3	J		9/26/90	130
SSB1-15-20.0-21.5FD	Lead	mg/kg	3	J		9/25/90	130
SB1-07-13.5-15.0	Lead	mg/kg	2.9			8/22/90	130
SSB1-11-08.5-10.0	Lead	mg/kg	2.9	J		9/26/90	130
SSB1-13-18.5-20.0	Lead	mg/kg	2.9	J		9/21/90	130
SB1-09-18.5-20.0	Lead	mg/kg	2.8			8/22/90	130
SSB1-10-18.5-20.0	Lead	mg/kg	2.7	J		9/27/90	130
SSB1-11A-13.5-15.0	Lead	mg/kg	2.7	J		9/26/90	130
SSB1-17-15.0-16.5FD	Lead	mg/kg	2.7	J		9/27/90	130
SB1-02-10.0-11.5	Lead	mg/kg	2.6			8/16/90	130
SSB1-16-08.5-10.0	Lead	mg/kg	2.5	J		9/27/90	130
SSB1-13-38.5-40.0	Lead	mg/kg	2.4	J		9/21/90	130
SSB1-12-18.5-20.0	Lead	mg/kg	2.2	J		9/24/90	130
SB1-01-04.0-05.5	Lead	mg/kg	2.1	J		8/6/90	130
SSB1-17-08.5-10.0	Lead	mg/kg	2.1	J		9/27/90	130
SB1-01-18.5-20.0	Lead	mg/kg	2	J		8/6/90	130
SB1-08-09.3-10.8	Lead	mg/kg	2			8/20/90	130
SSB1-15-18.5-20.0	Lead	mg/kg	1.9	J		9/25/90	130
SB1-01-01.0-02.5	Lead	mg/kg	1.8	J		8/6/90	130
SSB1-14-10.0-11.5	Lead	mg/kg	1.8	J		9/26/90	130
SB1-09-20.0-21.5	Lead	mg/kg	1.5			8/22/90	130
SSB1-17-10.0-11.5	Lead	mg/kg	1.5	J		9/27/90	130
SB1-01-20.0-21.5FD	Lead	mg/kg	1.3	J		8/6/90	130
SB1-03-20.0-21.5	Lead	mg/kg	1.3			8/23/90	130

Table 4-2

Comparison of Site 1 Soil Sample Results to Screening Levels
California Air National Guard - Fresno, California

Sample ID	Parameter	Units	Result	Lab Qual	Valid Qual	Sample Date	EPA PRG Residential Soil
SSB1-15-08.5-10.0	Lead	mg/kg	1.3	J		9/25/90	130
SB1-01-08.5-10.0	Lead	mg/kg	1.2	J		8/6/90	130
SSB1-10-08.5-10.0	Lead	mg/kg	1.1	J		9/27/90	130
SSB1-12-08.5-10.0	Lead	mg/kg	1.1	J		9/24/90	130
SSB1-13-09.0-10.5	Lead	mg/kg	1.1	J		9/21/90	130
SSB1-14-08.5-10.0	Lead	mg/kg	1.1	J		9/26/90	130
SB1-09-08.5-10.0	Lead	mg/kg	0.94			8/22/90	130
SB1-06-10.0-11.5	Lead	mg/kg	0.86	J		8/17/90	130
SB1-04-10.2-11.7	Lead	mg/kg	0.74	J		8/17/90	130
SB1-01-04.0-05.5DL	Methylene chloride	µg/kg	1300	BD		8/6/90	11000
SB1-01-01.0-02.5DL	Methylene chloride	µg/kg	1200	BD		8/6/90	11000
SB1-08-23.5-25.0	Methylene chloride	µg/kg	51			8/20/90	11000
SSB1-17-10.0-11.5	Methylene chloride	µg/kg	33			9/27/90	11000
SSB1-17-08.5-10.0	Methylene chloride	µg/kg	20			9/27/90	11000
SB1-01-01.0-02.5	Tetrachloroethene	µg/kg	21	J		8/6/90	7000
SB1-08-09.3-10.8	Toluene	µg/kg	5600			8/20/90	1.90E+06
SB1-01-08.5-10.0	Toluene	µg/kg	1400			8/6/90	1.90E+06
SB1-05-16.0-17.5	Toluene	µg/kg	870			8/23/90	1.90E+06
SB1-09-18.5-20.0	Toluene	µg/kg	350	J		8/22/90	1.90E+06
SB1-09-08.5-10.0	Toluene	µg/kg	190	J		8/22/90	1.90E+06
SB1-01-04.0-05.5	Toluene	µg/kg	28			8/6/90	1.90E+06
SB1-08-09.3-10.8	TPH - as diesel	mg/Kg	3500	J		8/20/90	NA
SB1-01-08.5-10.0	TPH - as diesel	mg/Kg	3470	J		8/6/90	NA
SB1-09-08.5-10.0	TPH - as diesel	mg/Kg	1700	J		8/22/90	NA
SB1-01-01.0-02.5	TPH - as diesel	mg/Kg	1530	J		8/6/90	NA
SB1-01-04.0-05.5	TPH - as diesel	mg/Kg	900	J		8/6/90	NA
SB1-09-18.5-20.0	TPH - as diesel	mg/Kg	120	J		8/22/90	NA
SB1-08-09.3-10.8	Xylenes (total)	µg/kg	38000			8/20/90	980000
SB1-01-08.5-10.0	Xylenes (total)	µg/kg	25000			8/6/90	980000
SB1-05-16.0-17.5	Xylenes (total)	µg/kg	13000			8/23/90	980000
SB1-09-18.5-20.0	Xylenes (total)	µg/kg	2200			8/22/90	980000
SB1-09-08.5-10.0	Xylenes (total)	µg/kg	1700			8/22/90	980000
SB1-01-04.0-05.5	Xylenes (total)	µg/kg	940			8/6/90	980000
SSB1-10-08.5-10.0	Xylenes (total)	µg/kg	3	J		9/27/90	980000

[a]Butanone, or methyl ethyl ketone

[b]4-Methyl-2-pentanone, or methyl isobutyl ketone

Table 4-3

Comparison of Site 2 Soil Sample Results to Screening Levels
California Air National Guard - Fresno, California

Sample ID	Parameter	Units	Result	Lab Qual	Valid Qual	Sample Date	EPA PRG Residential Soil
SB2-03-18.5-20.0	2-Hexanone[a]	µg/kg	2	J		8/9/90	5.20E+06[a]
SB2-03-18.5-20.0	Benzene	µg/kg	6			8/9/90	1400
SB2-03-47.5-48.0	Benzene	µg/kg	4	J		8/9/90	1400
SB2-03-18.5-20.0	Toluene	µg/kg	11			8/9/90	1.90E+06
SB2-03-18.5-20.0	Xylenes (total)	µg/kg	15			8/9/90	9.80E+05

[a] Also known as methyl butyl ketone. Used PRG for methyl isobutyl ketone

Table 4-4

Comparison of Site 3 Soil Sample Results to Screening Levels
California Air National Guard - Fresno, California

Sample ID	Parameter	Units	Result	Lab Qual	Valid Qual	Sample Date	EPA PRG Residential Soil
SB3-03-18.5-20.0	Acetone	µg/kg	9	J		8/7/90	2.00E+06
SB3-03-53.5-55.0	Acetone	µg/kg	9	J		8/7/90	2.00E+06
SB3-03-28.5-30.0	Acetone	µg/kg	5	J		8/7/90	2.00E+06
SB3-03-45.0-46.5	Acetone	µg/kg	5	J		8/7/90	2.00E+06
SB3-03-04.0-05.5	Acetone	µg/kg	4	J		8/7/90	2.00E+06
SB3-03-43.5-45.0	Acetone	µg/kg	4	J		8/7/90	2.00E+06
SB3-03-08.5-10.0	Acetone	µg/kg	3	J		8/7/90	2.00E+06
SB3-03-01.0-02.5	bis(2-Ethylhexyl)phthalate	µg/kg	92	J		8/7/90	32000

5.0 Summary and Recommendations

5.1 Summary

The SI report (IT, 1992) recommended three general activities to supplement existing information for the four SI sites. A quarterly groundwater sampling and periodic groundwater elevation monitoring program was implemented. Also, a baseline risk assessment was recommended to be performed to quantify risk from exposure to various chemicals detected at each site.

A quarterly groundwater sampling program was initiated in June 1992, and was completed in April 1993. Periodic groundwater elevation measurement rounds concluded in May 1993. Groundwater sampling results for each of the sites indicate that past materials handling or waste disposal practices have not impacted groundwater. Regional groundwater contamination is present in monitoring wells at Site 2, and also sporadically appears in Site 1 wells. Site-related chemicals of concern have not been detected in site-specific monitoring wells over their sampling history.

It was recommended by the State of California, and agreed to by the ANGRC, that a simple screening level comparison approach should be used in lieu of developing a rigorous baseline risk assessment for soil contamination at the SI sites. Concentrations of each analyte at each site were compared to residential PEGS that have been developed by EPA, Region IX. Results of the comparisons show that chemical constituents detected in soil at each site are not present at concentrations that may potentially pose a threat to human health. Therefore, no remedial actions are determined to be required for any of the SI sites.

5.2 Recommendations

Based on results from several groundwater sampling events and from a comparison of PEGS to measured contaminant concentrations in soil at each SI site, it is determined that no remedial actions are warranted for Site 1 (Old FTA), Site 2 (Base POL Area), or for Site 3 (Storage Area at the USMC Sublease Area). No site-related chemicals are present in groundwater at any site-specific monitoring wells. Constituent concentrations in soil are not present at concentrations that will pose a threat to human health.

Based on investigation results and risk-based screening level comparisons, it is recommended that no further action be taken under the IRP for the following sites at the Fresno ANG Base:

- Site 1 - Old Fire Training Area
- Site 2 - Base Petroleum, Oil and Lubricants Area
- Site 3 - Storage Area at the USMC Sublease Area.

Closure, or relocation, of underground storage tanks that are present at Site 2 must, however, follow appropriate actions as mandated by the State of California Leaking Underground Fuel Tank regulations at the time of closure/relocation.

6.0 References

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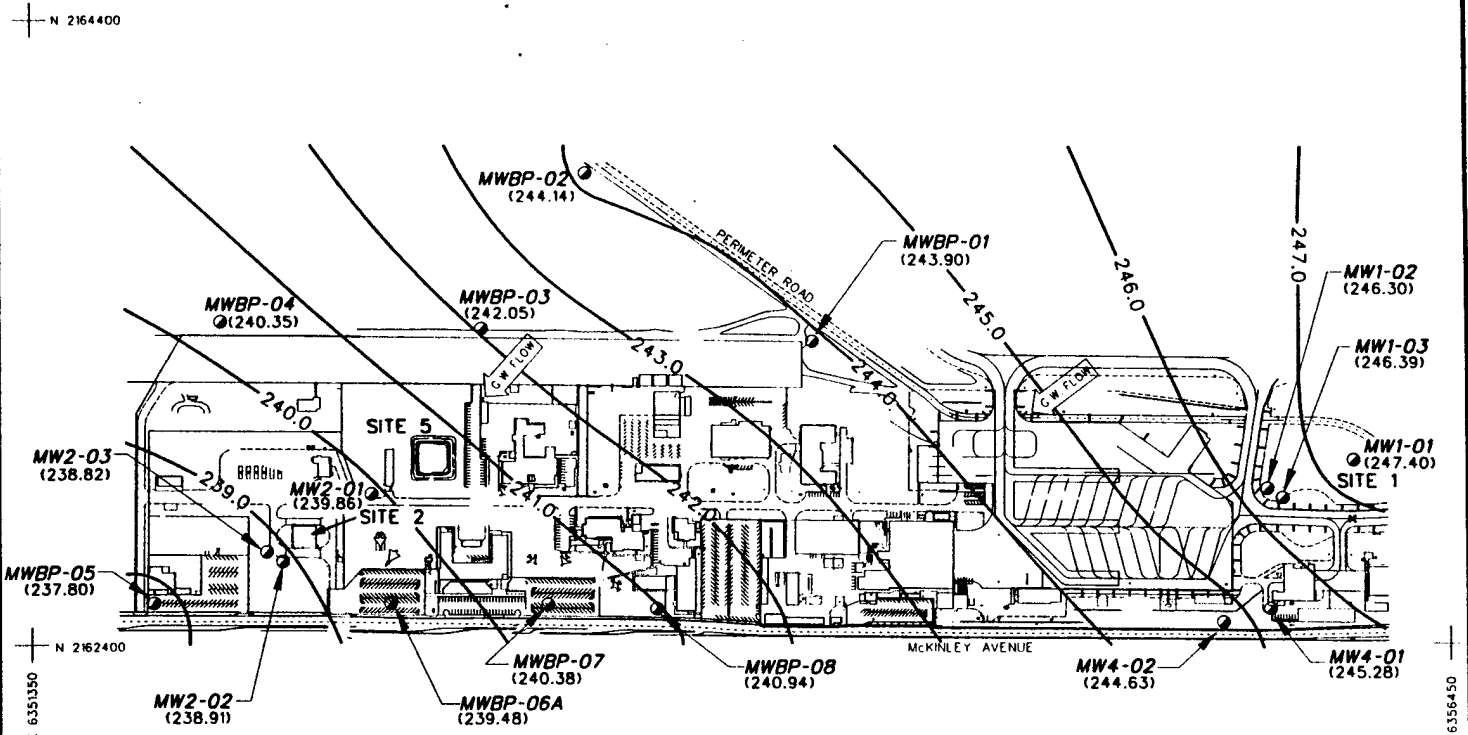
APPENDIX A

GROUNDWATER ELEVATION CONTOUR MAPS



LEGEND:

MW2-01 (239.86)	MONITORING WELL WITH MEASURED GROUNDWATER ELEVATION (ft. MSL)
244.0	GROUNDWATER ELEVATION CONTOUR
G.W. FLOW	GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL = 1.0 FT.

SCALE:

0 400 800FEET

FIGURE A-1
GROUNDWATER ELEVATION CONTOURS FOR WATER TABLE WELLS, NOVEMBER 1990

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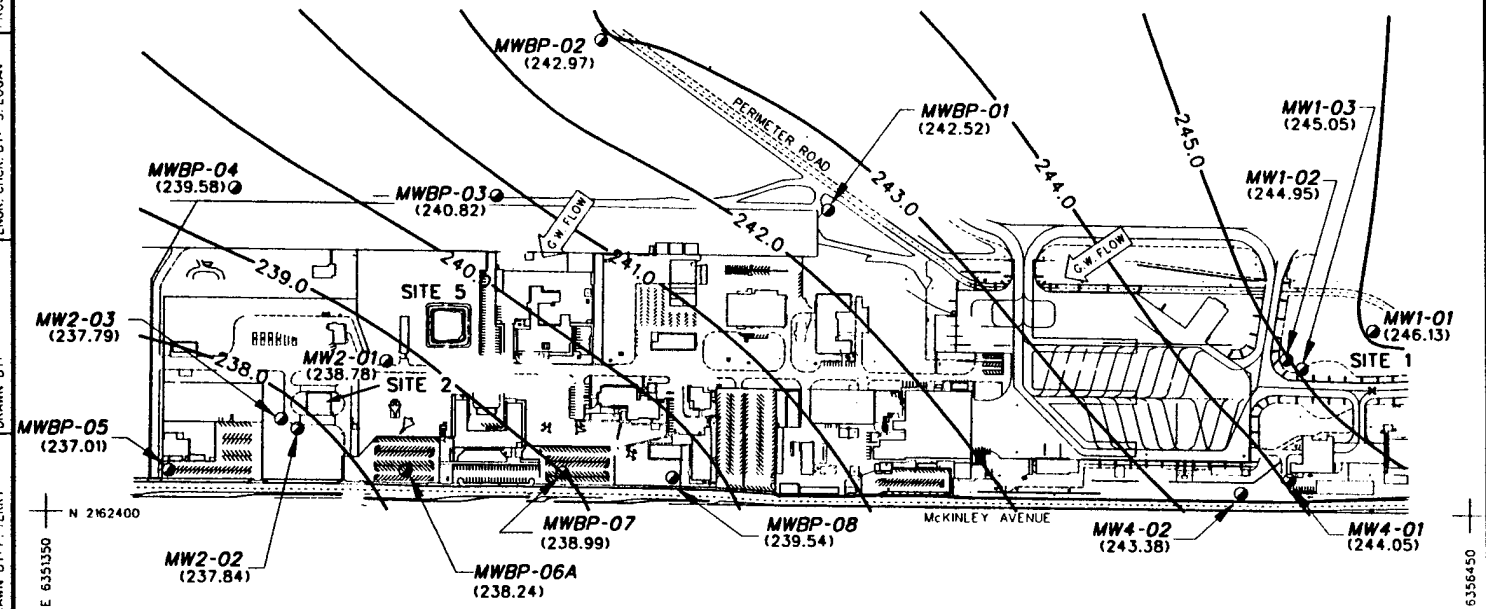
DRAWN BY: P. TERRY | DRAWN BY: | ENGR. CHCK. BY: S. LOGAN | PROJ. MGR.: D. BURTON | PROJ. NO.: 409724

409724ES.100 16:00 Nov 7, 1996 Clay



LEGEND:

MW2-01 (238.78)	MONITORING WELL WITH MEASURED GROUNDWATER ELEVATION (ft. MSL)
244.0	GROUNDWATER ELEVATION CONTOUR
G W FLOW	GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL - 1.0 FT.

SCALE:

0 400 800FEET

FIGURE A-2
GROUNDWATER ELEVATION CONTOURS FOR WATER TABLE WELLS, JANUARY 1992

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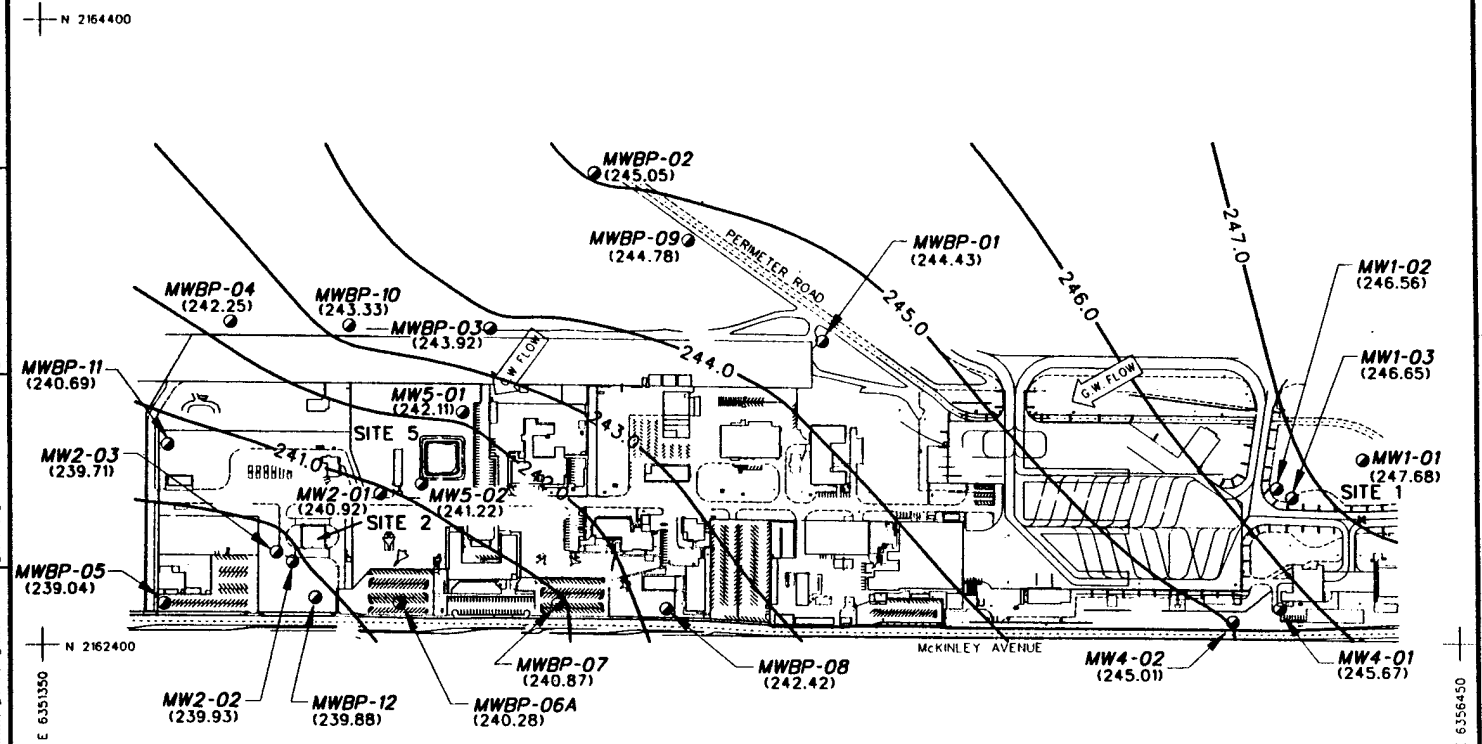

LEGEND:

MW2-01 (240.92)	MONITORING WELL WITH MEASURED GROUNDWATER ELEVATION (ft. MSL)
244.0	GROUNDWATER ELEVATION CONTOUR
GW FLOW	GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL = 1.0 FT.

SCALE:

0 400 800FEET

FIGURE A-3
GROUNDWATER ELEVATION CONTOURS FOR WATER TABLE WELLS, DECEMBER 1992

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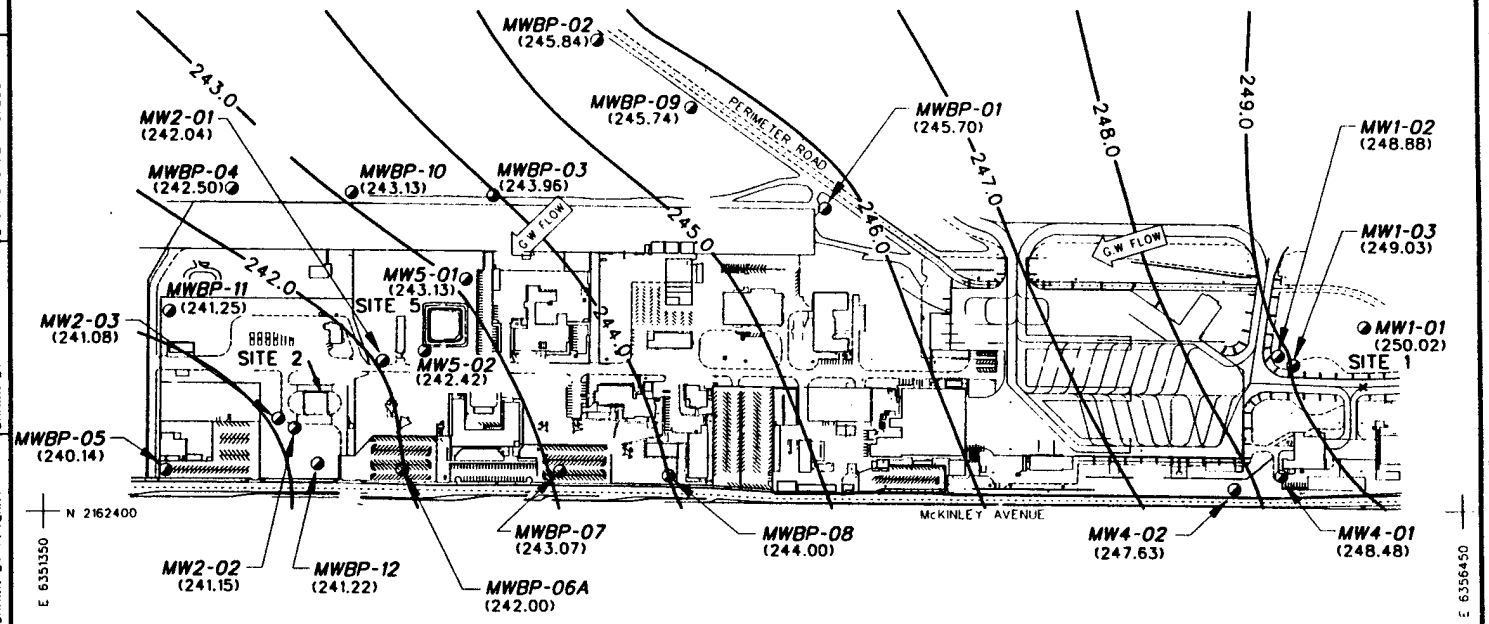

LEGEND:

MW2-01 (242.04)	MONITORING WELL WITH MEASURED GROUNDWATER ELEVATION (ft. MSL)
244.0	GROUNDWATER ELEVATION CONTOUR
G.W. FLOW	GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL = 1.0 FT.

NOTES:

1. "B" AND "C" SERIES WELLS ARE NOT SHOWN.

SCALE:

0 400 800FEET

FIGURE A-4
GROUNDWATER ELEVATION CONTOURS FOR WATER TABLE WELLS, DECEMBER 1993

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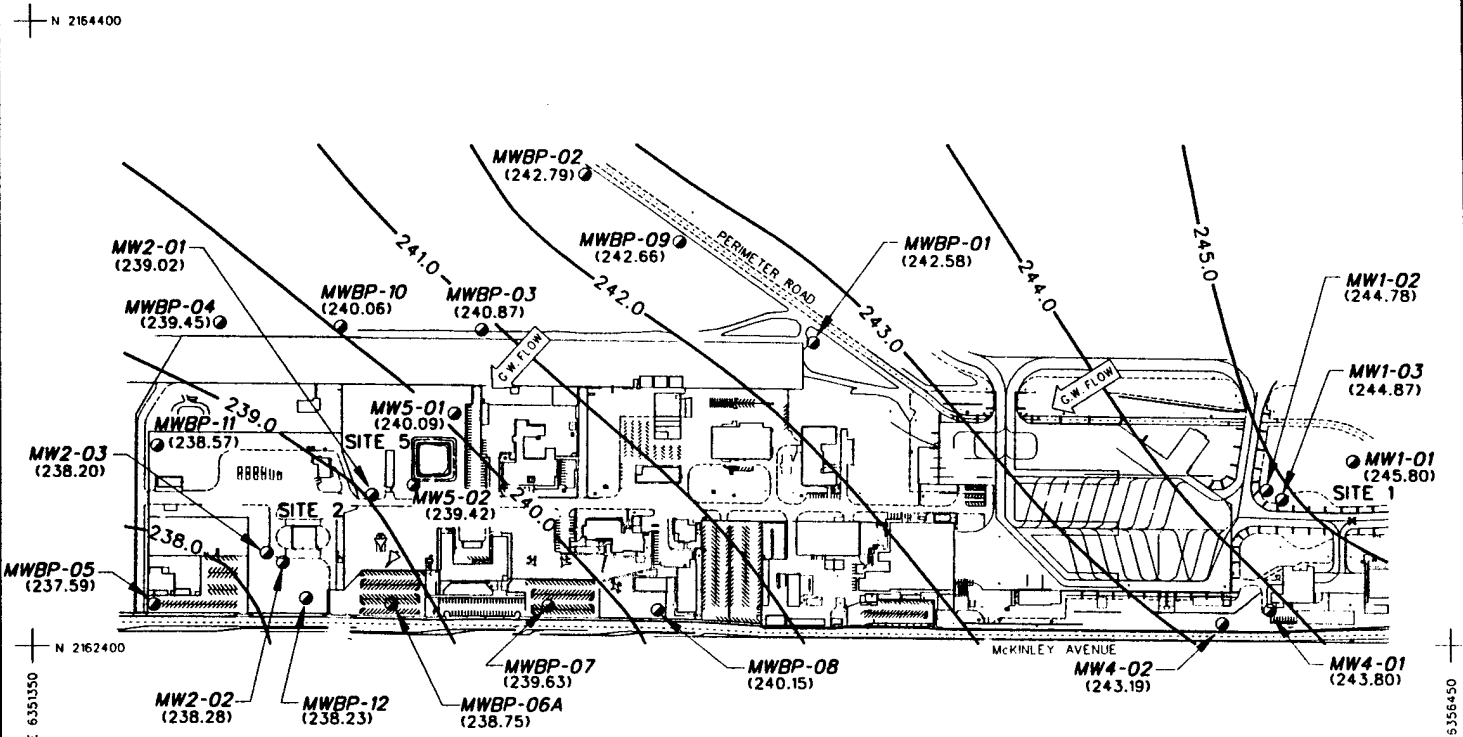

LEGEND:

MW2-01 (239.02)	MONITORING WELL WITH MEASURED GROUNDWATER ELEVATION (ft. MSL)
244.0	GROUNDWATER ELEVATION CONTOUR
G.W. FLOW	GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL = 1.0 FT.

NOTES:

1. "B" AND "C" SERIES WELLS ARE NOT SHOWN.

SCALE:

0 400 800FEET

FIGURE A-5
GROUNDWATER ELEVATION CONTOURS FOR WATER TABLE WELLS, DECEMBER 1994

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409724ES 104 16:00 NOV 7, 1996 Clov